ВИСОКА ТЕХНИЧКА ШКОЛА
СТРУКОВНИХ СТУДИЈА
у Новом Саду

COURSE CATALOGUE

PROTECTION ENGINEERING

Undergraduate applied studies

NOVI SAD
May 2023

Table 5.2.a – Course catalogue of the PROTECTION ENGINEERING undergraduate study programme

No.	Course code	Course title	Field of Study	Semester	Lecture	Lab	Other Forms of Teaching	Other Hours	ECTS
1	2002	Mathematics	Mathematical Sciences, Technological Engineering	1	2	3			7
2	2003	Physics	Physical Siences	1	2	2			6
3	2022	Technical drawing with descriptive geometry	Mechanical Engineering, Technological Engineering	1	2	2			6
4	2004	Chemistry	Chemical Sciences	1	3	2			7
	Elective option 1 (select 1 of 2)								
5	2001	Business communications	Cultural Studies and Communications, Applied Arts and Design	1	3	1			6
	2132	Business law	Legal Sciences	1	3	1			6
6	2005	Fundamentals of environmental protection	Environmental and Occupational Safety Engineering	2	2	3			6
7	2012	Occupational safety	Environmental and Occupational Safety Engineering, Mechanical Engineering	2	2	2			6
8	2007	Fundamentals of mechanical engineering	Mechanical Engineering	2	2	2			6
9	2008	Process devices	Technological Engineering, Environmental and Occupational Safety Engineering	2	2	3			7
10	2015	English	Philological Sciences	2	2	0			3
11	2009	Hazardous chemicals and physical agents	Chemical Sciences, Physical Siences, Technological Engineering	3	3	1	1		7
12	2010	Fundamentals of computing	Electrical and Computer Engineering, Technological Engineering	3	1	1	1		6
13	2006	Fundamentals of electrical engineering 1	Electrical and Computer Engineering	3	2	2			6
14	2026	Air, water and soil protection	Environmental and Occupational Safety Engineering	3	3	1	1		7
15	2013	Combustion processes	Chemical Sciences	3	2	2			7
16	2024	Energy and energy efficiency	Technological Engineering	4	3	2			7
17	2030	Disaster risk reduction system	Environmental and Occupational Safety Engineering	4	3	3			7

Back to top

18	2017	Fundamentals of fire and explosion protection	Environmental and Occupational Safety Engineering, Chemical Sciences	4	2	3			7
Elective option 2 (select 1 of 2)									
19	2035	Engineering communications	Mechanical Engineering	4	2	1	1		6
	2040	Fundamentals of maintenance	Mechanical Engineering	4	2	2			6
20	2018	Specialist English	Philological Sciences	5	2	0			3
21	2023	Work equipment safety	Environmental and Occupational Safety Engineering, Mechanical Engineering	5	2	3			7
Elective option 3 (select 1 of 2)									
22	2019	Technical systems management	Technological Engineering Organizational Sciences	5	2	2			6
	2036	Elements of automation	Mechanical Engineering	5	2	2			6
Elective option 4 (select 1 of 2)									
23	2032	Fundamentals of energy systems	Mechanical Engineering	5	2	2			7
	2078	Graphic processes	Technological Engineering, Машинско инжењерство	5	3	1	1		7
Elective option 5 (select 1 of 2)									
24	2052	Electrical installations and lighting	Electrical and Computer Engineering	5	3	2			7
	2087	Packaging	Technological Engineering	5	2	3			7
25	2106	Work practicum	Legal Sciences, Environmental and Occupational Safety Engineering, Cultural Studies and Communications, Technological Engineering	6	4	4			7
26	2107	Theoretical and experimental bases of professional work	Mechanical Engineering, Electrical and Computer Engineering, Cultural Studies and Communications	6	6	4			9
27	2115	Professional practice	Environmental and Occupational Safety Engineering	6				6/0	4
28	2135	Preliminary thesis	Environmental and Occupational Safety Engineering	6				0/2	2
29	2136	Final thesis	Environmental and Occupational Safety Engineering	6				3/0	8

Back to top

Table 5.2. – Course Specification

Study programme: Protection engineering

Course title: Mathematics

Teacher: Tanja Krunić

Course status: Compulsory

Number of ECTS: 7

Prerequisite course: None

Course objective

Introduction to and mastery of basic concepts in specific areas of mathematics. Preparing students to apply mathematical methods to solve problems in basic and applied sciences.

Learning outcomes

Students will acquire fundamental knowledge in mathematical logic and algebra, set theory, differential, and integral calculus. Students will be equipped to follow courses in professional fields that apply the concepts and techniques they have mastered, and to recognize problems where they can apply the acquired knowledge.

Course contents

Theoretical teaching

Basic concepts of mathematical logic. Sets - basic concepts. Complex numbers: concept, properties, operations. Matrices: Concept of a matrix and matrix operations. Determinants. Inverse matrix. Systems of linear equations. Matrix rank. Real functions of real variables: Domain, zeros, sign of function, boundedness, periodicity, parity. Basic elementary functions: linear, quadratic, power, radical, exponential, logarithmic, trigonometric functions, inverse trigonometric functions. Polynomials. Rational functions. Sequences, limit of a sequence. Continuity of a function. Limits of functions. Asymptotes of functions. Derivatives: Concept of a derivative, differentiation rules, derivatives of basic elementary functions, derivative of composite function, higher-order derivatives. Differential of a function. L'Hôpital's rule. Intervals of monotonicity and extreme values. Convex and concavity intervals, inflection points. Curve sketching and function analysis. Indefinite integral: Concept, table of integrals and basic integration methods. Definite integral. Application of the definite integral.

Practical teaching

Solving problems that illustrate the concepts and their interrelationships covered in the theoretical part of the course. Formulating and solving practical mathematical problems.

Literature

Krunić T., Skripta iz matematike u elektronskom obliku, 2017

Petrić M., Herceg D., Matematika, Visoka tehnička škola strukovnih studija u Novom Sadu, Novi Sad, 2010

Prentović B., Matematika – zbirka zadataka, Visoka tehnička škola strukovnih studija u Novom Sadu, Novi Sad, 2016

Active teaching classes: 75	**Theoretical teaching: 30**	**Practical teaching: 45**

Teaching methods

Monologic, dialogic, interactive.

Assessment (maximum number of points 100)

Pre-exam obligations	**Points**	**Course exam**	**Points**
Active participation in classes		Written exam	50
Practical work		Oral exam	
Interim exam/s	50		
Seminar paper/s			

Back to top

Study programme: Protection engineering

Course title: Physics

Teacher: Vesna Petrović

Course status: Compulsory

Number of ECTS: 6

Prerequisite course: None

Course objective

Introduction to the fundamental laws of selected fields of physics: mechanics with hydromechanics, thermophysics, as well as geometric and wave optics. Students become familiar with the scope of individual laws and their application in ideal and real cases.

Learning outcomes

Students know and can apply basic physical laws from selected areas (calculate the velocities of bodies and fluids, and apply gas laws as well as the laws of geometric and wave optics). They know how to measure specific physical parameters of liquids, verify gas laws, and determine certain optical parameters. They can later apply this knowledge with understanding in professionally applied courses and practice.

Course contents

Theoretical teaching

Introduction: International System of Units (SI). Scalar and vector quantities in physics. Basic algebraic operations with vectors.

Kinematics: Motion in space. Velocity and acceleration. Linear and curvilinear motion.

Dynamics: Newton's laws of motion. Force and impulse of a force. Work, power, and energy. Conservation laws. Dynamics of rigid body rotation.

Fluid Mechanics: Properties of liquids. Hydrostatic pressure. Pascal's and Archimedes' laws. Capillary phenomena. Properties of gases. Barometric formula. Steady flow of an ideal fluid. Continuity equation. Bernoulli's equation and its applications. Viscosity and viscous drag. Reynolds number. Bernoulli's equation for real fluids.

Thermophysics: Kinetic theory of gases: Fundamental principles. Maxwell distribution. Internal energy of a gas. Ideal gas pressure. Equation of state. Gas laws. Specific heat of an ideal gas.

Thermodynamics: First law of thermodynamics. Isoprocesses, adiabatic and polytropic processes. Real gas. Van der Waals equation. Second law of thermodynamics. Efficiency (coefficient of performance). Carnot cycle. Entropy. Enthalpy. Phase transitions.

Optics: Nature and speed of light. Electromagnetic spectrum. Geometric optics: Laws of reflection and refraction. Refraction through a prism and a plane-parallel plate. Dispersion of light. Plane and spherical mirrors. Lenses. Magnifying glass and microscope.

Wave Optics: Coherent light. Interference, diffraction, and polarization of light.

Practical teaching

Problems from the aforementioned fields. Determination of the surface tension constant and the viscosity coefficient of liquids; Verification of Boyle's and Gay-Lussac's laws. Determination of the latent heat of vaporization; Determination of the focal length of converging and diverging lenses; Determination of the wavelength of light using a diffraction grating.

Literature

Avramov, M: Fizika-skripta, Visoka tehnička škola strukovnih studija, Novi Sad, 2009

Petrović, V, Avramov, M.: Fizika – zbirka zadataka, Visoka tehnička škola strukovnih studija, Novi Sad, 2021

Petrović, V, Avramov, M.: Fizika – Praktikum za laboratorijske vežbe, Visoka tehnička škola strukovnih studija, Novi Sad, 2021

Active teaching classes: 60	**Theoretical teaching: 30**	**Practical teaching: 30**

Teaching method:

Monologic, dialogic and interactive.

Assessment (maximum number of points 100)

Pre-exam obligations	**Points**	**Course exam**	**Points**
Active participation in classes		Written exam	50
Practical work	10	Oral exam	
Interim exam/s	40		
Seminar paper/s			

Back to top

Study programme: Protection engineering

Course title: Technical drawing with descriptive geometry

Teacher: Vladimir Blanuša

Course status: Compulsory

Number of ECTS: 6

Prerequisite course: None

Course objective

Understanding spatial relationships (spatial visualization) and achieving technical literacy (enabling the reading of technical drawings and the creation of simple technical sketches).

Learning outcomes

Students will be equipped to perform tasks related to the creation and reading of technical drawings.

Course contents

Theoretical teaching

Technical drawing tools. Projections of a point: onto one, two, and three planes. Quadrants and octants. Projections of a line and a segment. Visibility of line projections. Planes. Traces of a plane. A plane defined by intersecting lines. A plane defined by a triangle. Strike lines (principal horizontal lines). First and second strike lines. Intersection of a line and a plane (penetration). Inclination lines. Technical drawing: scale, lines, sheet format, and technical lettering. Principal projections, required projections. Sections of a body: full section, half section, partial section, and stepped section. Dimensioning: dimensioning methods, dimensioning symbols. Sectional views in technical drawing, simplifications, and special projections. Completing characteristic views. Required projections and selecting characteristic views. Dimensioning. Tolerances. Surface qualities. Mechanical technical drawings. Civil engineering technical drawings. Electrical engineering technical drawings. Computers in engineering communications.

Practical teaching

Computational exercises that follow the theoretical lectures. Octants. Projection of a point onto projection planes. Projection of a straight line onto projection planes. Intersection of a line and a projection plane. Drawing projections of bodies based on 3D models. Reading simple technical drawings. Execution of graphic assignments.

Literature

Blanuša V.: Tehničko crtanje sa nacrtnom geometrijom (elektronski materijal), VTŠ, Novi Sad, 2020

Segedinac T: Tehničko crtanje sa nacrtnom geometrijom, VTŠ, Novi Sad, 2010. Dovniković, L: Tehničko crtanje sa nacrtnom geometrijom, Fakultet tehničkih nauka u Novom Sadu, Novi Sad, 1989

Active teaching classes: 60	**Theoretical teaching: 30**	**Practical teaching: 30**

Teaching methods

Monologic, dialogic, and interactive.

Assessment (maximum number of points 100)

Pre-exam obligations	**Points**	**Course exam**	**Points**
Active participation in classes		Written exam	50
Practical work		Oral exam	
Interim exam/s	20		
Graphic assignments*	30		

Back to top

Study programme: Protection engineering

Course title: Chemistry

Teacher: Saša Spajić

Course status: Compulsory

Number of ECTS: 7

Prerequisite course: None

Course objective

Introduction to the structure of the substance and its chemical transformations, including the accompanying energy effects, with a special focus on the basic classes of inorganic compounds. Introduction to functional groups as centers of reactivity and the primary cause of differences in properties between classes of organic compounds.

Learning outcomes

Upon successful completion of this course, students will be able to: Draw conclusions about an element's behavior in chemical reactions and the type and character of its corresponding compounds, based on its position in the Periodic Table of Elements; Perform stoichiometric calculations based on a chemical reaction; Understand the factors influencing chemical reaction rates and how to affect them to control the reactions; Perform calculations for solution preparation and dilution; Perform calculations based on gas laws and the ideal gas law equation; Recognize classes of inorganic compounds and calculate oxidation numbers of the elements present; Write dissociation equations for acids, bases, and salts; Balance neutralization reactions; Solve simpler redox equations; Master IUPAC nomenclature and the most common reactions of aliphatic and aromatic hydrocarbons, as well as their halogen, hydroxyl, ether, carbonyl, and carboxylic derivatives; Understand, at an elementary level, the behavior of substances in the living and working environment, in living organisms, during fires, and during catastrophic events.

Course contents

Theoretical teaching (Lectures)

Historical development of chemistry. Concept, forms, and properties of matter. Abundance of elements. Periodic Table of Elements. Fundamental chemical laws. Basic chemical quantities. Chemical symbols, formulas, and equations. Atomic structure. Chemical bonding and molecular structure: ionic, covalent, and metallic bonding. Intermolecular forces. Oxidation-reduction processes. Structure and properties of pure substances: gaseous, liquid, and solid states of matter. Thermal effects of chemical reactions. Chemical reaction rates. Mechanisms of chemical reactions. Chemical equilibrium. Disperse systems – solutions. Aqueous solutions. Solubility. Expressing the quantitative composition of solutions. Colligative properties of dilute solutions of nonelectrolytes and electrolytes. Colloidal solutions. Inorganic compounds and their properties: oxides, acids, bases, and salts. Arrhenius theory of electrolytic dissociation. Dissociation constant. Degree of electrolytic dissociation. Ionic reactions. Brønsted-Lowry acid-base theory. Lewis acid-base theory. Ionization of water, ionic product of water, pH, pOH, and pKw. Acid-base indicators. Neutralization. Hydrolysis of salts. Buffers. Solubility product. Organic chemistry – concept. Qualitative analysis. Hybridization. Isomerism. Classification of organic compounds. Nomenclature, synthesis, and properties of carbon compounds: hydrocarbons, halogen derivatives, organic oxygen compounds (alcohols, phenols, ethers, aldehydes, ketones, carboxylic acids, and their derivatives).

Practical teaching (Laboratory Exercises)

Laboratory accidents and protective measures. Heat sources and heating techniques in a chemical laboratory. Basic laboratory glassware and equipment. Measurement of mass and volume. Fundamental laboratory operations. Physico-chemical methods for obtaining pure substances. Verification of fundamental chemical and gas laws. Solutions, solubility, and solution preparation. 2. Oxidation-reduction reactions. Oxides. Acids. Bases. Neutralization. 3. Salts. Hydrolysis. Chemical equilibrium. Chemical reaction rates. 4. Hydrocarbons and their halogen derivatives. 5. Organic oxygen compounds.

Literature

Grigorjev-Munitlak, S., Spaić, S: Hemija, Visoka tehnička škola strukovnih studija u Novom Sadu, Novi Sad, 2017

Spaić, S: Organska hemija, materijal u elektronskoj formi dostupan studentima, Novi Sad, 2017

Grigorjev-Munitlak, S., Spaić, S: Organska hemija, Visoka tehnička škola strukovnih studija u Novom Sadu, Novi Sad, 2017

Active teaching classes: 75	**Theoretical teaching: 45**	**Practical teaching: 30**

Teaching methods: Monologic, dialogic, interactive, demonstrative, practical.

Assessment (maximum number of points 100)

Pre-exam obligations	**Points**	**Course exam**	**Points**
Active participation in classes		Written exam	50
Practical work	10	Oral exam	
Interim exam/s	40		
Seminar paper/s			

Back to top

Study programme: Protection engineering

Course title: Business communications

Teacher: Jovana Kopanja

Course status: Elective

Number of ECTS: 6

Prerequisite course: None

Course objective

To equip students for written and oral communication within the organization and with its environment under contemporary business conditions, and to provide them with insights into the relevant social, cultural, sociological, economic, and political factors.

Learning outcomes

Based on the mastered material, the student will understand the process, functions, models, forms, and channels of business communications, as well as their strategic importance and role in creating the enterprise's identity, reputation, and value. The student will be able to communicate successfully within and outside the enterprise while understanding an interconnected yet culturally, religiously, and socio-politically diverse world. The student will master basic grammatical rules, know how to select adequate vocabulary, and independently write a business letter and email, respecting the rules of business correspondence.

Course contents

Theoretical teaching

Language in communication: Defining the terms language and communication. Elements and phases of communication. Language and speech. Language and script. Oral and written speech. Speech culture. Cultivated speech. Attributes of good speech. Orthography: Basic spelling rules. Sound changes: Sound change rules and examples of deviations. Communicative competence: The concept of linguistic culture. Levels of speech culture. Grammatical norm. Use of foreign words. Social and individual language stratification. Speech constants. Criteria for assessing communicative competence. Personal appearance in business communication: Business communication. Verbal and non-verbal communication. Paralinguistic cues. Distance between interlocutors. Pauses in speech. The importance of active listening in communication. Business conversation. Telephone conversation. Elements of business presentation. Forms of personal appearance. The concept of empathy. Public relations: Manipulation in mass communication. Disinformation. Advertising. Propaganda. Defining the concept of public relations and **its** role. Communication procedures in public relations. Public relations tools. Advantages and disadvantages of public relations. Written business communication: Written business communication. Advantages and disadvantages of written business communication. Electronic communication. Visual communication. Culture and language culture: Culture as thinking and process. The relationship between culture and language culture. Creativity and communication - techniques of creative thinking: The concept of creativity. Intelligence and creativity. Negotiation: Motives for negotiations. Approaches to negotiation. Methods of negotiation. Preparation for negotiations. The negotiation process. Conclusion and implementation of agreements. Society, state and nation: Explanation of the concepts of society, state and nation. Man and organization, organizational culture: Formal and informal communication. The concept of bureaucracy. Bureaucratic style. Vertical and horizontal forms of formal communication. Types of organizations. Socio-cultural and psychological barriers to communication and their overcoming. Communication between cultures and communication strategies. Communication and cultural context. Cultural differences. Business communication contexts: Idea formation. Oral presentation. Business meetings and negotiation strategy. Types of power in communication. Business communication contexts: Marketing communications. Stakeholder philosophy. Problem-solving and decision-making.

Practical teaching

In practical classes, students will master the principles of good written and oral communication through practical examples, written and listening exercises. Using examples and exercises, students will become familiar with grammatical rules at the levels of phonology, morphology, syntax, and vocabulary. Students will write a business letter and email and prepare for a business conversation and meeting.

Literature

Šipka, M.: Pravopisni rečnik srpskog jezika, Novi Sad, Prometej, 2010
Čokorolo R.: Poslovne komunikacije, Novi Sad, Alfagraf, 2008
Pešikan, M., Pižurica, M., Jerković, J.: Pravopis srpskog jezika, Novi Sad, Matica Srpska, 2017
Pavić, Ž.: Etika i poslovne komunikacije, Beograd, Univerzitet Singidunum, (elektronska verzija), 2011
Šulc fon Tun, F.: Kako razgovaramo? Problemi i rešenja, Beograd, Laguna, 2020
Šulc fon Tun, F.: Kako razgovaramo 2: Stilovi, vrednosti i razvoj ličnosti, Beograd, Laguna, 2020

Active teaching classes: 60	**Theoretical teaching: 45**	**Practical teaching: 15**

Teaching methods: Oral presentation, conversation, discussion and demonstration.

Assessment (maximum number of points 100)

Pre-exam obligations	**Points**	**Course exam**	**Points**
Active participation in classes		Written exam	50
Practical work		Oral exam	
Interim exam/s	50		
Seminar paper/s			

Back to top

Study programme: Protection engineering

Course title: Business law

Teacher: Ivan Bulatović

Course status: Elective

Number of ECTS: 6

Prerequisite course: None

Course objective

The aim of this course is to familiarize students with the legal framework of business and managerial decision-making. Students acquire foundational knowledge of general legal concepts, core institutes of various branches of law, business entities, and their business relationships. In addition to theoretical fundamentals, this course provides systematized practical insights necessary for understanding and resolving specific business issues. Furthermore, students will develop practical skills in drafting contracts, formulating offers, and executing acceptances. They will explore the differences between Serbia's Law on Personal Data Protection and international privacy regulations. Finally, the course covers the basics of drafting copyright agreements, as well as preparing patent applications and structuring invention descriptions.

Learning outcomes

By mastering the course content, students acquire the following specific competencies: thorough knowledge and understanding of the principles of law, and the ability to solve specific problems by connecting basic knowledge from different branches of law, such as property law**,** law of obligation**s**, and intellectual property law. Students acquire and improve their ability to apply innovations in the profession by following current regulations and legal commentaries in professional literature. In addition, they develop skills for independent work and the practical application of knowledge (drafting contracts, making offers, and accepting offers). Students will also familiarize themselves with drafting *service agreements*, preparing patent applications, and structuring invention descriptions within those applications.

Course contents

Theoretical teaching

General concepts in law: State, legal order and legal system, legal norm, concept and attributes of a legal entity. Concept and types of property rights: Concept of property rights, things, state property, ownership rights. Law of obligations: Contracts, types of contracts, formation of a contract, offer, acceptance of an offer, subject matter of a contract, legal instruments for securing contract performance and liability for damages. Right to privacy and data processing: Privacy – concept, Law on Personal Data Protection in Serbia and global privacy protection laws. Jurisdictional challenges. Intellectual property: Forms of intellectual property. Copyright and related rights: Copyrighted work as an object of protection. Scope of protection of copyrighted work. Classification of copyrighted works. Subject of copyright - author and copyright holder, as well as co-authors and joint works. Origin and content of subjective copyright: Moral rights. Economic rights. Limitations of subjective copyright and its duration. Database producer's right: Database as an object of protection. Subject matter and content of protection. Duration of rights. Rights of the first publisher of an unprotected work: Subject matter, scope and content of protection. Duration of rights. Industrial property rights: Patent law. Invention as an object of protection. Patentability criteria. Invention right - right to patent protection: Conflict between two independent inventors over the right to a patent. Lawsuit for determining inventor status. Lawsuit for challenging the right to protection. Specifics of the patent granting procedure: Patent application, sufficient description of the invention in the application, unity of invention – divisional application, supplementary application, right of priority, publication of the invention and substantive examination. Origin, duration and termination of the patent: Termination with *ex nunc* effect.

Practical teaching

During practical classes, students will review the covered material and analyze real-world case studies. They will engage in drafting various types of contracts, as well as making and accepting offers. Through case analysis, students will examine and identify the differences between Serbia's Law on Personal Data Protection and international privacy regulations. Furthermore, they will practice drafting copyright agreements, evaluating patentability criteria, preparing patent applications, and structuring invention descriptions within those applications.

Literature

Ljubojević, G., Milošević, I., Poslovno pravo, Visoka poslovna škola strukovnih studija, Novi Sad, 2020
Vernart, B., Međunarodno pravo i poslovanje, Visoka poslovna škola strukovnih studija, Novi Sad, 2022
Marković, S., Popović, D., Pravo intelektualne svojine, Pravni fakultet univerziteta u Beogradu, Beograd, 2022
Spirović-Jovanović, L., Dabić, L., Poslovno pravo, Beograd, Ekonomski fakultet Beograd, 2015
Šogorov, S., Radoman, M., Poslovno pravo, Univerzitet Singidunum, Beograd, 2007

Active teaching classes: 60	**Theoretical teaching: 45**	**Practical teaching: 15**

Teaching methods: Oral presentation, conversation, discussion and demonstration.

Assessment (maximum number of points 100)

Pre-exam obligations	**Points**	**Course exam**	**Points**
Active participation in classes	10	Written exam	50
Practical work		Oral exam	
Interim exam/s	40		
Seminar paper/s			

[Back to top]

Study programme: Protection engineering

Course title: Fundamentals of environmental protection

Teacher: Anita Petrović Gegić

Course status: Compulsory

Number of ECTS: 6

Prerequisite course: None

Course objective

To introduce students to current issues in the field of environmental protection and its fundamental principles. The course aims to develop knowledge of basic principles and key environmental problems from an interdisciplinary and global perspective.

Learning outcomes

Students understand the basic principles and key environmental problems from an interdisciplinary and global perspective. They will be aware of global environmental issues such as climate change and its consequences. Furthermore, students will acquire the elementary knowledge required to understand and resolve environmental problems, including the population explosion, urban development and pollution, and noise as a specific form of pollution. Additionally, they will master introductory concepts in air, water, and soil protection, as well as the issue of solid waste management.

Course contents

Theoretical teaching

Introduction to the fundamental principles of environmental protection. Global environmental challenges and mitigation measures: climate change, ozone layer depletion, soil acidification, tropospheric ozone, biodiversity loss, water resource management, forest decline, soil degradation, and waste management. Environmental protection as a scientific discipline (environment in crisis, symptoms of the environmental crisis, the new dimension of the environmental crisis, sustainable development, interdisciplinarity, and globality). Concept of a system, system boundaries, energy and matter exchange across system boundaries, planet Earth as a system, flows, cycles, and structures of the environmental system. Interaction of civilization and the living environment (urban development, population explosion, human nutrition). Noise as a specific form of pollution (sound generation and transmission, noise sources, permissible noise levels in the environment). The atmosphere, significant atmospheric parameters, and MAC (Maximum Allowable Concentrations) of pollutants in the atmosphere (structure of the atmosphere, atmospheric temperature). Sources, characteristics, and effects of air pollution (sources of air pollution, primary and secondary air pollutants, effects of air pollution). Air pollution emission control. Sources, characteristics, and effects of water pollution. Control and treatment of polluted water. Soil as an environmental medium (soil composition and properties, soil pollution, soil remediation methods). Solid waste as an environmental problem (definition and classification of waste, solid waste management hierarchy).

Practical teaching

During laboratory and practical sessions, students analyze the state of the environment through practical examples and case studies, gaining a deeper understanding and evaluating cause-and-effect relationships. Furthermore, through a mandatory term paper, they analyze a specific problem within the field of environmental protection. Practical instruction promotes teamwork, creativity, and independence in order to increase students' interest and motivation throughout the course.

Literature

Štrbac D., Petrović Gegić, A., Introduction to Environmental Engineering, FTN Novi Sad, 2019

Štrbac, D.: Introduction to the Basic Principles of Environmental Protection, script, FTN Novi Sad 2010

Šećerov, R., Sokolović, S.,: Environmental Engineering, Faculty of Technology Novi Sad, 2002

Active teaching classes: 60	**Theoretical teaching: 30**	**Practical teaching: 30**

Teaching methods: Monologic, dialogic, interactive, demonstrative, practical.

Assessment (maximum number of points 100)

Pre-exam obligations	**Points**	**Course exam**	**Points**
Active participation in classes		Written exam	50
Practical work		Oral exam	
Interim exam/s	30		
Seminar paper/s	20		

Back to top

Study programme: Protection engineering

Course title: Occupational safety

Teacher: Dušan Gavanski

Course status: Compulsory

Number of ECTS: 6

Prerequisite course: None

Course objective

To introduce students to current legislation and the most significant general elements of the occupational safety system. Students are introduced to its operation, required record-keeping, preventive and corrective measures, expert findings, and other official documentation within the field of occupational safety.

Learning outcomes

Upon successful completion of this course, students will understand the fundamental rulebooks in the field of occupational safety and will be capable of maintaining mandatory records (Forms 1–14) and workplace injury reports. Furthermore, they will be able to identify hazards and physical/chemical agents in the workplace, as well as determine the safety methods and protective measures required to mitigate, prevent, and/or eliminate risks.

Course contents

Theoretical teaching

Law on Occupational Safety and Health. Rulebook on Preventive Measures for Safe and Healthy Work at the Workplace. Rulebook on the Manner and Procedure of Risk Assessment at the Workplace and in the Working Environment. Rulebook on the Procedure for Inspection and Testing of Work Equipment and Testing of Working Environment Conditions. Rulebook on Records in the Field of Occupational Safety and Health. Rulebook on Preventive Measures for Safe and Healthy Work When Using Work Equipment with Display Screens. Hazards, physical/chemical agents, and risks in the workplace. Hazards of slips, trips, and falls. Working at low heights and the use of ladders. Occupational safety in offices. Manual lifting and handling of loads. Ergonomics in the workplace. Workplace stress. Workplace hygiene. Risk assessment in the workplace.

Practical teaching

International and domestic regulations in the field of Occupational Safety and Health. Presentation of case studies related to the theoretical instruction. Overview of the KINNEY risk assessment method. Risk assessment for an administrative worker. Expert findings: inspection and testing of work equipment and testing of working environment conditions. Workplace injury report. Record-keeping.

Literature

Đapan, M., Mačužić, I.: Bezbednost i zdravlje na radu – praktikum, Univerzitet u Kragujevcu, Fakultet inženjerskih nauka, Kragujevac, 2020

Zakon o bezbednosti i zdravlju na radu

Pravilnik o preventivnim merama za bezbedan i zdrav rad na radnom mestu

Pravilnik o načinu i postupku procene rizika na radnom mestu i u radnoj okolini

Pravilnik o postupku pregleda i provere opreme za rad i ispitivanje uslova radne okoline

Pravilnik o evidencijama u oblasti bezbednosti i zdravlja na radu

Active teaching classes: 60	**Theoretical teaching: 30**	**Practical teaching: 30**

Teaching methods: Interactive.

Assessment (maximum number of points 100)

Pre-exam obligations	**Points**	**Course exam**	**Points**
Active participation in classes		Written exam	50
Practical work		Oral exam	
Interim exam/s	40		
Seminar paper/s	10		

Back to top

Study programme: Protection engineering

Course title: Fundamentals of mechanical engineering

Teacher: Nenad Janjić, Branko Savić

Course status: Compulsory

Number of ECTS: 6

Prerequisite course: None

Course objective

To introduce students to the fundamental components of machines and devices (machine elements) and parts from various branches and fields of engineering, including their standard shapes and dimensions, principles of operation and functioning, as well as to achieve mastery of modern and generally accepted methods for the calculation and dimensioning of standard machine elements and parts.

Learning outcomes

In technical practice, students will be capable to: • apply engineering thinking and decision-making by connecting theoretical knowledge acquired from related engineering disciplines, thereby demonstrating an interdisciplinary approach to their work; • evaluate multiple options for performing an elementary working function and make an informed choice to select the option that executes the given function in the most optimal manner from technical, economic, and occupational and environmental safety perspectives.

Course contents

Theoretical teaching

***Planar Statics*:** Fundamental concepts, axioms, forces, systems of forces, moment of a force about a point, reduction of a force system to a given point, equilibrium conditions of a planar force system, centers of gravity, beams (types and calculation), sliding and rolling friction forces. ***Kinematics*:** Fundamental concepts, types of motion: translational, rotational, and complex motion. ***Dynamics*:** Fundamental concepts, mass, concept of force, work, energy, power. ***Strength of Materials*:** Fundamental concepts, types of loading, stresses and stress states, and safety factor verification for various stress states. ***Machine Elements*:** Fundamental concepts, standardization, tolerances, classification of machine elements, fasteners and joining elements: detachable (threaded fasteners, pin, key, and spring connections) and non-detachable (riveted, welded, and brazed/soldered joints), elements for rotational motion and power transmission (shafts, axles, pins, sliding and rolling bearings, couplings, transmission pairs: types and characteristics, including friction, belt, chain, and gear drives). ***Mechanisms*:** Fundamental concepts, kinematic pairs and chains, types and applications of linkage, cam, and slotted mechanisms. ***Elements for Fluid Storage and Transmission*:** Pressure vessels, piping elements, and valves/fittings.

Practical teaching

Solving problems in planar statics (planar beams and supports) and 3D statics. Tolerances.

Literature

V. Savić: Osnovi mašinstva - elektronski materijal za predavanja i vežbe, VTŠ, Novi Sad, 2016

S. Velikić: Statika, Viša tehnička škola, Novi Sad, 1987

S. Kovačević: Mašinski elementi, Viša tehnička škola, Novi Sad, 2009

V. Miltenović: Mašinski elementi – oblici, proračun primena. Univerzitet u Nišu, Mašinski fakultet Niš, 2009

Active teaching classes: 60	**Theoretical teaching: 30**	**Practical teaching: 30**

Teaching methods: Interactive.

Assessment (maximum number of points 100)

Pre-exam obligations	**Points**	**Course exam**	**Points**
Active participation in classes		Written exam	
Practical work		Oral exam	50
Interim exam/s	50		
Seminar paper/s			

Back to top

Study programme: Protection engineering

Course title: Process devices

Teacher: Petra Tanović, Anita Petrović-Gegić

Course status: Compulsory

Number of ECTS: 7

Prerequisite course: None

Course objective

To introduce students to the equipment used in technological processes and provide them with a comprehensive understanding of their operating principles. The course covers the processes of sedimentation, mixing, comminution, solid material transport, heat transfer and exchange methods, distillation, and drying. Furthermore, it aims to equip students with the skills required to perform calculations related to heat balance, sedimentation, distillation, filtration, and heat exchange.

Learning outcomes

Students are qualified to perform engineering tasks and will thoroughly understand the operating principles of equipment used in technological processes. They possess essential knowledge of mechanical, thermal, and mass transfer operations necessary for professional practice in the process industry. Additionally, students will master the functioning of process equipment and be capable of performing calculations related to heat balance, heat exchange, particle sedimentation, filtration, drying, distillation, and other related operations.

Course contents

Theoretical teaching

Introduction: Material and energy balance of technological processes. Mechanical operations. Homogeneous and heterogeneous systems. Gaseous heterogeneous systems. Separation of gaseous heterogeneous systems by sedimentation, gravity settlers, cyclones, scrubbers, wet scrubbing, filtration, and electrostatic precipitation. Liquid heterogeneous systems. Foams. Emulsions. Suspensions. Separation of liquid heterogeneous systems: emulsions and suspensions (by sedimentation and filtration). Devices for separating emulsions. Devices for separating suspensions. Mixing of liquids and solid materials. Mixing equipment (mixers with horizontal and vertical blades, propeller mixers). Comminution of solid materials by crushing and grinding. Jaw and cone crushers. Hammer mills and ball mills. Roller mills. Screening, sieves, and screens.

Transport of Solid Materials: Belt, chain, screw, and apron/plate conveyors. Bucket elevators. Pneumatic transport. Hydraulic transport. Air transport.

Heat Transfer Mechanisms: Heat transfer by conduction. Heat transfer by fluid flow – convection. Heat transfer by radiation. Heat sources and carriers. Devices for direct heat exchange. Devices for indirect heat exchange (heat exchangers). Cooling. Condensation and condensers. Evaporation and evaporators.

Mass Transfer Operations: Fundamental laws. Distillation and rectification. Equipment for distillation and rectification. Drying and dryers. Material humidity and moisture content. Material and heat balance.

Practical teaching

Solving problems related to material and heat balances. Problem-solving exercises regarding particle sedimentation and filtration operations. Problems in the field of fluid flow and heat exchange. Exercises covering drying processes, as well as distillation and rectification.

Literature

Milanko, V: Procesni uređaji, Visoka tehnička škola strukovnih studija, Novi Sad, 2015

Milanko, V: Tehnološki procesi proizvodnje, Visoka tehnička škola strukovnih studija, Novi Sad, 2011

Đurić S., Stanojević P., Stepanov B., Radonjić J.: Procesni sistemi i postrojenja, FTN Novi Sad, 2015

Sovilj M. : Difuzione operacije, Tehnološki fakultet Novi Sad, 2004

Active teaching classes: 75	**Theoretical teaching: 30**	**Practical teaching: 45**

Teaching methods: Monologic, dialogic, interactive.

Assessment (maximum number of points 100)

Pre-exam obligations	**Points**	**Course exam**	**Points**
Active participation in classes		Written exam	50
Practical work		Oral exam	
Interim exam/s	50		
Seminar paper/s			

Back to top

Study programme: Protection engineering

Course title: English

Teacher: Branka Petrović

Course status: Compulsory

Number of ECTS: 3

Prerequisite course: None

Course objective

Mastering the basic structures and functions of the English language through everyday life situations, while developing speaking, reading, writing, and listening comprehension skills, as well as gaining familiarity with the culture and lifestyle of English-speaking countries.

Learning outcomes

Communication at an elementary level of English language proficiency (CEFR level A2).

Course contents

Theoretical teaching

Phonetic system and orthography: introduction to the sound system of the English language; the alphabet; spelling; phonetic transcription symbols.

Language functions: asking for and giving personal information; filling out forms; greetings; introducing oneself and others; expressing possession, desires, likes/dislikes, and opinions; orientation in space; telling the time; giving directions; inviting and accepting or declining invitations; telephone conversations; ordering in a restaurant; shopping; describing objects and people; conversations about family, habits, daily activities, the past, and the future.

Grammatical structures: personal and demonstrative pronouns; articles; nouns (regular and irregular plural, word formation, and Saxon genitive); possessive and indefinite adjectives; cardinal and ordinal numbers; quantifiers; prepositions; comparison of short adjectives; existential there; adverbs of frequency and definite time; modal verbs can, may, and must; the imperative; Present Simple, Present Continuous, Past Simple (regular and irregular verbs), and Future Simple tenses, and the going to construction.

Vocabulary: words and expressions necessary for communication at an elementary level of English proficiency.

Practical teaching

Although separate practical classes are not explicitly scheduled, due to the nature of the course, to a certain extent – depending on the specific teaching units – lectures include activities that involve the practical oral and written application of the English language by the students.

Literature

Kovačević, J: Engleski jezik, drugi strani jezik – prva godina učenja, za gimnazije, Zavod za udžbenike i nastavna sredstva, Beograd, 2006

Nastavni materijal predmetnog nastavnika, 2023

Dimitrijević, N., Radovanović, K: Your first English tests, zbirka testova za engleski jezik, Zavod za udžbenike i nastavna sredstva, Beograd, 2007

Active teaching classes: 30	**Theoretical teaching: 30**	**Practical teaching:**

Teaching methods

Combined method (monologue, dialogue, demonstration, illustration, and text-based method along with appropriate organizational forms: frontal, individual, group, pair, and team/interactive work).

Assessment (maximum number of points 100)

Pre-exam obligations	**Points**	**Course exam**	**Points**
Active participation in classes		Written exam	50
Practical work		Oral exam	
Interim exam/s	50		
Seminar paper/s			

Back to top

Study programme: Protection engineering

Course title: Hazardous chemicals and physical agents

Teacher: Saša Spaić, Vesna Petrović

Course status: Compulsory

Number of ECTS: 7

Prerequisite course: None

Course objective

To introduce students to types of chemicals, with a specific focus on hazardous chemicals, and the system of integrated chemical management globally, within the European Union, and in the Republic of Serbia. The course covers emergency response to accidents caused by hazardous chemicals during production, storage, and transport. Furthermore, it introduces physical phenomena, both natural and anthropogenic, that lead to physical pollution and harmful effects on humans. Students will become familiar with their measurement, regulation, standards, and protective measures.

Learning outcomes

Students understand global trends toward uniform classification and hazard communication for every hazardous chemical. They recognize that Serbian chemical regulations (the Law on Chemicals and related bylaws) are fully harmonized with corresponding European Union regulations, such as the REACH Regulation. Additionally, and understand the positioning and role of Serbian chemical regulations in relation to the umbrella Law on Environmental Protection, occupational health and safety regulations, and dangerous goods transport regulations. Based on this legal knowledge, they are qualified to apply these regulations across all safety sectors and comprehend accident intervention strategies involving hazardous chemicals. Students also master the concepts of physical hazards, specifically noise, vibration, and the full spectrum of electromagnetic radiation, alongside the laws and rulebooks that regulate them and their respective protective measures. They are capable of calculating eight-hour daily exposure to noise and vibration, measuring work environment parameters and lighting levels, and evaluating compliance based on relevant regulations. Finally, they differentiate between parts of the electromagnetic spectrum and understand its properties and harmful biological effects.

Course contents

Theoretical teaching

Integrated Chemicals Management. REACH (Regulation (EC) No. 1907/2006) and the European Chemicals Agency – ECHA. General notes on the Chemicals Act, the role of the Chemicals Advisor. Integrated Chemicals Register: substance dossiers **and** Substances of Very High Concern (SVHC**)**. Regulations governing the classification, packaging, labelling and advertising of chemicals. Classification of chemicals based on physical and chemical properties. Classification of chemicals based on properties affecting human life and health. Classification of chemicals based on properties affecting the environment. Safety Data Sheet. Detergents. Particularly hazardous chemicals. Restrictions and bans on the production, placing on the market, and use of chemicals. Import and export of chemicals. International conventions regulating chemicals management (Stockholm Convention, Rotterdam Convention, and the Convention on the Prohibition of the Development, Production, Stockpiling and Use of Chemical Weapons and on their Destruction). General principles of prevention of risk caused by hazardous and harmful substances, specific preventive and protective measures for chemical risk control and their prioritization. European Agreement concerning the International Carriage of Dangerous Goods by Road (ADR-regulations). Emergency Response Guidebook 2016. Emergency Response Guidebook 2020. ERG 2020 for Android.
Sound: Intensity and level of sound/noise. Ultrasound. ***Noise and vibrations***: Levels and spectrum of noise and vibration. Equipment, measurement methods and harmful effects. Regulations of harmful exposure, standards and norms. ***Working environment microclimate***: Criteria for determining comfort. ***Frequency-dependent radiation***: Electrostatic and stationary fields. Classification of frequency-dependent radiation, measurement and standardization according to regulations in the working and living environment. ***Visible light radiation***: Light sources. Photometric quantities. Illumination assessment and measurement of photometric quantities. ***Electromagnetic radiation of wave-quantum nature***: Laws of **blackbody radiation**. Infrared and ultraviolet radiation: sources, properties and classification. Atomic models. Bohr's theory. Lasers: working principle, application, harmful effects and protection. X-rays: measurement, standardization and protection. ***Particulate radiation***: Basic properties of the atomic nucleus. Law and types of radioactive decay. Nuclear reactions. Dosimetry and detectors.

Practical teaching

Practical assignments from the specified areas. Noise measurement and calculation of exposure levels. Determination of microclimate factors and lighting quality. Determination of the γ-radiation absorption coefficient. Ionizing radiation dosimetry**.**

Literature

Zakon o hemikalijama („Službeni glasnik RS“, br. 36/09, 88/10, 92/11, 93/12 i 25/15) sa pripadajućim pravilnicima.
Vodič za odgovor na udes 2016, prevod na srpski jezik, izdavač: Štamparija A&D Technology, Pančevo (internet).
Emergency response guide book 2020, CANUTEC, Transport Dangerous Goods Canada; U. S. Department of Transportation, Pipeline and Hazardous Materials Safety Administration; Secretaría de Comunicaciones y Transportes, México; Centro de Información Química para Emergencias (CIQUIME), Argentina (internet).
Stojaković, P.: Fizički izvori štetnosti, VTŠ, Novi Sad, 1989. Veličković, D.: Buka i vibracije 1 i 2 deo, Niš, 1988
*** Fizičke štetnosti – pripremljen materijal sa predavanja u elektronskoj formi.
Petrović, V., Avramov, M.: Fizika - zbirka zadataka, Visoka tehnička škola strukovnih studija u Novom Sadu, Novi Sad, 2021
Petrović, V., Avramov, M.: Fizičke štetnosti - Praktikum za laboratorijske vežbe, Visoka tehnička škola strukovnih studija u Novom Sadu, Novi Sad, 2021

Active teaching classes: 75	**Theoretical teaching: 45**	**Practical teaching: 30**

Teaching methods: Monologic, dialogic, interactive, demonstrative, practical.

Assessment (maximum number of points 100)

Pre-exam obligations	**Points**	**Course exam**	**Points**
Active participation in classes		Written exam	50
Practical work		Oral exam	
Interim exam/s	50		
Seminar paper/s			

Back to top

Study programme: Protection engineering

Course title: Fundamentals of computing

Teacher: Lazo Manojlović

Course status: Compulsory

Number of ECTS: 6

Prerequisite course: None

Course objective

To enable students to learn the fundamental concepts of information technology related to computer components, hardware, software, the concepts of primary memory (RAM) and external storage, information networks, and internet security. Additionally, students should learn to use word processing software such as Word, spreadsheet software such as Excel, raster graphics editing software such as Photoshop, and presentation software such as PowerPoint, or similar applications, in their daily work.

Learning outcomes

Proficient use of Word, Excel, Photoshop, PowerPoint, or similar applications in daily life, further education, and future career. Students are equipped to use the Windows operating system and to properly and safely utilize the internet and its services. By understanding the basic functions and services of computers, students will be able to further develop more detailed, specific knowledge depending on their future profession.

Course contents

Theoretical teaching

Computer development to date and future development directions. Number systems. Binary number system and arithmetic operations. Data encoding in a computer. Code pages. Boolean algebra and its application. Logic gates in a computer.

Computer organization and architecture. Computer hardware components. Processor (CPU). Motherboard.

Primary memory (RAM). Types of external storage. Input devices. Output devices. Video system. The role and importance of the internet. Internet services.

Types of computer software. The role of the operating system. The concept of an information system. Types of computer applications. Safe computer operation.

Practical teaching

Basics of using the Windows operating system. Basics of using the Internet. Working with software applications: word processing (Word or similar), spreadsheets (Excel or similar), photo editing (Photoshop or similar), and presentations (PowerPoint or similar).

Literature

Ružić Dimitrijević, Lj., Lovreković, Z., Subić, N.: Računari i praktikum, VTŠ, Novi Sad, 2015

Zoranović, T.: Informatika, Poljoprivredni fakultet, Univerzitet u Novom Sadu, Novi Sad, 2021

Jovanović, P.: Računajte na računare (digitalna edicija), Računajte na računare, 2010

Eremić, Ž.: Računari - udžbenik, Visoka tehnička škola strukovnih studija u Zrenjaninu, Zrenjanin, 2021

Frye C.: Microsoft Office Excel 2019:korak po korak, CET, 2019

Active teaching classes: 45	**Theoretical teaching: 15**	**Practical teaching: 30**

Teaching methods

Monologic, interactive, laboratory.

Assessment (maximum number of points 100)

Pre-exam obligations	**Points**	**Course exam**	**Points**
Active participation in classes	5	Written exam	50
Practical work	45	Oral exam	
Interim exam/s			
Seminar paper/s			

Back to top

Study programme: Protection engineering

Course title: Fundamentals of electrical engineering 1

Teacher: Branislav Santrač

Course status: Compulsory

Number of ECTS: 6

Prerequisite course: None

Course objective

To introduce students to the fundamental concepts and laws of electrostatics, direct current (DC) circuits, electromagnetism, and alternating current (AC) circuits.

Learning outcomes

Students will understand the fundamental concepts and laws of electrostatics, DC circuits, electromagnetism, and AC circuits. Furthermore, they will be capable of solving theoretical and practical problems within these subject areas.

Course contents

Theoretical teaching

Electrostatics: Concepts of static electricity, electrostatic field, behavior of materials in an electrostatic field, capacitors.

Direct Current (DC): Concept of electric current, electric circuit and its elements, resistance and conductivity of materials, voltage, current intensity and their magnitudes, Ohm's law, open-circuit, operating mode, and short-circuit, complex electrical circuits, Kirchhoff's laws, power and work of electric current, Joule's law, effects of electric current: thermal effect, heating of conductors by electric current, thermoelectricity.

Electromagnetism: Magnetic field of a permanent magnet and electric current, current-carrying conductor in a magnetic field, mutual interaction of current-carrying conductors, behavior of materials in a magnetic field, ferromagnetic materials, magnetic hysteresis, magnetic materials, magnetic circuit, electromagnetic induction, self-induction, mutual induction, eddy currents.

Alternating Current (AC): Vector representation of alternating quantities, phasor and vector diagrams, impedance in alternating current circuits, alternating current power, power factor, three-phase alternating current systems, power of a three-phase system.

Practical teaching

Solving numerical problems from all covered subject areas, working through problems on the blackboard, and group problem-solving exercises.

Literature

B. Santrač, S. Skoko: Elektrotehnika, VTŠ, Novi Sad, 2014

B. Popović: Osnovi elektrotehnike 2, Građevinska knjiga, Beograd

N. Pekarić-Nađ, V. Bajović: Zbirka rešenih ispitnih zadataka iz osnova elektrotehnike, Građevinska knjiga, Beograd, 1998

A. Torbica: Osnovi elektrotehnike, VTŠ, Novi Sad, 2003

A. Torbica: Elektroenergetika, VTŠ, Novi Sad, 2002

Grupa autora: Bezbednost i zdravlje na radu - knjiga 3, Elektroenergetika, VTŠ Novi Sad, 2011

Active teaching classes: 60	**Theoretical teaching: 30**	**Practical teaching: 30**

Teaching methods

Monologic, dialogic, interactive, demonstrative, practical, as well as group and independent student work on solving problems.

Assessment (maximum number of points 100)

Pre-exam obligations	**Points**	**Course exam**	**Points**
Active participation in classes		Written exam	50
Practical work		Oral exam	
Interim exam/s	50		
Seminar paper/s			

[Back to top]

Study programme: Protection engineering

Course title: Air, water and soil protection

Teacher: Anita Petrović

Course status: Compulsory

Number of ECTS: 7

Prerequisite course: None

Course objective

To provide students with fundamental knowledge in the protection of air, water, and soil, including contamination pathways, quality analysis, and purification treatment.

Learning outcomes

Students are able to participate in resolving issues related to quality control and the protection of air, water, and soil resources, as they are familiar with the primary pollutants in these media. They understand detection methods and the monitoring of specific parameters, and have acquired practical skills for laboratory analysis of air, water, and soil. Furthermore, students are capable of analyzing and interpreting results to determine the source of pollution. They are also familiar with emission control methods, including air and water purification technologies and soil remediation techniques.

Course contents

Theoretical teaching

Air: Importance of air, sources, and types of air pollution. Pollutants – typical and specific; characteristics; sources of origin, effects on the human body, and the entire environment. Air quality monitoring. AQI (Air Quality Index). Air sampling, detection methods, and characterization of specific air quality control parameters. Air pollution control focusing on various techniques for removing specific pollutants. Legal regulations and standards in air protection management.

Water: Importance of water and the issue of surface water pollution at local and global levels. Pollution control in water bodies. Water quality control parameters. Water sampling, parameter measurement methods, and their characteristics. Classification of wastewater. Municipal, industrial, and thermal power plant wastewater. Wastewater treatment methods. Drinking water: quality requirements and pollution issues. Drinking water quality control. Drinking water treatment methods. Legal regulations and standards in water protection management.

Soil: Importance of soil. Soil structure. Soil properties. Threats to soil. Types of erosion. Loss and destruction of fertile soil. Surface mining of mineral resources. Phases of soil damage (degradation and destruction). Soil degradation and pathways of degradation. Complete exclusion of soil from its primary function. Sources of soil pollution. Industry as a source of soil pollution. Impact of mineral resource exploitation and groundwater extraction on soil. Soil pollution from agricultural production. Acid rain as a soil pollutant. Soil pollution from wastewater. Traffic as a soil pollutant. Impact of accidental situations on soil pollution. Landfills as soil pollutants. Radioactive soil contamination. Soil remediation and reclamation. Phytoremediation.

Practical teaching

Laboratory exercises are closely linked to the practical development of theoretical units to ensure hands-on laboratory experience in this field. Air sampling and determination of particulate matter (dust) and volatile organic compounds (VOCs) concentrations. Gas analysis using the Orsat apparatus. Measurement of pH and electrical conductivity in water. Determination of chemical oxygen demand (COD) in water. Determination of chlorides in water. Photometric and spectrophotometric detection of specific pollutants in water. Soil sampling and sample preparation for analysis. Sedimentation methods (particle-size analysis). Qualitative and quantitative detection of chlorides, sulfates, bicarbonates, humus, phosphorus, and heavy metals in soil.

Literature

Petrović Gegić, A., Božović, T: Zagađenje i zaštita vazduha, Visoka tehnička škola strukovnih studija Novi Sad, Novi Sad, 2014

Petrović Gegić, A., Božović, T: Zagađenje i zaštita vode, Visoka tehnička škola strukovnih studija u Novom Sadu, Novi Sad, 2012

Đukanović, J., Bojanić, V: Aerozagađenje, Institut zaštite i ekologije, Banja Luka, 2000

Tomašević-Pilipović D., i saradnici.: Zagađivanje voda, PMF, Novi Sad 2015

Tanović, P., Božović, T: Analiza zemljišta, praktikum, VTŠ, Novi Sad, 2015

Novaković V., Tomić A., Nikolić N., Petrović D.: Zagađenje i zaštita zemljišta i podzemnih voda, Feljton, Novi Sad, 2018

Active teaching classes: 75	**Theoretical teaching: 45**	**Practical teaching: 30**

Teaching methods: Monologic, dialogic, interactive, demonstrative, practical.

Assessment (maximum number of points 100)

Pre-exam obligations	**Points**	**Course exam**	**Points**
Active participation in classes		Written exam	50
Practical work	20	Oral exam	
Interim exam/s	30		
Seminar paper/s			

Back to top

Study programme: Protection engineering

Course title: Combustion processes

Teacher: Saša B. Spaić

Course status: Compulsory

Number of ECTS: 7

Prerequisite course: None

Course objective

The objective of the course is for students to comprehend and master the types, relevant parameters, laws, and outcomes of combustion and thermal decomposition processes, enabling them to identify and resolve practical problems related to these processes. The course provides the fundamental knowledge necessary for further advanced study in all aspects of fire science.

Learning outcomes

Students will understand the fundamental concepts related to combustion, fire, and material flammability. They will be capable of writing combustion equations for organic combustible materials in oxygen and air, and they will understand the combustion characteristics of gaseous, solid, and liquid fuels. Regarding fire dynamics, students will master heat transfer mechanisms, combustion products, smoke and heat as hazards, gas movement during fires, and fire suppression chemistry. Furthermore, they will perform calculations related to gas mixtures, fuel combustion processes, and heat transfer that can act as fire ignition sources.

Course contents

Theoretical teaching (Lectures)

Introductory considerations. Combustibility of materials. Combustion. Fire. Flammability. Fire triangle and fire tetrahedron. Fire stages. Backdraft. Flashover. ***Combustion of gases***. Flame classification. Forced and spontaneous ignition of gas mixtures. Lower and upper flammability (explosive) limits. Explosion. Deflagration. Detonation. Chemical mechanism of gas combustion. Examples of hazardous gases. Flammability interval. Influence of temperature, pressure, and the presence of inert gases on the flammability interval. Stoichiometric mixture. Ignition temperature. Activation energy. Autoignition temperature. Cause of ignition. Ignition sources. Ignition energy. Heat of combustion. Heat and pressure of explosion. ***Combustion of liquids***. Mechanism of liquid combustion. Flash point of liquids. Fire point of liquids. Linear and mass burning rate of liquids. Examples of combustion: pure liquid, mixture of miscible flammable liquids, mixture of a flammable liquid miscible with water, flammable liquid lighter than water and immiscible with it (boilover). BLEVE (Boiling Liquid Expanding Vapor Explosion). Flame spread rate across liquid surfaces. Combustion of liquid droplets. Autoignition of liquids. ***Combustion of solids***. *Combustion mechanisms of solids.* Pyrolysis. Flaming combustion. Ignition and autoignition temperature. Smoldering. Char formation and melting. Rate of combustion and flame spread. Cone calorimeter. Combustible dusts. Self-heating and autoignition. Flammable solid materials. Flame retardants. Oxygen consumption calorimetry. Combustion of metals. Exothermic materials. ***Concluding remarks***. Heat transfer mechanisms. Hazards due to heat transfer. Smoke aerosols. Smoke and heat as hazards. Filling of a fire-affected space with smoke. Chemistry of fire suppression.

Practical teaching (Laboratory exercises)

Stoichiometric equations of combustion reactions in oxygen and air. Calculation of gas mixture parameters using the ideal gas law equation; calculation of volumetric and mass composition of gas mixtures. Assessment of gas mixture explosiveness. Calculation of the heating value of combustible materials (lower and upper limits). Calculation of the required amount of oxygen and air for combustion, combustion products, and the volumetric composition of combustion products. Calculation of the quantity of heat, heat flow rate, and temperature regimes.

Literature

Spaić, S.: Procesi sagorevanja, materijal u elektronskoj formi, dostupan studentima, Novi Sad, 2018

Gann, R.G., Friedman, R.: Principles of Fire Behavior and Combustion, 4th Edition, NFPE (Quincy), Jones&Bartlett Learning (Burlington), 2015

Drysdale, D.: An introduction to fire dynamics, 3rd Edition, John Wiley & Sons Ltd (Chichester), 2011

Active teaching classes: 60	**Theoretical teaching: 30**	**Practical teaching: 30**

Teaching methods: Monologic, dialogic, interactive, demonstrative.

Assessment (maximum number of points 100)

Pre-exam obligations	**Points**	**Course exam**	**Points**
Active participation in classes	10	Written exam	50
Practical work		Oral exam	
Interim exam/s	40		
Seminar paper/s			

Back to top

Study programme: Protection engineering

Course title: Energy and energy efficiency

Teacher: Petra Tanović

Course status: Compulsory

Number of ECTS: 7

Prerequisite course: None

Course objective

To introduce students to different types of non-renewable and renewable energy sources and their environmental impact. Additionally, the course aims to familiarize students with opportunities for improving energy efficiency across various sectors, while raising awareness regarding the necessity of energy conservation and the enhancement of energy efficiency.

Learning outcomes

Students will understand the significance of energy utilization for economic and social development, as well as the negative consequences it can have on the environment. Furthermore, students will recognize the importance of utilizing renewable energy sources and improving energy efficiency for environmental protection. Students will be fully equipped to perform greenhouse gas emission calculations for fossil fuels.

Course contents

Theoretical teaching

Energy: Energy sources (renewable and non-renewable energy sources). Forms of energy (potential, kinetic, thermal, chemical, nuclear, and electrical energy). Power engineering. Humanity's energy demands. Energy trends in the 21st century. Non-Renewable Energy Sources: Coal (ecology and coal cleaning technologies). Oil (petroleum). Natural gas. Nuclear energy. Environmental consequences of energy sector development. Environmental impact of thermal power plants on air pollution. Emission reduction measures. Renewable Energy Sources: The necessity of using renewable energy sources. Energy of the future and alternative energy sources. Hydropower from flowing water. Wind energy. Solar energy. Geothermal energy. Ocean energy. Biomass (classification of biomass by origin, technologies for biomass conversion into other forms of energy). Calorific value of biomass. Biomass combustion boilers. Heat exchangers. Municipal Solid Waste (MSW) Energy: Significance of utilizing municipal solid waste energy. Technologies for converting municipal solid waste into other forms of energy (incineration, pyrolysis, plasma process, gasification, anaerobic digestion). Landfill gas.

Energy efficiency: The need to reduce the consumption of non-renewable energy sources. Basic concepts of energy efficiency. Sustainable development and energy efficiency. Energy efficiency in energy consumption. Energy efficiency in transport (eco-friendly vehicles/electric cars). Efficiency of boiler plants. Combustion. Calorific value of fuel. Fuel utilization efficiency. Industrial energy efficiency. Energy efficiency in buildings (solar thermal systems, heat pumps, etc.). Energy and ecology: Environmental impact of specific energy sources. Nuclear hazards (environmental impact of nuclear waste storage).

Legal regulations in the field of energy efficiency: Law on Energy Efficiency and Rational Use of Energy. Regulations on energy efficiency of buildings. Law on the Use of Renewable Energy Sources. Energy Law. Law on Mining and Geological Research. Integrated National Energy and Climate Plan. European Union Directives.

Practical teaching

Calculation of annual CO2 emissions. Calculation of building energy efficiency. Calculation of the energy potential of landfill gas. Calculation of efficiency of boiler plants and heat exchangers.

Literature

Šulić M.: Čovjek i energija, AGM knjiga, Beograd 2020
Đonlagić M.: Energija i okolina, Printcom, Tuzla, 2005
Morvaj Z., Gvozdenac D., Tomišić Ž., Sustavno gospodarenje energijom i upravljanje utjecajima na okoliš u industriji, Energetika marketing, Zagreb 2016
Despotović M., Babić M.: Energija biomase, Mašinski fakultet Kragujevac, 2007
Babić M., Gordić D., Bošković G., Končalović D., Živković D, Vukašinović V., Rakić N., Josijević M.: Energetsko planiranje u opštinama-metodologije i alati, Fakultet inženjerskih nauka -Univerzitet u Kragujevcu, 2015
Ž., Adamović, B. Ilić, Eneretska efikasnost: Zelena energija, VTŠ Beograd, 2013

Active teaching classes: 75	**Theoretical teaching: 45**	**Practical teaching: 30**

Teaching methods

Lectures and auditory exercises. Monologic, dialogic, interactive, demonstrative and practical methods.

Assessment (maximum number of points 100)

Pre-exam obligations	**Points**	**Course exam**	**Points**
Active participation in classes		Written exam	50
Practical work		Oral exam	
Interim exam/s	30		
Seminar paper/s	20		

Back to top

Study programme: Protection engineering

Course title: Disaster risk reduction system

Teacher: Branko Babić

Course status: Compulsory

Number of ECTS: 7

Prerequisite course: None

Course objective

To introduce students to the legal and regulatory framework in the field of disaster risk reduction; the system (forces and assets) for the protection and rescue of the population, **property, and cultural heritage** from natural disasters and other emergencies; and the statutory obligations of system entities in developing Disaster Risk Assessments and Protection and Rescue Plans.

Learning outcomes

Students are equipped to successfully perform tasks related to assessing potential risks from natural and other disasters within defense system entities, as well as tasks concerning the structure, replenishment, and training of organized protection and rescue forces. They can independently, professionally, and scientifically analyze disaster data to formulate adequate response strategies. Furthermore, students are qualified to participate in the preparation of Disaster Risk Assessments alongside institutional teams, as well as the development of Emergency Protection and Rescue Plans.

Course contents

Theoretical teaching

1. Establishment of the disaster risk reduction and emergency management system.
2. Legal and regulatory framework of the disaster risk reduction and emergency management system.
3. Disaster risk reduction and emergency management system – rights and duties of system entities.
4. Emergencies – Emergency management and emergency headquarters. Functioning of the disaster risk reduction system at the city, urban municipality, and municipal levels. Occupational health and safety measures under various risks. Emergency communication systems.
5. Risk – Nature, treatment, and the core concept of management. Risk levels. Classification, functions, and phases of risk management. Risks within statutory and legal documents.
6. Disaster risk assessment for companies and other legal entities, state administration bodies, and the Republic of Serbia.
7. Disaster risk assessment methodology for defense entities: Guidelines for the Republic of Serbia, autonomous provinces, local self-government units, companies, and other legal entities.
8. Protection and rescue plans: Plan of the Republic of Serbia; Plan of the autonomous province; Plan of the local self-government unit; Plan for companies and other legal entities; Employee protection and rescue plan for state administration bodies and special organizations; Operational plan for state administration bodies, autonomous provinces, the City of Belgrade, and local self-government units.

Practical teaching

Laboratory Exercises: Risk assessment for the territory of local self-government units and companies. Preparation of protection and rescue plans based on specific hazards.
Site visits to companies and other legal entities:
Field visit to the Sector for Emergency Situations of the Ministry of Internal Affairs of the Republic of Serbia.
Field visit to local self-government units and the administrative district offices to get acquainted with enacted Disaster Risk Assessments and Protection and Rescue Plans.

Literature

Babić, B: Integrisani sistem zaštite i spasavanja u Republici Srbiji, VTŠ SS Novi Sad, 2022

Babić, B: Sistem smanjenja rizika od katastrofa i upravljanja vanrednim situacijama, VTŠ SS Novi Sad, 2021

Babić, B: Zbirka propisa za procenu rizika od katastrofa – Normativno pravna regulativa za polaganje stručnog ispita- Novi Sad 2021

Babić, B: Sistem zaštite i spasavanja u Republici Srbiji, Regionalna asocijacija za bezbednost i krizni menadžment, Beograd 2017

Active teaching classes:	**Theoretical teaching:**	**Practical teaching:**

Teaching methods:Monologic, dialogic, interactive, demonstrative.

Assessment (maximum number of points 100)

Pre-exam obligations	**Points**	**Course exam**	**Points**
Active participation in classes		Written exam	50
Practical work – field visits	5		
Interim exam/s	30		
Seminar paper/s	15		

Back to top

Study programme: Protection engineering

Course title: Fundamentals of fire and explosion protection

Teacher: Saša B. Spaić

Course status: Compulsory

Number of ECTS: 7

Prerequisite course: None

Course objective

To introduce students to the fundamentals of fire and explosion protection systems, starting with the Law on Fire Protection and its accompanying regulations, through the influence of the combustible material's nature on the initiation and behavior of fires and explosions, suppression mechanisms, fire classes, and the types and selection of fire detection and suppression equipment and agents, up to the basics of passive fire protection and firefighting tactics.

Learning outcomes

Students understand the legal framework and functioning of the fire protection system in the Republic of Serbia. They are familiar with the initiation mechanisms of fires and explosions, as well as their suppression mechanisms, enabling them to comprehend and safely apply both preventive and repressive fire and explosion protection measures for themselves and their environment.

Course contents

Theoretical teaching (Lectures)

Fire protection (FP) system. Entities of FP. Definitions. Implementation of FP. Principles of FP. FP Strategy. Ministry of Internal Affairs and FP. Ministry of Defense, the Serbian Armed Forces, and FP. Autonomous Province and FP. Local Self-Government Units and FP. Fire risk categorization. FP Plan. Evacuation plan. FP Rules. FP in urban planning documentation. Essential FP requirements during design and construction. Main FP project design and approval. Facility eligibility for occupancy. Design and installation of special systems. Maintenance and inspection of installations and devices. Preventive measures in nature. Storage of flammable materials. Harvesting operations. Open-air burning. Fire watch. Basic FP training. Special FP training. Inspection and supervision – inspectors. Combustion of gaseous, liquid, and solid materials. Ignition sources. Combustion products, their properties, and effects. Fire. Explosion. Types of fires by location. Boilover. BLEVE. Enclosure fires. Extreme fire behavior in enclosures: flashover, backdraft, rollover, fire gas explosion, and wind-driven fires. Tactical ventilation and anti-ventilation. Gas mixture explosions. Hazardous areas (Zones 0, 1, 2). Primary and secondary explosion protection. Equipment for use in explosive atmospheres. Explosives. Dust explosions. Hazardous Zones 0, 1, 2. Detection of explosive atmospheres. Fire suppression mechanisms. Fire classes (A, B, C, D, and F). Fire extinguishing agents: water, foam, powder, carbon dioxide, halons, and novel agents (chemical agents, inert agents, pyrotechnically generated aerosols). Equipment for extinguishing incipient fires (first-aid equipment, fire extinguishers – portable and wheeled). Tactical application of fire extinguishers for incipient fires. Hydrants. Fixed fire extinguishing systems (sprinkler, drencher, etc.). Fire alarm and detection systems. Passive fire protection. Fire protection equipment. Tactics for indoor fire suppression using water. Hot fire training simulators.

Practical teaching (Laboratory Exercises)

General introduction to fires, classification of combustible materials, heat, and combustion products. Behavior of materials in fire and their classification. Fire load (calculations and problems). Fire compartments, facility categorization, fire development and spread. Calculation of safe separation distances between buildings. Public buildings. Evacuation (general overview without calculations). Fire extinguishing agents. Selected fire case studies (seminar paper).

Literature

Spaić, S.: Osnove zaštite od požara i eksplozija, materijal u elektronskoj formi, dostupan studentima, Novi Sad, 2021

Zakonska regulativa zaštite od požara (Zakoni, Uredbe, Prvilnici, Odluke, Standardi, Preporuke).

Mihajlović, E., Mlađan, D., Janković, Ž.: Procesi i sredstva za gašenje požara, Fakultet zaštite na radu u Nišu, Niš, 2009

Cote, A.E. (Editor-in-Chief): Fire Protection Handbook®, 20th Edition, Volume I & II, NFPE®, Quincy, Massachusetts, 2008

Active teaching classes: 75	**Theoretical teaching: 30**	**Practical teaching: 45**

Teaching methods: Monologic, dialogic, interactive, demonstrative.

Assessment (maximum number of points 100)

Pre-exam obligations	**Points**	**Course exam**	**Points**
Active participation in classes		Written exam	50
Practical work	10	Oral exam	
Interim exam/s	20		
Seminar paper/s	20		

Back to top

Study programme: Protection engineering

Course title: Engineering communications

Teacher: Biljana Gemović

Course status: Elective

Number of ECTS: 6

Prerequisite course: None

Course objective

Introducing students to software used for drawing and shaping mechanical, structural and design segments.

Learning outcomes

Students will be equipped to independently draw workshop and assembly drawings using computer software and technical drawing principles, and to generate complete product technical documentation.

Course contents

Theoretical teaching

Workshop drawings: requirements, elements of a workshop drawing, and production methods. Assembly drawings: requirements, elements of assembly drawings, and production methods. Installation (erection) drawings: oblique projection drafting using the indirect projection method, elements of installation drawings, and production methods. Mechanical engineering projects: components and production methods. Electrical power engineering projects: components, production methods, and report writing. Technical drawings in mechanical, electrical, and civil engineering.

Basic concepts and structure of CAD. Engineering design: phases, types of structures. Function structure. Conceptual design development. Dimensioning of parts: functional dimensioning, dimensioning based on stress and other component states. Optimization of dimensions using iterative procedures. Design for manufacturing (DFM): cast, forged, welded, and machined parts. Modern CAD software: AutoCAD, PRO/Engineer, and others. 3D solid modelling and 2D drafting.

Fundamentals of design science: the engineering design process, structure, and environment. Elements of systems theory. Elements of information and decision theory. New product development. Generation of product technical documentation.

Practical teaching

Introduction to the AutoCAD user interface and software. 2D drafting of mechanical parts. Creation of workshop and assembly drawings. Dimensioning. Adding text to drawings. Plotting and printing. Working in AutoCAD 3D.

Literature

Kovačević S., Gemović B.: CAD, VTŠ, Novi Sad, 2006

Gemović B.: Kompjuterska grafika, VTSNS, Novi Sad. 2020

Dovniković, L.: Tehničko crtanje sa nacrtnom geometrijom, Fakultet tehničkih nauka u Novom Sadu, Novi Sad, 1989

Active teaching classes: 60	**Theoretical teaching: 30**	**Practical teaching: 30**

Teaching methods Interactive, demonstrative and laboratory.

Assessment (maximum number of points 100)

Pre-exam obligations	**Points**	**Course exam**	**Points**
Active participation in classes		Written exam	50
Practical work		Oral exam	
Interim exam/s	50		
Seminar paper/s			

Back to top

Study programme: Protection engineering

Course title: Fundamentals of maintenance

Teacher: Ranko Antunović, Branko Savić

Course status: Elective

Number of ECTS: 6

Prerequisite course: None

Course objective

To introduce students to technical system maintenance procedures and technical diagnostics with the aim of ensuring equipment safety and preventing failures in the technological process.

Learning outcomes

Students will acquire core knowledge of technical system maintenance, operational procedures, and technical diagnostics.

Course contents

Theoretical teaching

Fundamentals of technical systems maintenance. Technical systems. Maintenance objectives. Maintenance as a production function. Integrated systems approach to maintenance. Maintenance concept, organization, and technology. ***Working capacity and failures of technical systems***. ***System effectiveness and effectiveness indicators***. System effectiveness concepts. System effectiveness indicators. ***Maintenance of technical systems***. Corrective, preventive, and condition-based maintenance. Total Productive Maintenance (TPM). Reliability-Centered Maintenance (RCM). Risk-Based Maintenance (RBM). Performance-based maintenance. Run-to-failure maintenance. Predictive maintenance. Proactive maintenance. ***Technical diagnostics***. Objectives of diagnostic inspections of technical systems. Basic diagnostic methods. Subjective diagnostic methods. Objective diagnostic methods (Operating parameter monitoring procedures; Basic monitoring procedures for wear and combustion products; Root causes of vibrations in technical systems; Non-Destructive Testing (NDT) procedures). ***Objective and structure of a maintenance information system***. ***Fundamentals of maintenance technology***. Technology for repair and reclamation of technical system components. Weak-point analysis and elimination. ***Maintenance management***. Maintenance planning. Maintenance quality control. Decision-making in management. Selection, training, organization, and allocation of human resources.

Practical teaching

Component reliability analysis. System reliability analysis. Preparation and defense of a seminar paper. Contact and non-contact temperature measurement – thermographic diagnostics. Mechanical vibration measurement.

Literature

Adamović, Ž., Savić, B., Stanković, N.: Osnovi održavanja mašina, Old Commerce, Novi Sad, 2003

Savić, B., Stanković, N., Ilić, B.: Održavanje mašina i opreme, Visoka tehnička škola strukovnih studija, Novi Sad, 2013

Savić, B., Stanković, N., Ilić, B.: Pouzdanost tehničkih sistema, Visoka tehnička škola strukovnih studija, Novi Sad, 2013

Active teaching classes: 60	**Theoretical teaching: 30**	**Practical teaching: 30**

Teaching methods: Monologic, dialogic and interactive.

Assessment (maximum number of points 100)

Pre-exam obligations	**Points**	**Course exam**	**Points**
Active participation in classes		Written exam	50
Practical work		Oral exam	
Interim exam/s	30		
Seminar paper/s	20		

Back to top

Study programme: Protection engineering

Course title: Specialist English

Teacher: Branka Petrović

Course status: Compulsory

Number of ECTS: 3

Prerequisite course: None

Course objective

Mastering the structures and functions of the English language at an intermediate level and expanding professional vocabulary through field-specific topics and situations, alongside further development of speaking, reading, writing, and listening comprehension skills.

Learning outcomes

Communication at an intermediate level of English language proficiency (CEFR level B1).

Course contents

Theoretical teaching

Language functions: writing emails; interpreting technical data; professional telephone conversations; ordering and purchasing devices; writing a curriculum vitae (CV); applying for a job.

Grammatical structures: comparison of long and irregular adjectives; relative, possessive, indefinite, and reflexive pronouns; adverbs of manner; the gerund; Past Continuous, Present Perfect, Present Perfect Continuous, and Past Perfect tenses; the passive voice; reported speech (commands, as well as declarative and interrogative sentences without backshift of tenses); the three basic types of conditionals; question tags.

Vocabulary: words and expressions necessary for communication at an intermediate level of English proficiency, with an emphasis on field-specific situations and topics arising from the profession as presented in the textbook.

Practical teaching

Although separate practical classes are not explicitly scheduled, due to the nature of the course, to a certain extent – depending on the specific teaching units – lectures include activities that involve the practical oral and written application of the English language by the students.

Literature

Evans V., Dooley J., Wright S., Career Paths: Information Technology, Express Publishing, Newbury, UK, 2013

Lloyd Ch., Frazier J.A., Career Paths: Engineering, Express Publishing, Newbury, UK, 2011

Evans V., Dooley J., Rogers H.P., Career Paths: Art & Design, Express Publishing, Newbury, UK, 2013

Nastavni materijal predmetnog nastavnika

Dimitrijević N., Radovanović K.: Test Your English, zbirka testova za engleski jezik, Zavod za udžbenike i nastavna sredstva, Beograd, 1992

Active teaching classes: 30	**Theoretical teaching: 30**	**Practical teaching:**

Teaching methods

Combined method (monologue, dialogue, demonstration, illustration, and text-based method along with appropriate organizational forms: frontal, individual, group, pair, and team/interactive work).

Assessment (maximum number of points 100)

Pre-exam obligations	**Points**	**Course exam**	**Points**
Active participation in classes		Written exam	50
Practical work		Oral exam	
Interim exam/s	50		
Seminar paper/s			

Back to top

Study programme: Protection engineering

Course title: Work equipment safety

Teacher: Dušan Gavanski

Course status: Compulsory

Number of ECTS: 7

Prerequisite course: None

Course objective

The primary objective of the course is to introduce students to the operating principles, potential hazards, and protection systems of various machinery and transport vehicles. A specific objective of the course is to enable students to independently recognize and analyze hazards and protection systems on various machines and transport vehicles, and to determine whether the applied safety measures are adequate—specifically, whether the machine or transport vehicle is safe for operation.

Learning outcomes

The student is capable of recognizing and analyzing hazards and protection systems on various machines and transport vehicles, and based on this, drawing a conclusion on whether the machine or transport vehicle is safe for operation.

Course contents

Theoretical teaching

General Overview of Machinery and Protection Systems: Concept of machinery. Analysis of danger zones on machines. Methods of protection against injuries when working on machinery. ***Metal Cutting Machines***: Lathes. Drilling machines. Planing machines). Milling machines. Grinding machines. Basic movements, tools, hazards, and safety measures. ***Woodworking Machines***: Circular saw. Band saw. Surface planer. Thickness planer. Spindle moulder. Belt sander. Vertical panel saw. Combination woodworking machine. Basic movements, tools, hazards, and safety measures. ***Metal Forming Machines***: Presses. Shearing machines. Basic movements, tools, hazards, and safety measures. ***Rubber and Plastics Processing Machines***: Two-roll mills. Calenders. Injection moulding machines. Extruders. Basic movements, tools, hazards, and safety measures. ***Packaging and Palletization Machines***: Principles of unit load forming. Mechanization and automation of the packaging process. Primary (individual) packaging machines. Secondary (transport) packaging machines. Palletizing machines. ***Organization of Transport***: Concepts and definitions. Transport. Warehousing. Cargo handling. Material handling equipment. Goods handling and packaging. Pallets and palletization. Containers and containerization. ***Intermittent-Motion Floor Transport Equipment***: Hand trucks. Lift platforms. Manual pallet jacks. Forklifts. ***Continuous-Motion Transport Equipment***: Conveyors with traction elements. Conveyors without traction elements. Pneumatic conveyors. Hydraulic conveyors. Computer-controlled conveyors. Protective elements on conveyors. Industrial robots and automated guided vehicles (AGVs). ***Intermittent-Action Lifting Equipment***: Bridge-type cranes. Jib cranes. Mobile slewing cranes. Tower and floating cranes. Chains and ropes. Hooks and shackles. Slings, cargo platforms, clamps, lifters, grippers, and spreader beams. Electromagnetic lifters and grabs. Drums, sheaves, and pulley blocks. Braking devices. Bumpers and buffers. Safety devices. Control devices and operator stations. Stairways, approaches, walkways, and platforms. Hazards in crane operations. Signs, warnings, and instructions. Personal protective equipment (PPE).

Practical teaching

Hazard and protection system analysis on machinery and transport equipment – case studies: real-world examples and practical applications. Hazards and protection systems on graphic machinery: Practical training conducted in the Laboratory for Graphic Engineering and Design. Preparation and defence of a seminar paper. Risk assessment for specific workplaces: Risk assessment analysis for a lathe operator and a forklift operator.

Literature

Gavanski, D.: Mašine za obradu metala rezanjem – opasnosti i mere zaštite, skripta, Novi Sad, 2014. Gavanski, D.: Mašine za obradu i preradu drveta – opasnosti i mere zaštite, skripta, Novi Sad, 2014.
Janković, Ž.: Sistemi zaštite na mašinama – koncepcijska analiza, Univerzitet u Nišu, Fakultet Zaštite na radu, Niš, 1999.
Grupa autora: Bezbednost i zdravlje na radu, monografija, knjiga 1, Tempus, Joint Project 41045_2006, Mašinski fakultet u Kragujevcu, 2009.
Gavanski, D.: Bezbednost u unutrašnjem transportu, skripta, Visoka tehnička škola strukovnih studija, Novi Sad, 2021

Active teaching classes: 60	**Theoretical teaching: 30**	**Practical teaching: 30**

Teaching methods: interactive, demonstrative.

Assessment (maximum number of points 100)

Pre-exam obligations	**Points**	**Course exam**	**Points**
Active participation in classes		Written exam	
Practical work		Oral exam	50
Interim exam/s	40		
Seminar paper/s	10		

Back to top

Study programme: **Protection engineering**

Course title: Technical systems management

Teacher: Petra Tanović, Đorđe Mihailović

Course status: Elective

Number of ECTS: 6

Prerequisite course: None

Course objective

To enable the student to understand and manage the processes of management, automation, and robotics, and, with the acquired knowledge of economics, to rationally participate in the economic process within manufacturing and service enterprises in a market environment. The student learns to understand the structure of enterprise processes and modern approaches to production implementation.

Learning outcomes

Based on the mastered material, the student is able to integrate the function of technical systems management with economic and financial functions in various types of enterprises. Understands the mechanisms and factors of strategy creation. Understands and knows how to plan the financing of manufacturing or service activities.

Course contents

Theoretical teaching

Introduction to technical systems; Basic concepts and definitions. States of technical systems. Classification of production technologies. Basic processes in the enterprise and the functioning of the enterprise. Structure of the production process in a manufacturing enterprise. Basic types of production processes and provision of services. The impact of technological development on the relationship between humans, society and technology. Factors of production and principles of business; Forms of investment in production and cost calculation; Definition, reasons for existence, and business objectives of an enterprise; Legal forms of entities performing economic activities; Entrepreneurship and entrepreneurial venture; Business plan/Investment studies/Development projects; Financial part of the business plan; Market structures; Management and managers – definition and types; Marketing function in the enterprise; SWOT analysis; Strategic management; Operational management; Project management; Gantt chart; Indicators of technological progress of the enterprise; Methods for supporting technological innovations in an enterprise; Strategic technology management; Perspectives of technology development strategies. The impact of technology on national competitiveness. Technology transfer; Types and forms of technology transfer. Technology as a factor of economic growth. Innovative activity. The role of the information system for managing production and technological resources. Development of computer-integrated production.

Practical teaching

Preparation of cost calculations; Preparation of a business plan; Preparation of the financial part of the business plan; Analysis of legal forms of entities on specific examples; Preparation of SWOT analysis – case study; Preparation of Gantt chart; Project planning – case study.

Literature

Regodić, D.: Tehnički sistemi, Univerzitet Singidunum, Beograd 2011

Pokrajčić D.: Ekonomika preduzeća, Ekonomski fakultet Univertizeta u Beogradu, Beograd, 2016

Ćirović M. Redaktor: Strateški menadžment, Naučno društvo Srbije i Univerzitet Singidunum, Beograd, 2009

Active teaching classes: 60	**Theoretical teaching: 30**	**Practical teaching: 30**

Teaching methods

Monologic, dialogic, interactive.

Assessment (maximum number of points 100)

Pre-exam obligations	**Points**	**Course exam**	**Points**
Active participation in classes		Written exam	50
Practical work		Oral exam	
Interim exam/s	30		
Seminar paper/s	20		

Back to top

Study programme: Protection engineering

Course title: Elements of automation

Teacher: Ranko Antunović

Course status: Elective

Number of ECTS: 6

Prerequisite course: None

Course objective

Acquiring knowledge on the possibilities and effects of implementing small-scale automation in material production. Developing systemic knowledge on the operation and performance characteristics of various small-scale automation elements, as well as the design principles of automated systems in material production.

Learning outcomes

Knowledge and understanding of different types of automation elements, in order to select the most suitable solutions for specific engineering problems. Ability to select components for system design of pneumatic and hydraulic systems. Selection and practical connection of pneumatic components to implement a system that fulfills the given target function. Gaining self-confidence in solving practical engineering problems and tasks imposed by production, both in teams and individually.

Course contents

Theoretical teaching

Introduction: Automation. Automatic control system (ACS). Automatic management system. Process control.
Automatic control system: graphical symbols, structural block diagram of ACS, examples of automatic control systems, operating modes of ACS, characteristics of ACS elements, classification of ACS, analysis and synthesis of ACS, description of ACS behavior, mathematical description of dynamic behavior of ACS, definition of mathematical models.
Measuring transducers: basic concepts and classifications, characteristics of measuring transducers (sensors), transducers (voltage to normalized current signal, frequency, electrical power, displacement, temperature, rotational speed, pressure, flow). Error signal detectors.
Controllers: basic concepts and classifications, amplifiers, P-controller, I-controller, D-controller, PI-controller, PID-controller. Commissioning of electric motor drive control systems.
Actuators: electrical actuators, DC and AC motors, synchronous and asynchronous motors, stepper motors, mechanical motion and power transmission systems, linear electric motors. Pneumatic actuators (cylinders, motors, valves). Hydraulic actuators (cylinders, pumps and motors, valves).
Computer-based process control: general characteristics of digital computers, basic procedures in developing process control systems, types of computer-based process control, NC (Numerical Control) machines, CNC machines. Systems: PLC (Programmable Logic Controller), AC (Adaptive Control), DNC (Direct Numerical Control), Industrial robots. Integrating computers into a control system. Management organization of complex systems. Process control using SCADA systems. Industrial process control devices. Protection elements in switchgear and distribution plants. Signaling devices.

Practical teaching

Scope of application of the ISO 1219 standard (specifically SRPS N.L1.003-006). Presentation of didactic equipment, and methods of learning and working with didactic equipment. Methods of positioning and connecting structural elements during laboratory exercises. Actuators/working structural elements, actuator speed, and speed regulation. Control structural elements, minimal form. Processor structural elements, setup, and application.

Literature

Vuković, V.: Uvod u hidropneumatsku tehniku, FTN, Novi Sad, 2005
Šešlija, D.: Pneumatski sistemi, FTN, Novi Sad, 2005
Savić, V.: Osnovi uljne hidraulike, Ikos, Novi Sad, 2002
Ilić, B.: Elementi automatizacije (elektronski materijal), VTŠ, Novi Sad, 2019

Active teaching classes: 60	**Theoretical teaching: 30**	**Practical teaching: 30**

Teaching methods: Interactive, demonstrative.

Assessment (maximum number of points 100)

Pre-exam obligations	**Points**	**Course exam**	**Points**
Active participation in classes		Written exam	50
Practical work	25	Oral exam	
Interim exam/s	25		
Seminar paper/s			

Back to top

Study programme: Protection engineering

Course title: Fundamentals of energy systems

Teacher: Miodrag Kovačević

Course status: Elective

Number of ECTS: 6

Prerequisite course: None

Course objective

Introduction to approaching and solving energy-related problems.

Learning outcomes

Students will acquire knowledge that will enable them to solve energy-related problems.

Course contents

Theoretical teaching

Hydromechanics (Fluid Mechanics). Fluid. Basic physical properties of fluids. Continuity equation for compressible and incompressible fluids. Fundamental equations of hydrostatics. Flow through pipes and channels. Darcy-Weisbach equation. Similarity theory. Navier-Stokes equations. Similarity theory and dimensional analysis in hydrodynamics. Laminar and turbulent flow.

Thermodynamics. Basic concepts and definitions. State parameters. Ideal gas. Fundamental laws of an ideal gas. Ideal gas equation of state. Basic thermodynamic processes. Polytropic processes. Second law of thermodynamics. Water vapor. Changes of state of water vapor. Humid air. Processes involving humid air. Heat pumps.

Heat Transfer. Heat conduction. Steady-state heat conduction. Heat conduction through a flat finned surface. Transient heat conduction. Plate cooling. Plate heating. Heat convection. Newton's law of cooling (heat convection). Similarity theory and dimensional analysis in heat transfer. Dimensionless equations for heat convection. Heat transmission through a flat partition. Heat transmission through a cylindrical partition. Critical insulation thickness of a pipe.

Boilers: Operating principle of a steam boiler. Fuels for steam boilers. Heating value of fuel. Composition and quantity of combustion products. Enthalpy of air and combustion products. Thermal balance of a steam boiler. Water vapour. Determination of the efficiency of a steam boiler. Steam boiler furnaces. Steam superheaters. Economizers. Regenerative water heaters. Classification of boilers. Application of liquid and gaseous fuel boilers.

Compressors: Working processes in compressors. Reciprocating compressors. Dynamic compressors. Compressor stations.

Practical teaching

Solving numerical problems aligned with the topics covered in the theoretical classes.

Literature

Čantrak C.: Mehanika fluida, Mašinski fakultet, Beograd, 2005

Miljković B.: Zbirka rešenih zadataka iz termodinamike, FTN-Novi Sad, 2017. Lambić M.: Termodinamika, Zavod za udžbenike, Beograd, 2005

Milisavljević B.: Hidridinamika, teorija sličnosti-dimenzionala analiza, VTŠ, Novi SAD, 2013

Milovanović Z.: Termoenergetska postrojenja (elektronski materijal), Mašinski fakultet, Banja Luka, 2011

Active teaching classes: 60	**Theoretical teaching: 30**	**Practical teaching: 30**

Teaching methods

Monologic, dialogic, interactive.

Assessment (maximum number of points 100)

Pre-exam obligations	**Points**	**Course exam**	**Points**
Active participation in classes		Written exam	
Practical work		Oral exam	50
Interim exam/s	30		
Seminar paper/s	20		

Back to top

Study programme: Protection engineering

Course title: Graphic processes

Teacher: Branko Savić, Petra Balaban

Course status: Elective

Number of ECTS: 7

Prerequisite course: None

Course objective

Introducing students to graphic manufacturing processes, with a special focus on planographic, screen, relief, gravure, and digital printing techniques. Introducing students to the technology of manufacturing bookbinding products (books, magazines, pads, etc.).

Learning outcomes

Students are able to professionally perform tasks and duties related to graphic processes. They are qualified to analyze a graphic product and select the appropriate printing technique and finishing process (post-press graphic processing) for the graphic product.

Course contents

Theoretical teaching

Design of printing machines. Sheet and roll feeding devices. Pressure devices for offset, relief, and gravure printing. Sheet transport. Delivery units. Inking units. Printing defects. Printing pressure. Ink transfer equation.

Offset printing system. Printing form cylinder. Offset cylinder. Impression Impression cylinder. Dampening unit. Inking unit. Rotary offset printing techniques. Techniques for measuring ink film thickness on offset prints. Problems in offset printing.

Screen printing system. Screen printing machines. Print deformations in screen printing.

Printing unit for gravure printing. Form cylinder. Impression cylinder. Inking unit and doctor blade. Drying unit. Pad printing techniques.

Flexographic printing system. Anilox rollers (structure and form of the anilox roller). Ink transfer. Doctor blade units. Drying units. Analysis of a central impression (satellite-type) flexo press.

Digital printing. Plateless printing processes. Computer-to-Press / Computer-to-Print technologies. Functional components of Non-Impact Printing (NIP) technology. System components for Computer-to-Print. Electrophotography (principle, imaging, inking, impression, toner fixing, cleaning). Ionography. Printing unit. Imaging system. Magnetography. Imaging system. Inkjet printing. Continuous Inkjet. Drop-on-Demand Inkjet technologies. Thermography. Thermal transfer and thermal sublimation printing systems. Other digital printing techniques.

Classification and characteristics of materials, products, and basic post-press procedures. Sheet flattening. Cutting. Die-cutting. Creasing. Embossing. Perforation. Folding. Gathering. Wire stitching. Perfect binding. Mechanical processing of the spine, glue application, defects of perfect binding). Hardcover binding (sheet preparation, production and processing of the book block, case-making, and book finishing).

Practical teaching

Preparation and printing of materials in digital printing at the printing house of the Higher Education Technical School of Professional Studies in Novi Sad. The process of single-color and multi-color screen printing. Laboratory exercises for measuring specific print parameters using the measuring devices available at the school.

Literature

Savić, B, Balaban, P.: Grafički procesi - materijal u elektronskoj formi, VTŠSS, Novi Sad, 2021
Novaković, D. Dedijer, S.: Grafički procesi, Fakultet tehničkih nauka, Novi Sad, 2019
Novaković, D., Kašiković, N.: Digitalna štampa, FTN, 2013
Todorović, M.: Rotacije za ravnu, duboku i flekso štampu, Viša politehnička škola, Beograd, 2006
Kašiković, N., Novaković, D., Jurič, I.: Digitalna štampa-praktikum za vežbe, FTN, 2016

Active teaching classes: 75	**Theoretical teaching: 45**	**Practical teaching: 30**

Teaching methods:

Assessment (maximum number of points 100)

Pre-exam obligations	**Points**	**Course exam**	**Points**
Active participation in classes		Written exam	55
Practical work	10	Oral exam	
Interim exam/s	30		
Company visit	5		

Back to top

Study programme: Protection engineering

Course title: Electrical installations and lighting

Teacher: Božo Ilić

Course status: Elective

Number of ECTS: 7

Prerequisite course: None

Course objective

To introduce students to different types of electrical installations, materials and accessories used, as well as to the installation design principles.

Learning outcomes

Students will be able to select appropriate components and accessories for electrical installations, as well as design these systems.

Course contents

Theoretical teaching

***Introduction to electrical installations*:** The concept of electrical installations. Types of installations. Electrical regulations and standards.

Electrical installations: Materials and accessories. Installation lines and their fittings. Fuses. Switches. Connection and distribution devices. Electricity meters. Grounding. Conductor cross-section calculation and selection. Home connections. Methods of executing electrical installations. Smart electrical installations. Technologies for smart installations. Centralized and decentralized control systems in smart homes. Implementation examples. Advantages and disadvantages of smart installations. Electrical installation distribution systems (TT, TN-C, TN-C-S, TN-S, and IT systems). Protection against electric shock. Protection against direct and indirect contact with live parts. Auxiliary power supply sources. Electrical installations as a fire hazard and preventive protection. Electrical lighting: Basic lighting quantities. Electrical light sources. Requirements for quality lighting. Lighting design and calculations.

Lightning protection installations: Arresters. Down conductors and test joints. Earthing switches.

Electrical installation design: Components of an electrical installation project. Project examples. Regulations for the execution of electrical installations.

Practical teaching

Laboratory and practical exercises covering the topics addressed in the lectures.

Literature

M., Mišković, Električne instalacije i osvetljenje, Građevinska knjiga, Beograd, 2005

M., Žarić, Savremene električne instalacije, Savez energetičara Republike Srpske, Banja Luka, 2013

M., Kostić, Teorija i praksa projektovanja električnih instalacija, AGM knjiga, Beograd, 2014

B., Ilić, Električne instalacije i osvetljenje, VTŠ Novi Sad, 2019

Active teaching classes: 75	**Theoretical teaching: 45**	**Practical teaching: 30**

Teaching methods

Lectures, classroom and laboratory exercises. Methods of demonstration, practical work, research, workshops, learning through discovery.

Assessment (maximum number of points 100)

Pre-exam obligations	**Points**	**Course exam**	**Points**
Active participation in classes	10	Written exam	50
Practical work		Oral exam	
Interim exam/s			
Seminar paper/s	40		

Back to top

Study programme: Protection engineering

Course title: Packaging

Teacher: Petra Tanovic, Petra Balaban

Course status: Elective

Number of ECTS: 7

Prerequisite course: None

Course objective

Introduction to packaging design tasks, packaging materials (paper, cardboard, plastic, metal and glass), design methodology, evaluation and selection of packaging with regard to aesthetic-ergonomic and technical-technological requirements, with special emphasis on graphic elements of packaging.

Learning outcomes

Students are able to design and select appropriate packaging considering the type of products to be packed, paying special attention to the graphic elements of their packaging.

Course contents

Theoretical teaching

Historical development of packaging (social and economic changes, technical achievements, etc.). Introduction to the field of packaging as a graphic product. Types of packaging and packaging functions: protective, ecological, sales. Good packaging requirements. Packaging in the function of product sales. Active and intelligent packaging. Requirements and tasks of packaging design. Main elements of packaging and graphic presentation of products. Aesthetics of packaging. Application of visual elements in packaging design. Application of photography, typography and illustration in packaging design. Printing. Design methodology, evaluation and selection of packaging. Production processes of various types of packaging.

Paper packaging. Types of paper for packaging production. **Fabrication and structural design of paper packaging.** Cardboard packaging. Cardboard boxes. Examples of structural design (grids). Computer application in the preparation, design of cutouts and production of stackable cardboard boxes. Packaging made of flat and corrugated cardboard. Analysis of well-known examples of packaging design. Labels.

Polymer packaging, types of polymer materials for packaging. Production of packaging films and production of polymer packaging. Decoration of polymer packaging (labeling and printing).

Glass packaging, production, characteristics, assortment and graphic decoration of glass packaging.

Metal packaging, forms of metal packaging and graphic decoration. Wooden packaging. Textile packaging. Packaging standards. Packaging quality requirements. Ecological materials for packaging production. Ecological aspects of packaging and environmental protection.

Practical teaching

Application of creative and aesthetic elements in various types of packaging products. Work in packaging design programs and realization of conceptual solutions with the creation of mockups. Realization and presentation of final solutions for given packaging. Creation of packaging mockups.

Literature

Tanović, P.: Skripte sa predavanja u elektronskoj formi, VTŠSS, Novi Sad, 2021. Balaban P.: Skripte sa predavanja u elektronskoj formi, VTŠSS, Novi Sad, 2021

Novaković D., Pal M., Đurđević S.: Grafička amabalaža - praktikum, Fakultet tehničkih nauka, Univerziteta u Novom Sadu, Novi Sad, 2022

Vujković, I., Galić, K., Vereš, M.: Ambalaža za pakiranje namirnica, Tectus, Zagreb, 2007

Lazić V., Novaković D.: Ambalaža i životna sredina, Tehnološki fakultet - Univeritet Novi Sad, 2010. Cvetković D., Marković D.: Dizajn pakovanja, Singidunum, 2010

Active teaching classes: 75	**Theoretical teaching: 30**	**Practical teaching: 45**

Teaching methods:
Interactive

Assessment (maximum number of points 100)

Pre-exam obligations	**Points**	**Course exam**	**Points**
Active participation in classes	5	Written exam	50
Practical work	20	Oral exam	
Interim exam/s	25		
Seminar paper/s			

Back to top

Study programme: Protection engineering

Course title: Work practicum

Teacher: Branko Babić, Ivan Bulatović, Jovana Kopanja

Course status: Compulsory

Number of ECTS: 7

Prerequisite course: None

Course objective

To introduce students to basic occupational health and safety measures and fire safety protocols in order to prevent workplace injuries and fatalities, while familiarizing them with the applicable legal regulations and laws related to launching a business venture. The course aims to enable students to effectively source information regarding government subsidies and financial assistance for first employment and startup initiatives. Furthermore, students will gain insight into the specific procedures and practical examples of business registration, exploring realistic opportunities, development phases, and entrepreneurial prospects within relevant industries. Finally, through hands-on exercises in specialized fields, students will acquire practical experience on advanced machinery and equipment not available within the institution, thereby preparing them for professional practice and direct integration into modern production plants.

Learning outcomes

Upon successful completion of the course, students will possess a foundational knowledge of occupational health and safety regulations and fire safety protocols, enabling them to implement prescribed personal protection measures in the workplace and apply the code of business conduct. Furthermore, students will understand legal instruments used for securing contracts, such as loan and current account agreements, and will master the formal procedures required to establish their own company. They will be able to evaluate realistic opportunities, development phases, and entrepreneurial potential within relevant industries. Finally, students will acquire practical, hands-on experience by operating advanced machinery and specialized equipment not available within the institution, thoroughly preparing them for professional practice and seamless integration into modern production facilities.

Course contents

Theoretical teaching

1. Training students in the field of occupational safety and health (OSH) to ensure safe participation in work processes and environments. Through professional OSH training, students acquire foundational knowledge regarding the obligations and responsibilities of employers, the rights and duties of employees, the organization of workplace safety, and the personal protective equipment used in work processes. During their practical work within the company, students apply this knowledge to minimize the risk of workplace injuries and fatalities.
2. Fire safety training provides students with fundamental knowledge about fire behavior, combustion products, smoke toxicity, fire classes, and safe extinguishing techniques. It covers preventive measures, alerting Fire and Rescue Services, and operating portable fire extinguishers. Students apply and practice these skills within a limited, controlled scope during their practical placement.
3. Individual organizational characteristics, corporate representation, ownership and property relations, and special regulations governing internal company relations.
4. Cash deposits, savings deposits, loan agreements, and current account contracts.
5. Core rules of business etiquette, dress code, principles of ethics and integrity, conflict resolution mechanisms in professional relationships, and strategies for achieving business goals and navigating diverse workplace scenarios.
6. Preparation for establishing a business and the foundations of the regulatory framework, including: the Constitution of the Republic of Serbia, the Labor Law, the Law on Companies, the Law on the Registration Procedure with the Serbian Business Registers Agency (APR), the Law on Safety and Health at Work, the Law on Mandatory Social Security Contributions, the Law on Health Care, the Law on Pension and Disability Insurance, the Law on Health Insurance, and relevant bylaws issued by the Ministry of Labor.
7. The concept and legal nature of trade secrets, and their relationship with the protection of exclusive intellectual property rights.
8. Students undergo a practical knowledge assessment based on the first two topics, which serves as a prerequisite for implementing prescribed safety and security measures during their company placement.

Practical teaching

Students deliver presentations on the procedures and practical examples of launching their own business. The course also includes company site visits to help students understand real-world opportunities, development phases, and the broader potential of entrepreneurship. Within these partner enterprises, students conduct practical exercises in relevant fields, operating modern machinery and advanced equipment not available within the institution. This hands-on approach ensures that students are thoroughly prepared for their professional practice and ready to operate within modern production facilities.

Literature

Zakon o bezbednosti i zdravlju na radu („Sl. glasnik RS“, br. 35/2023)
Zakon o zaštiti od požara, Službeni glasnik RS, broj 111/2009, 20/2015, 87/2018 i 87/2018 – dr. zakoni.
Normativno-pravna regulativa iz oblasti rada
Marković, S., Popović, D.: Pravo intelektualne svojine (Beograd, Pravni fakultet univerziteta u Beogradu), 2022
Ljubojević, G., Milošević, I.: Poslovno pravo (Novi Sad, Visoka poslovna škola strukovnih studija), 2020
Vernart, B.: Međunarodno pravo i poslovanje (Novi Sad, Visoka poslovna škola strukovnih studija), 2022

Active teaching classes: 120	**Theoretical teaching: 60**	**Practical teaching: 60**

Teaching methods: Monologic, dialogic, interactive, demonstrative.

Assessment (maximum number of points 100)

Pre-exam obligations	**Points**	**Course exam**	**Points**
Active participation in classes	5	Written exam	50
Practical work	15	Oral exam	
Interim exam/s	30		

Back to top

Study programme: Protection engineering

Course title: Theoretical and experimental bases of professional work

Teacher: Božo Ilić, Jovana Kopanja, Branko Savić

Course status: Compulsory

Number of ECTS: 9

Prerequisite course: None

Course objective

Introduction of students to the methodology of producing various types of professional papers. Training students for engineering research in practice, as well as for conducting experimental and other types of research using various scientific and professional methods.

Learning outcomes

Upon successful completion of the course, students will be able to independently produce various types of professional papers by effectively applying diverse scientific and professional research methodologies. Additionally, students will demonstrate the ability to conduct experimental and other engineering research projects using advanced methodological frameworks.

Course contents

Theoretical teaching

Basic concepts of science and publication. Scientific papers. Scientific versus professional papers. Types of professional papers (Final paper, Specialist paper, Project, Technical study, Professional report, etc.). Methodology for writing professional papers: Selecting a research topic; Choosing and reviewing literature (collecting relevant data on the addressed problem); Structuring the paper (preface, table of contents, introduction, main body, conclusion, literature, appendices). Core rules for drafting professional papers. Scientific and professional methods in research: Analysis method. Synthesis method. Generalization method. Proof method. Refutation method. Comparative method. Statistical method. Sampling method. Mathematical method. Modeling method. Cybernetic method. Experimental method. Counting method. SWOT analysis. Organization of research applying various methodological frameworks. Practical application: conducting experimental and alternative research types relevant to the student's study programme, using real-world examples and diverse scientific and professional tools. Engineering foundations and engineering decision-making.

Practical teaching

A portion of the instruction for this course is conducted within a host company where students undergo professional internships and perform various activities directly related to their study program. During this internship period, students gain practical experience and familiarize themselves with business, production, and technological systems, specifically focusing on design, development, production, research, and testing. Throughout their practical placement, students maintain an internship logbook, recording descriptions of their tasks, conclusions, and observations. Upon completing the practical work, students compile their findings into a final report structured as a seminar paper.

Literature

Ilić, B., Savić, B.: Teorijske i eksperimentalne osnove stručnog rada, Visoka tehnička škola strukovnih studija u Novom Sadu, Novi Sad, 2022

Segedinac, T.: Teorija inženjerskog eksperimenta, Visoka tehnička škola strukovnih studija u Novom sadu, Novi Sad, 2012

Kovačević, S.: Teorijske i eksperimentalne osnove specijalističkog rada, Visoka tehnička škola strukovnih studija u Novom Sadu, Novi Sad, 2012

Adamović, Ž., Vulović, S.: Metodologija naučno-istraživačkog rada, Društvo za tehničku dijagnostiku Srbije, Beograd, 2011

Adamović, Ž., Nadrljanski, Đ.: Metodologija naučno-istraživačkog rada – Statističke metode u istraživanju, Društvo za tehničku dijagnostiku Srbije, Pedagoški fakultet, Sombor, 2011

Active teaching classes: 150	**Theoretical teaching: 90**	**Practical teaching: 60**

Teaching methods: Monologic, dialogic, interactive.

Assessment (maximum number of points 100)

Pre-exam obligations	**Points**	**Course exam**	**Points**
Active participation in classes		Written exam	50
Practical work	20	Oral exam	
Interim exam/s	30		
Seminar paper/s			

Back to top

Study programme: Protection engineering

Course title: Professional practice

Teacher: Head of the study programme

Course status: Compulsory

Number of ECTS: 4

Prerequisite course: None

Course objective

Acquiring and applying practical knowledge related to the study programme within the host organization, specifically for the purpose of drafting the final thesis.

Learning outcomes

Practical experience in the application and use of knowledge and skills acquired during undergraduate studies. Understanding of the work processes, operational structures, and management of the host company. Data collection and analysis necessary for drafting both the preliminary thesis and the final thesis.

Course contents

Professional practice is carried out in the sixth semester of basic professional studies. It is conducted within manufacturing, service, or other relevant business organizations, following general and individual programme contents designed for final thesis preparation, as agreed upon by the company co-mentor, the institution's mentor, and the student. Students may also complete their professional practice directly at the Higher Technical School of Professional Studies in Novi Sad (the Institution), according to a pre-determined and approved plan. All relevant forms regarding professional practice are available to students registered for the course.

Throughout the internship, students perform both general and specialized tasks. General tasks require students to familiarize themselves with the company's history, organizational structure, production or service portfolio, and overall work processes. Specialized professional tasks are jointly defined by the company co-mentor and the mentor. These tasks represent thematic units that students have already studied during their coursework and are now applying under practical conditions within the selected company. The mentor and co-mentor are responsible for precisely defining work assignments and obligations to familiarize students with the organizational structure, work processes, technology, quality control procedures for products and services, and methodologies for data collection and processing related to the preparation of the final thesis. The company co-mentor cooperates with the student on a daily basis, providing guidance and monitoring progress. During the placement, students maintain an Internship Logbook.

Assigned work tasks should enable students to actively apply the knowledge acquired throughout their studies, ensuring effective training for their future profession. Upon completing the internship, students submit a final report that corresponds in content and form to the instructions provided at the beginning of the placement.

Literature

Technical documentation from the company and other relevant literature agreed upon between the student, the company co-mentor and the mentor.

Active teaching classes: 90

Teaching methods: Practical, laboratory, individual work.

Assessment (maximum number of points 100)

Pre-exam obligations	**Points**	**Course exam**	**Points**
Active participation in classes		Written exam	
Practical work	45	Oral exam	
Interim exam/s		Exam	55
Seminar paper/s			

Back to top

Study programme: Protection engineering

Course title: Preliminary thesis

Teacher: Head of the study programme/Mentor

Course status: Compulsory

Number of ECTS: 2

Prerequisite course: None

Course objective

Developing the ability to identify and define problems and communicate with the mentor. Familiarization with practical methodologies applicable to the selected field of study. Integrating, upgrading, and practically applying the knowledge acquired throughout the studies. Preparation for the writing of the final thesis.

Learning outcomes

Through independent and mentored research, the student defines and elaborates upon the initial topic of the final thesis, culminating in a written thesis proposal and an oral defense of a detailed research plan. Consequently, the student develops the ability to conduct analysis and identify problems within the given topic, demonstrating full readiness to write the final thesis.

Course contents

The course is taught through independent professional research and mentoring, during which the student defines the initial topic of the final thesis and elaborates it in detail, leading up to a written proposal and an oral defense of a detailed plan for the preparation of the final thesis.
Upon receiving the topic and research assignment, and through regular consultations and progress reporting, the student reviews relevant academic literature, past final theses, and other publications in a related field. The student then conducts preliminary analyses to better delineate the assigned research problem.
In the second phase, the student studies the nature, structure, and complexity of the problem in more detail. The student actively searches for published knowledge within the broader topic of the assigned work, and plans and conducts preliminary research or conceptual solutions in order to better conceptualize the task and direct it toward implementation and finalization. In this way, the student draws conclusions about possible solutions, chooses a methodology/technology, and plans in detail the organization and execution of the main analyses or applications of the selected technology when writing the final thesis. During this process, the student regularly consults with the mentor, and if necessary, with other faculty members of the School. The goal of the activities is to gain the necessary experience for problem-solving and to identify opportunities for applying previously acquired knowledge in practice.
At the end of the research work, the student writes a Preliminary Thesis Paper. The quality of the written proposal is assessed by the mentor/head of the study programme, and it is defended orally (viva).

Literature

Textbooks in the chosen field, papers from professional journals, technical documentation and company records, software tutorials, past final thesis, etc.

Active teaching classes: 30

Teaching methods: Practical, research, mentoring.

Assessment (maximum number of points 100)

Pre-exam obligations	**Points**	**Course exam**	**Points**
Active participation in classes		Written exam	
Practical work		Oral exam	
Interim exam/s		Preliminary thesis (viva)	50
Preliminary thesis (preparation)	50		

Back to top

Study programme: Protection engineering

Course title: Final thesis

Teacher: Mentor

Course status: Compulsory

Number of ECTS: 8

Prerequisite course: Passed all courses from the study programme

Course objective

Systematization of theoretical and practical knowledge acquired throughout the study programme, enabling students to develop decision-making and practical problem-solving skills. Documentation of the work done in a written format and the public defense (viva) of the results of the work.

Learning outcomes

The capacity to analyze and resolve practical problems. Skills in presenting research results through both written reports and oral presentations.

Course contents

Upon passing all examinations, the student proceeds to draft the final thesis. This is an applied research paper through which the student becomes familiar with practical problem-solving and research methodologies within one of the fields of the study programme. All procedures and forms related to the final thesis are available on the School's website.

The mentor is an active participant in all phases of writing the final thesis, and if necessary, includes a co-mentor from the company (from the student's professional practice) and other faculty mambers of the School.

In addition to a comprehensive review of the existing literature and/or legal and technical regulations in the chosen field, the final thesis should include at least one of the following elements: an analytical, computational, design, or experimental/practical aspect.

The student completes the final thesis independently, and it is highly desirable that the work is linked to specific knowledge acquired during professional practice. The student drafts the final thesis based on the detailed execution plan previously presented in the Preliminary Thesis. In doing so, the preliminary experiments, analyses, or software solutions obtained during the research for the Preliminary Thesis are finalized to achieve the definitive results or programs. Subsequently, the student prepares the final thesis in the prescribed format, which includes the following chapters: Introduction, Thesis Objective, Elaboration of the Topic, Conclusion, and Literature.

After submitting the written version of the thesis, a verification of fulfillment of conditions follows, according to the procedure given by the *Regulations on Topic Application, Preparation, and Defense of the Final Thesis on Bachelor, Specialist, and Master Studies at the Higher Education Technical School of Professional Studies*. Then the student proceeds to the oral presentation and defense of the final thesis. The viva is public, and the thesis is defended before a committee.

Literature

Textbooks in the chosen field, papers from professional journals, technical documentation and company records, software tutorials, past final thesis, etc.

Number of classes: 45

Teaching methods: Mentoring, practical, laboratory, individual work.

Assessment (maximum number of points 100)

Pre-exam obligations	**Points**	**Course exam**	**Points**
Active participation in classes		Written exam	
Practical work		Oral exam	
Interim exam/s		Final thesis (viva)	50
Seminar paper/s			
Final thesis (preparation)	50		

Back to top