Study Programme	**Technological Engineering** **Module 1: Food Engineering** **Module 2: Environmental Engineering**
Qualifications awarded	First degree
Professional title	Bachelor (appl.) in Technological Engineering
Number of ECTS credits	180
Level of qualification according to the National Qualification Framework and the European Qualifications Framework	VS-1 (NQF) First cycle (EQF)
Field of study	Engineering and technology
Mode of study	Full-time
Language of instruction	Serbian
Work-based learning	In the College laboratories with state-of-the-art equipment; In business systems whose main activities are relevant to the needs of this study programme.
Head of the study programme	Vesna Marjanovic, PhD

Programme objectives

The main objective of the study programme is to educate experts with sufficient knowledge to follow the trend of environmental protection by minimizing the negative impact of production processes on the environment, as well as experts working in the food industry using modern technological methods in the production of traditional meat, milk products, fruits and vegetables.

Programme outcomes

General outcomes:

- professional knowledge relating to theories, principles and processes, including critical understanding and practical application;
- Skills: solving complex problems at work, successful communication, cooperation and use of equipment, instruments and devices relevant to the field of technological engineering;

Specific outcomes:

- training students for the practical application of the necessary knowledge from fundamental scientific disciplines (mathematics, physics, biology, etc.);
- professional knowledge relating to theories, principles and processes, including critical understanding and practical application;

- providing students with creative problem-solving approaches and developing critical thinking;
- providing students with teamwork skills;
- developing the ability to publicly present the results of their work;
- providing the foundation for further education at higher levels.

Course-specific competences

Module 1: Environmental Engineering:

- the organization and planning of necessary activities in the area of waste management, and implementation of measures for the protection of the environment;
- designing and managing systems for purification of industrial and communal waste water and disposal of waste sludge;
- organization and selection of environmental monitoring locations;
- the analysis of the consequences of the interaction of the most important pollutants with the environment, and the application of protection measures;
- linking the basics of biology and physiology of plant and animal cells with influential factors technologies,
- the analysis and forecasting of the level of energy utilisation in technological processes, taking into account the technical, ecological and economic aspects of the use of renewable energy sources;
- the application of the adopted knowledge and regulations related to methods of the protection against radiation in laboratories and industrial conditions;
- the application of instrumental methods for analyzing different samples, and the estimation the reliability and accuracy of the selected method
- the application, control and improvement of security and safety measures in the implementation of technological processes.

Course-specific competences

Module 2: Food Engineering:

- knowledge and use of various raw materials, auxiliary materials and additives necessary for growing fruit and vegetable products;
- managing technological operations of processing and preserving fruits and vegetables;
- managing technological operations of processing and preserving meat (cooling, freezing, high temperatures, salting, drying, fermentation);
- management of technological procedures for the production of pasteurized and sterilized

milk, milk drinks, fermented dairy products, cheeses, concentrated and dried dairy products;

- knowledge of the chemical composition, physical and physical-chemical properties of milk and meat, and milk and meat products;
- management of technological processes of cooling, freezing and storage of all food products in industrial refrigerators;
- managing the technological processes of drying and storage of dried products in the industry that deals with food preservation by drying;
- knowledge and application of various methods that can control the development of microorganisms in the technological processes of the food industry;
- preparation and implementation of plans and programs for equipping and functioning of facilities in the meat, milk, fruits and vegetables industry, as well as knowledge of the concept and design of refrigerators and driers;
- the application of standard methods for controlling and improving the quality of products in the food industry.

UNDERGRADUATE VOCATIONAL STUDIES: TECHNOLOGICAL ENGINEERING
Module 2:Food Engineering

1	Mathematics 1	Joint course
2	Electrical Engineering and Electronics	Joint course
3	Physics	Joint course
4	Chemistry 1	Joint course
5	Biology	Joint course
6	Mathematics 2	Joint course
7	Informatics Fundamentals	Joint course
8	Sociology	Joint course
9	Chemistry 2	Joint course
10	**Elective Course 1**	Joint course
	English 1	
	Russian 1	
11	Physical Chemistry	Joint course
12	Thermodynamics	Joint course
13	Microbiology	Module 2
14	Occupational Safety	Joint course
15	**Elective Course 2**	Joint course
	English 2	
	Russian 2	
16	Processing Devices	Joint course
17	Technological Processes	Joint course
18	Sources of Pollution in Environment and Workplace	Joint course
19	Environmental Protection	Joint course
20	Waste Management	Joint course
21	Business and Ecological Ethics	Joint course
22	Product Quality Control	Module 2
23	Meat Industry – Technology for Processing Meat and By-Products	Module 2
24	Dairy Industry – Technology for Processing Milk and By-Products	Module 2
25	**Elective Course 3**	Module 2
	Instrumental Methods of Analysis	
	Waste Water Treatment Technologies	
26	Fruit and Vegetable Processing Technology	Module 2
27	Food Chilling, Freezing and Drying	Module 2
28	**Elective Course 4**	Module 2
	Eco Protection in Industry	
	New technologies and Materials	
29	**Elective Course 5**	Module 2
	Radiation and Protection	
	Electrical Hazards and Safety	
30	Professional Internship	Joint course
31	Final Thesis	Joint course

Study programme: TECHNOLOGICAL ENGINEERING

Type and Level of Studies: UNDERGRADUATE VOCATIONAL STUDIES

Course code and title: BIOLOGY

Teacher (Surname, middle initial, name): Marinković S. Tatjana

Course status: Compulsory

Number of ECTS credits: 6

Prerequisites: no

Course aims: to provide students with fundamental knowledge on occurrence and basic structure of living organisms at the level of the cell and cell organelles (cytology), the principles of inheritance and variability in organisms (genetics), structure, morphology, propagation and systematics of plants (botany) and structure, morphology, reproduction and systematics of animals), as well as basic concepts of ecology and evolution of living organisms.

Learning outcomes: Students will understand the core concepts of biology: evolution, cellular structure and function, information transfer and gene expression, systems and organismal biology, thus having a basis for studying other professional applicative subjects in the study program.

Syllabus

Theoretical instruction: Introduction to biology. Discovery and general features of cells. General characteristics of prokaryotic and eukaryotic cells (plant and animal). Genetics - discoveries, Mendel's views, genotype and phenotype, forms of inheritance. Transferring genetic information and genetic code. Changes in the structure and number of chromosomes as a source of genetic variability. Population genetics. Plant growth. The notion and division of plant tissue (histology). Morphology of plants. Plant propagation. Shift of nuclear phase and shift of generations. Plan reproduction. Overview and features of the most important phylums: Cyanophyta, Chrysophyta, Xanthophyta, Chlorophyta, Euglenophyta, Bacillariophyta, Pyrrophyta, Pheophyta, Rhodophyta, Lichenophyta, Bryophyta, Lycopodiophyta, Equisetophyta, Polypodiophyta, Piniphyta and Magnoliophyta. Introduction to zoology (Animalia). Characteristics of animals as organisms, origin, evolution, main organizational stages. Structural and functional diversity of animals. Representatives of nine large animal films: Protozoa, Porifera, Platylminthes, Nematode, Annelida, Mollusca, Arthropoda and Chordata. Core concepts of Ecology. Core concepts of Evolution.

Practical teaching: Laboratory practice in cytology, anatomy and histology of plants. Computational exercises from qualitative genetics. Determination, systematics, description, distribution of the most important representatives of plants. Functional material of animals, identification, study and description of various zoological preparations. Identification, description, systematics of representatives of nine large animal phylum.

Literature:

Đorđević-Miloradović, J. (2014) Biologija I, autorizovan udžbenik, VTŠSS-Požarevac
Đorđević-Miloradović, J. (2005) Biologija I, autorizovan praktikum, VTŠSS-Požarevac

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

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

Knowledge evaluation (maximum 100 points)

Pre-exam obligations	**Points**	**Final exam**	**Points**
Activity during lectures	**5**	Written exam	50
Practical classes	**5**	Oral exam	
Colloquia	**40**		
Seminar papers			

Assessment methods:

Study programme: Technological Engineering

Type and Level of Studies: Basic professional studies, first level of studies

Course code and title: Business and Ecological Ethics

Teacher (Surname, middle initial, name): Vesna O. Vasović

Course status: Compulsory

Number of ECTS credits: 5

Prerequisites: none

Course aims:
Criticism of anthropocentric mind and promotion of new, so called green working and living culture.

Learning outcomes:
Training students for the placement of the new work logic that lies on the postulates of ecologic paradigm.

Syllabus
Theoretical instruction:
Ecology. Development of ecological mind. Ecological ethics. Subjects of ecological ethics. Pedagogy of human world of work and life. Ecological crisis and modern theoretical thought. Anthropocentrism. Eco-centrism. Various civilization models of cultural and social behaviour. Material practice and predominance of anti-ecological mind. Discrepancy of technological and economic development. Disturbance of natural systems and processes. Roman club and reports. Sustainable development. Spiritual exhaustion. Political and institutional apparatus. Globalization and necessity of new work logic. . The ecumene tired of urban ways. In the labyrinth of a risky society. Demographic boom. Business ethics. Moral responsibility and reasoning. Conflicts and how to solve them. Horizontal and vertical mobbing. Towards sustainable development – potential victory of new business ethics. Business ethics, civilizing and cultural models in the world. Business ethics and importance of communication. Public relations. Business life in conditions of healthy collaboration. Ethical and business codex. New managers in conditions of new theory and practice. Ecological mind and ecological education. Rise of ecologism and new emancipation –political trends. Political arena and green parties. Business ethics and legal regulations of environment in our country. Ecology, ethics and business. Thesis about relation between ethics and ecology. Ethics of a country and life respecting ethics. Possibility of reconciliation – ecological management. Promotion of new ecological-ethical matrix.

Practical teaching:
Theoretical ethical-ecological controversies. Work, values, cultural patterns. The state of natural resources and actual practice. From bureaucratic to cosmopolitan way of living and working. The criticism of the city and a desirable place at a human scale. Business ethics and the sustainable living formula. New business culture and judgment. Hierarchy, communication, publicity. New business culture and judgment. The desirable ethical, ecological, socio-political framework and a ten-minute pre-exam test. Can we rely upon ecologism in our search for a better life? The greening of culture and material sphere in Serbia. Ecological and ethical ethos. The young and their awareness of the fundamental problems of a community. Reflections. Usefulness, utilitarism, spirit and living practice. Ten-minute test.

Literature:

1. Vesna Vasović, Društvo, etika i ekologija, VPTŠ, ISBN 978-86-83573-50-9, 2014, Užice
2. V. Pavlović, Ekologija i relativna etika, 2013, Zavod za udžbenike, Beograd
3. Džozef R. De Žarden, Ekološka etika – UVOD u ekološku filozofiju, Beograd, 2006.
4. Patrick Curry, Ecological Ethics, 2011, Polity, University of Wales
5. Krkač Kristijan, 2007, Uvod u poslovnu etiku i korporacijsku društvenu odgovornost, Zagreb
6. Dragan Subotić, 2007, Poslovna etika u preduzetničkom biznisu, Tea Beograd
7. Dragan Subotić, 2007, Poslovna etika i veština komuniciranja, Beograd

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

Teaching methods: Auditory, colloquial, consulting, demonstrative, etc.

Using video presentations, examples from practice, brochures, instructions, paper, notebooks and other demonstration material.			
Knowledge evaluation (maximum 100 points)			
Pre-exam obligations	**Points**	**Final exam**	**Points**
Activity during lectures	10	Written exam or as agreed with students	50
Practical classes	10	Oral exam	The same option
Colloquia	20		
Seminar papers	10		
Assessment methods:			

Study programme: TECHNOLOGICAL ENGINEERING

Type and Level of Studies: UNDERGRADUATE VOCATIONAL STUDIES

Course code and title: CHEMISTRY 1

Teacher (Surname, middle initial, name): Marjanovic M. Vesna

Course status: Compulsory

Number of ECTS credits: 6

Prerequisites: no

Course aims: to provide students with fundamental knowledge on general and inorganic chemistry. Students learn about: (1) basic chemical concepts, atomic structure, types of chemical bonds, the composition of ionic and molecular compounds, the properties of disperse systems and basic terms from the chemical equilibrium; (2) finding elements in nature, the properties of elements and their most important compounds based on the electronic configuration, the size of the atom, and the types of bonds between atoms; (3) the practical application and toxicological properties of certain elements and inorganic compounds; (4) chemical calculations and basic techniques in a chemical laboratory.

Learning outcomes: Understanding basic chemical concepts and laws. Knowledge: structures of atoms and molecules; chemical connections and the consequences of their presence in the properties of the compound; chemical equilibrium; electrolytic dissociation and balance in electrolyte solutions. Understanding the logic of the Periodic Table of Elements. Knowledge of the basic classes of inorganic compounds, their physical and chemical properties, and their toxicity. Become skilled at chemical calculations, basic laboratory operations and linking theoretical, experimental and computational knowledge in chemistry.

Syllabus

Theoretical instruction: Matter and energy. Basic chemical laws. Models of atoms. Periodic system of elements. Types of chemical bond (ionic bond, covalent bond, metal bond). The theory of valence bonding and the geometry of molecules. The theory of molecular orbitals. Intermolecular forces. Dispersion systems. Real solutions. Solutions of solid liquid and gaseous substances in liquids. Colloids. Balance between the solution and the solid phase. Balance in electrolyte solutions: acids, bases and salts. Types of chemical reactions. Oxidation and reduction reactions. Classification of elements and properties of s, p, d, and elements. Classification of inorganic compounds. Element chemistry (finding in nature, properties, more important inorganic compounds, application): Hydrogen. Elements VIIIb (8, 9 and 10) of the group. Elements VIIb (7) of the group. Elements VIb (6) of the group. Elements IIb (12) of the group. Elements Ib (11) of the group. Elements IIa (2) of the group. Elements Ia (1) of the group. Group VIIa (17). Elements VIa (16) of the group. Elements Va (15) of the group. Elements IVa (14) of the group. Elements IIIa (13) of the group.

Practical teaching: Computational and experimental exercises follow the teaching materials.

Computational exercises: Relative atomic and molar masses, Gas laws, Stoichiometric calculations, Solvents, Electrolyte solutions and ionic reactions, Ionic water product, Hydrogen exponent, Buffers, Solvability product, Oxidation reactions.

Experimental Exercises: Safety in a Chemical Laboratory. Laboratory dishes and accessories. Basic operations in experimental work. Solutions. Ionic reactions. Hydrolysis. Oxidation-reduction. Titrations. Qualitative chemical analysis of some elements and their compounds: Group VIIa elements (iodine solubility, iodine sublimation, characteristic reaction to halides ions); elements of VIIIb group (the effect of hydrochloric acid on Fe, the action of nitric acid on Fe, the reduction properties of elemental Fe, the properties of Fe (II) -hydroxide, characteristic Fe (II) ion reactions, the reduction effect of the Fe (II) compound, III) -hydroxide, characteristic reactions of Fe (III) ion, oxidation effect of Fe (III) -unique); elements of IVa group (properties of elemental Sn, reduction properties of Sn (II) ion, properties of Pb (II) ion); elements of the Ib group (conductance of Cu to dilute and concentrated acids, behavior of aqueous solutions of Cu salts, Cu (II) reaction with hydroxyl ion, complex divalent Cu compounds, reaction of Ag + ion with hydroxyl ions, evidence of Ag + ion reaction).

Literature:

1) Filipović I, Lipanović S, 1998, Opća i anorganska kemija 1 i 2 deo, Zagreb, Školska knjiga.
2) Poleti D, 2011, Opšta hemija, II deo, Hemija elemenata, Beograd, TMF.
3) Popović M. i ostali, 2003, Zbirka zadataka iz opšte hemije, Beograd, TMF.
4) Marjanović V, 2015, Hemija 1 - Predavanja, Užice, VPTŠ.
5) Marjanović V, 2013, Praktikum za eksperimentalne vežbe iz hemije, Užice, VPTŠ.

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

Teaching methods: Monologue, dialogue, demonstration and laboratory-based work.

Knowledge evaluation (maximum 100 points)

Pre-exam obligations	**Points**	**Final exam**	**Points**
Activity during lectures	**5**	Written exam	40
Practical classes	**10**	Oral exam	
Colloquia	**15**		
Seminar papers	**30**		
Assessment methods:			

Study programme: TECHNOLOGICAL ENGINEERING

Type and Level of Studies: UNDERGRADUATE VOCATIONAL STUDIES

Course code and title: CHEMISTRY 2

Teacher (Surname, middle initial, name): Marjanović M. Vesna

Course status: Compulsory

Number of ECTS credits: 6

Prerequisites: passed CHEMISTRY 1

Course aims: to provide students with fundamental knowledge on organic chemistry. Students are introduced to: (1) the nomenclature of organic compounds; (2) basic concepts in the structure and reactions of organic compounds; (3) dependence of physical and chemical properties on the structure of organic molecules; (4) the practical application and toxicological properties of certain organic compounds; (5) basic techniques for the allocation, purification and identification of organic compounds.

Learning outcomes: The ability to name organic compounds according to the IUPAC nomenclature. Knowledge of physical and chemical properties of organic compounds. Understanding characteristic transformations of functional groups and mechanisms of organic reactions. Independent isolation, purification and identification of organic compounds.

Syllabus

Theoretical instruction: Classification and nomenclature of organic compounds. Functional groups. Alkanes and cycloalkanes. Alkene, diene and alkynes. Aromatic hydrocarbons (benzene and arene). Halogenated hydrocarbon derivatives (alkyl halides, alkenyl halides, arylhalogenides). Organic compounds of oxygen (Alcohols, Phenols, Etri). Organic nitrogen compounds (Nitro compounds, Amines). Aldehydes and ketones. Carboxylic acids. Carboxylic acid derivatives (acid halides, acid anhydrides, carboxylic esters, carboxylic acid amides). Heterocyclic compounds. Carbohydrates (monosaccharides, disaccharides and polysaccharides). Proteins (natural amino acids, peptide bond, protein structure). Nucleic acids (composition and structure of DNA and RNA). Natural aromatic compounds (classification and properties). Lipids (composition, structure, characteristics and classification, complex lipids). Terpens and terpenoids (structure and classification). Vitamins (definition, classification of vitamins). Steroids, hormones (definition and structure, stereochemistry and classification). Alkaloids (definition and basic heterocyclic alkaloids systems, classification). Antibiotics (definition, classification).

Practical teaching: Computational and experimental exercises follow lecture materials.

Computational Exercises: After mastering the theoretical basics of individual chapters, checking and determining the learned material by creating tasks for which solving requires the direct application of basic concepts and reactions, as well as a combination of basic concepts and reactions.

Experimental Exercises: Safety in a Chemical Laboratory. Dishes, accessories, appliances and basic operations in experimental work with organic substances. Basic methods of separation and purification of organic substances (separation and purification of pure substances based on differences in physical properties: extraction, sublimation, distillation, filtration, recrystallization). Demonstration of carbon and hydrogen in an organic substance. Saturated hydrocarbons (Reaction with bromine in chloroform or carbon tetrachloride). Unsaturated hydrocarbons (Reaction with bromine in chloroform or with bromine in carbon tetrachloride, Reaction with potassium permanganate). Aromatic hydrocarbons (Benzene solubility, Reaction with concentrated sulfuric acid (sulfonation reaction), Reaction with concentrated nitric acid (nitrobenzene production), Reaction with potassium permanganate). Alcohols (Alcohol solubility, Demonstration of neutral character of alcohol, Isolation of alcohol from aqueous solution, Iodoform reaction to ethanol (ethanol test)). Phenols (Solubility and Acid Characteristics of Phenols, Reaction with Sodium Hydroxide, Reaction with Concentrated Sulfuric Acid (Phenol Sulfonation Reaction), Potassium permanganate Reaction (Phenol Oxidation)). Aldehydes and ketones (Reaction with Tollens' solution, Reaction with Fehling's solution). Carboxylic acids (Acid solubility, Reaction with sodium hydroxide, Reaction with sodium hydrogen carbonate, Reaction with potassium permanganate). Carboxylic acid derivatives (esterification reaction).

Literature:

1) Volhard P, Šor N, Organska hemija: struktura i funkcija, Data status, Nauka , Beograd 2004.
2) Bončić-Caričić G. i ostali, Eksperimentalna organska hemija, TMF, Beograd, 2001.
3) Jovanović, B. i ostali, Zbirka zadataka iz organske hemije, TMF, Beograd, 2000.
4) Petrović S, Mijin D, Stojanović N, Hemija prirodnih organskih jedinjenja, TMF, Beograd, 2009.
5) Marjanović V, Hemija 2 - Predavanja, Užice, VPTŠ, 2015.
6) Marjanović V, Praktikum za eksperimentalne vežbe iz hemije, Užice, VPTŠ, 2013.

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

			work:	
Teaching methods: monologue, dialogue, demonstration and laboratory-based work				
Knowledge evaluation (maximum 100 points)				
Pre-exam obligations	**Points**	**Final exam**		**Points**
Activity during lectures	**5**	Written exam		40
Practical classes	**10**	Oral exam		
Colloquia	**15**			
Seminar papers	**30**			
Assessment methods:				

Study programme: TECHNOLOGICAL ENGINEERING Module 1: Environmental Engineering

Type and Level of Studies: UNDERGRADUATE VOCATIONAL STUDIES

Course code and title: ECO PROTECTION IN INDUSTRY

Teacher (Surname, middle initial, name): Aksentijević M. Snežana

Course status: Elective

Number of ECTS credits: 6

Prerequisites: no

Course aims: Acquisition of general and expert knowledge on the most important industrial processes that pollute the environment, as well as promoting the sustainable development of industry at the local, regional and global level.

Learning outcomes: Training students to organize pollution control, prevent pollution and propose protection measures on the basis of adopted knowledge about industrial processes and their characteristics.

Syllabus

Theoretical instruction: Defining the production technology system - input and output elements. Environmental threats, classification of pollutants. Sources of air pollution, primary and secondary pollutants, protection measures, air purifiers. Sources of water pollution. Waste water classification. Industrial wastewater. Methods for purification. Degradation of soil. Protect the land from degradation. Industry - definition, division. Pollution and protection in the following technological processes: metallurgy (production of copper, aluminum and lead), coal production, chemical industry (production of sulfuric acid, phosphoric acid, soap and detergents, paints and varnishes, oil and natural gas, glass, rubber, artificial fertilizers , wood processing), food industry (production of milk and dairy products, bread production, meat processing, production of alcoholic and non-alcoholic beverages). Changes in the production process - waste production, the use of waste pollutants for new production, the improvement of technologies and production processes. Legislation.

Practical teaching: Auditory -explanation and practical examples related to theoretical instruction. Student describes the technological process, industrial plant, assesses environmental impacts, compliance with legal regulations. Preparation of seminar papers. Visit to businesses.

Literature:

1) D.Marković: Fizičko hemijske osnove zaštite životne sredine, Knjiga druga:Izvori zagađivanja posledice i zaštita, Fakultet za fizičku hemiju Beograd, 1996.
2) B. Anđelković, I. Krstić, Tehnološki procesi i životna sredina, Niš, 2002.
3) B. Dalmacija, D. Krčmar, Industrijski procesi, PMF, Novi Sad, 2011.

Number of active teaching classes: 90				Other classes:
Lectures: 45	Practical classes: 45	Other teaching forms:	Study research work:	

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

Knowledge evaluation (maximum 100 points)

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

Assessment methods:

Study programme: Technological Engineering

Type and level of studies: Undergraduate Vocational Studies

Course title: Electrical and Electronic Engineering

Teacher: Vidoje N. Milovanović

Course status: Compulsory

Number of ECTS: 6

Prerequisites: None

Course aim: Introducing students to the fundamental principles of electrical and electronic engineering; training them to use scientific and professional achievements in solving problems of environmental protection and improvement.

Course outcomes: Students can apply the acquired knowledge of electrical and electronic engineering and develop the system of ecological behaviour and positive attitudes to the nature, which will result in environmental protection and improvement. Through the acquisition of knowledge and skills, students gain professional competence in environmental protection.

Syllabus:

Theoretical instruction:

Electrical engineering: Electrostatics. Constant direct currents. Electromagnetism. Alternating currents. Electric machines and electrical measurements. Occupational safety and health. Electrical hazards and respective protective measures.

Electronic engineering: Semiconductors. Diodes. Transistors. Thyristors. Amplifiers. Integrated circuits. Non-ionizing electromagnetic radiation.

Practical instruction:

Laboratory exercises. Measuring resistance and power of receivers, using an oscilloscope to measure frequency, using an oscilloscope for time interval measurement, using an oscilloscope for voltage measurement, magnetic field measurement; diode characteristics, transistor characteristics, rectifiers, transistors as switches; measuring the radiation of mobile phones.

Literature:

1. Elektrotehnika sa elektronikom, Vidoje Milovanović, Užice, 2005.
2. Elektrotehnika sa elektronimkom zbirka zadataka, Vidoje Milovanović, Užice, 2006.
3. Elektrotehnika, Vidoje Milovanović, Užice, 2009.
4. Elektronika, Vidoje Milovanović, Užice, 2009.
5. Grupa autora: Bezbednost i zdravlje na radu - knjiga 1-modul 1-VPTŠ Užice, 2011.

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

Teaching methods::

Dialogue, monologue, practical work demonstration, work with texts, studying specialized literature.

Knowledge evaluation (maximum number of points: 100)

Pre-exam obligations	**Points:**	**Final exam**	**Points:**
Activity during lectures	10	Written exam	0
Practical classes	20	Oral exam	40
Colloquia	20		
Seminar papers	10		

Study programme: TECHNOLOGICAL ENGINEERING

Type and Level of Studies: UNDERGRADUATE VOCATIONAL STUDIES

Course code and title: ELECTRICAL HAZARDS AND SAFETY

Teacher (Surname, middle initial, name): Milovanović N. Vidoje

Course status: Elective

Number of ECTS credits: 5

Prerequisites: no

Course aims: Introducing students to the dangers of electric current and protective measures, training students for the application of scientific and professional achievements in solving problems of protection and improvement of the environment

Learning outcomes: Training students for the application of acquired knowledge in the field of hazard and protection from electrical current in practice and thus to develop a system of ecological behavior, a positive attitude towards nature, thus achieving protection and improvement of the environment. With the acquired knowledge and skills, the student acquires professional competence for environmental protection.

Syllabus

Theoretical instruction: Danger of electrical current, effects of electrical current on the human body, protection of the human when using the receiver in the low voltage installation, protection of the human being when using the receiver in the high voltage plant, protective measures and testing elements, electrical appliances and devices in danger zones, anti-explosion protection of electrical devices equipment and installations, static electricity and its dangerous phenomena, atmospheric electricity, lightning protection, electromagnetic non-ionizing radiation. Standards and regulations. Giving first aid.

Practical teaching: Laboratory exercises, earthing resistance measurement, step voltage measurement, touch voltage measurement, magnetic field measurement, mobile phone radiation measurement, base station radiation measurement, microwave oven radiation measurement. Insulation tests.

There are 10 exercises.

Literature:

1. Nikola Nikolić, Opasnost i zaštita od električne struje, Naučna knjiga, Beograd, 1987.
2. Priručnik za protiveksplozijsku zaštitu električnih uređaja opreme i instalacija, Građevinska knjiga, Beograd, 1986.
3. Vjekoslav Srb, Električne instalacije i niskonaponske mreže, Tehnička knjiga, Zagreb, 1982.
4. Vidoje Milovanović, Opasnosti i zaštita od električne struje,VPTŠ, Užice, 2015.
5. Grupa autora, Bezbednost i zdravlje na radu - knjiga 1-modul 1- VPTŠ

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

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

Knowledge evaluation (maximum 100 points)

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

Assessment methods:

Study programme: Technological Engineering

Type and level of studies: Undergraduate Vocational Studies

Course title: English 1

Teacher: Marinković M. Ivana

Course status: Elective

Number of ECTS: 6

Prerequisites: None

Course aim: Acquiring the necessary knowledge of English for General Purposes, as well as of English for Specific Purposes; further development of language skills; reading comprehension and conversation about general and discipline-related topics; providing students with skills required for both oral and written business communication in English.

Course outcomes: Successful use of acquired knowledge in specific situations. Providing continuous foreign language education upon high school completion. Achieving proficiency in English for Specific Purposes.

Syllabus:

Theoretical instruction:

Nouns (plural of nouns). Pronouns (personal, possessive, relative, reflexive). Relative clauses. Articles (types and use). Adjectives and adverbs (comparison). Verbs (tenses).

English for Specific Purposes – introduction to specialized vocabulary using specialized texts.

Business English – business correspondence rules and formal expressions.

Practical instruction:

Grammar exercises, listening and speaking exercises aimed at the integration of lexical and grammatical knowledge; oral and written translation; writing business letters, CVs, etc.

1. Naunton, J., 2005, ProFile 2, Oxford, Oxford University Press
2. Murphy, R., 1990, English Grammar in Use, Cambridge University Press
3. Thompson A.J., Martinet, A.V., 1994, A Practical English Grammar, Oxford, OUP
4. Skripta stu;nih tekstova, Ljiljana Kovačević, 2007.
5. Advanced Learner's Dictionary of Current English, 1998, OUP.

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

Teaching methods: Monologue, dialogue, combined teaching methods, work with text

Knowledge evaluation (maximum number of points: 100)

Pre-exam obligations	**Points:**	**Final exam**	**Points:**
Activity during lectures	10	Written exam	15
Practical classes	10	Oral exam	15
Colloquia	50		
Seminar papers			

Study programme: Technological Engineering

Type and level of studies: Undergraduate Vocational Studies

Course title: English 2

Teacher: Ivana M. Marinković

Course status: Elective

Number of ECTS: 6

Prerequisites: Passed examination in English 1.

Course aim:

Acquiring the necessary knowledge of English for General Purposes, as well as of English for Special Purposes; further development of four language skills: reading comprehension skills, listening, speaking and writing skills. Providing students with the skills required for both oral and written communication in English on topics relating to technological engineering.

Course outcomes:

Students can use English for Specific Purposes successfully.

Syllabus:

Theoretical instruction:

Verbs (auxiliary and modal). Conditional sentences. Numbers. Passive. Reported speech (sequence of tenses). Future forms.

English for Specific Purposes – introducing students to discipline-related vocabulary through work with speacialised texts.

Business English –business correspondence rules and formal expressions.

Practical instruction:

Grammar exercises, listening and speaking exercises aimed at the integration of lexical and grammatical knowledge; oral and written translation; successful communication in business situations using English for mechanical engineering.

1. Naunton, J., 2005, ProFile 2, Oxford, Oxford University Press
2. Murphy, R., 1990, English Grammar in Use, Cambridge University Press
3. Thompson A.J., Martinet, A.V., 1994, A Practical English Grammar, Oxford, OUP
4. Skripta stu;nih tekstova, Ljiljana Kovačević, 2007.
5. Advanced Learner's Dictionary of Current English, 1998, OUP.

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

Teaching methods: Monologue, dialogue, combined teaching method, work with text.

Knowledge evaluation (maximum number of points: 100)

Pre-exam obligations	**Points:**	**Final exam**	**Points:**
Activity during lectures	10	Written exam	15
Practical classes	10	Oral exam	15
Colloquia	40		
Seminar papers	10		

Study programme: TECHNOLOGICAL ENGINEERING

Type and Level of Studies: UNDERGRADUATE VOCATIONAL STUDIES

Course code and title: ENVIRONMENTAL PROTECTION

Teacher (Surname, middle initial, name): Aksentijević M. Snežana, Taching associate: Tomić D. Milena

Course status: Compulsory

Number of ECTS credits: 6

Prerequisites: no

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

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

Syllabus

Theoretical instruction: Environment - concept, content. Ecosphere and ecosystem. Ecological factors (abiotic and biotic). Water, air, soil, living world. Endangering and pollution of living and working environment - global pollution, water pollution, air pollution, soil degradation. Waste, types of waste. Environmental protection and enhancement - environmental protection systems. Protection of air, water, soil from pollution. Accidents and environmental risk management. Tools for improving environmental protection - cleaner production, energy efficiency. Legislation, international and national standards.

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

Literature:

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

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

Teaching methods: Dialogue, monologue, practical work demonstration

Knowledge evaluation (maximum 100 points)

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

Assessment methods:

Study programme: TECHNOLOGICAL ENGINEERING

Type and Level of Studies: UNDERGRADUATE VOCATIONAL STUDIES

Course code and title: FINAL THESIS

Course status: Compulsory

Number of ECTS credits: 9

Prerequisites: all exams passed

Aims of Final Exam:
Application of acquired knowledge and skills for independent work in the field of Food Engineering.

Learning outcomes:
Ability to work independently in the field of Food Engineering.

General facilities:
The content of the Final Work is in accordance with the Rulebook on Final Work, which is publicly available.
Theoretical work:
The Final work should contain in the theoretical part: the title, the name of the candidate and mentor, the precisely defined task, the summary in Serbian and English, the content of the work, the basic theoretical and experimental part, the conclusion, the contributions and the literature.
The title should clearly indicate the subject matter, should contains the key words and should be as short as possible. The task contains the basic theses given by the mentor. The summary should have 150 to 200 words, with a prominent subject of work, procedures and main results obtained in the work. Content represents work overview, a list of titles and subheadings, with the number of pages on which it is located. The Introduction, the Basic part and the Conclusion are essential parts of the work that should include: the theme and goal of the work, the methods or methods used in solving the tasks, and a brief overview of the work on the whole. The Basic part contains the main material in details. It should be organized in several parts that should include: a demonstration of the procedure used in the work, the application of the procedure for a concrete solution, the description of the experiment, the presentation and processing of experimental results, the presentation of the obtained results. The Conclusion should be brief and clear to show what was done in the work and in what way, the advantages of the procedure used as well as the shortcomings and limitations, the practical application of the obtained results. Literature should be relevant and as recent as possible.
Practical teaching:
(Experimental part and defense of work)
Final work is represented to a commission of three members (president, mentor and member). Oral defense is public. During the defense, the candidate presents a written part of the paper. In defense, a candidate can use a computer, projector, slide, or poster. After the defense, the candidate answers the questions of the members of the commission. After the completion of the defense, the commissions determine the grade.

Teaching methods: Discussion of selected topics; case study; simulations.

Knowledge evaluation (maximum 100 points)

Pre-exam obligations	**Points**	**Final exam**	**Points**
activity during workmanship	**50**	oral exam	**50**

Study programme: TECHNOLOGICAL ENGINEERING - Module 2: Food Engineering

Type and Level of Studies: UNDERGRADUATE VOCATIONAL STUDIES

Course code and title: FOOD **CHILLING, FREEZING AND DRYING TECHNOLOGIES**

Teacher (Surname, middle initial, name): Theoretical instruction - **Dragomir M. Aćimović** Practical teaching – **Milivojević D. Petar**

Course status: Compulsory/Elective

Number of ECTS credits: 6

Prerequisites: no

Course aims:
Acquisition of basic knowledge in the field of food chilling, freezing and drying processes and installations: types and characteristics of processes and installations, conditions of quality that installations and processes should satisfy. Acquiring knowledge about design principles, use of project documentation, installation of equipment and its maintenance.

Learning outcomes:
Training students to apply knowledge in practice. Proper selection and proper application of processes and installations of chilling, freezing and drying. Training students for solving practical problems in the field of improvement of existing processes and installations of chilling, freezing and drying.

Syllabus
Theoretical instruction:
Introduction to chilling and freezing processes for food products. Application of refrigeration. Thermal insulation. Chilling needs calculation. Cycles with compressors. Chilling fluids. Components of chilling installations - pipelines and equipment, Preparation of refrigeration and freezing materials. Automation of chilling devices.
Introduction to drying processes for food products. Wet material and moist air. Static and kinetics of the drying process. Thermal drying calculation, h-x diagram. Types of dryers. Components of drying. Preparation of drying material. Automation of drying process.

Practical teaching:
Calculation tasks and analysis of the results obtained in accordance with the material passed on the lectures. Calculation tasks refer to the calculation of chilling needs and the need for drying.

Literature:
1. Sava Vujić, Rashladni uređaji, Mašinski fakultet Beograd

2. Radivoje Topić, Osnove projektovanja proračuna i konstruisanja sušara, Naučna knjiga, Beograd

3. Radivoje Topić, Sušenje i sušare, Savez mašinskih i elektrotehničkih inženjera i tehničara Srbije (SMEITS), Beograd

4. Bogosav Vasiljević, Miloš Banjac, Priručnik za termodinamiku, Mašinski fakultet, Beograd

Number of active teaching classes: 90				Other classes:
Lectures: **3 x 15 = 45**	Practical classes: **3 x 15 = 45**	Other teaching forms:	Study research work:	

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

Knowledge evaluation (maximum 100 points)

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

Assessment methods:

Study programme: TECHNOLOGICAL ENGINEERING – Module 2: Food Engineering

Type and Level of Studies: UNDERGRADUATE VOCATIONAL STUDIES

Course code and title: FRUIT AND VEGETABLE PROCESSING TECHNOLOGY

Teacher (Surname, middle initial, name): Theoretical instruction – **Čabrilo B. Slavica** Practical teaching – **Đedović S. Miloš**

Course status: Compulsory

Number of ECTS credits: 5

Prerequisites: passed Chemistry 2 exam

Course aims:
To provide students with the necessary knowledge in the field of fruit and vegetable technology and to introduce students in the theory and practice of designing and implementing methods of processing and preserving fruits and vegetables

Learning outcomes:
Acquiring knowledge necessary for independent work in processing of fruit and vegetable plants

Syllabus
Theoretical instruction:
Classification and assessment of the quality of fresh fruits and vegetables. Mechanical composition (randman), chemical composition and technological maturity of fruits and vegetables. Auxiliary materials in the technology of fruits and vegetables. Tackling reactions (enzymatic and non-enzymatic). Methods of preserving fruits and vegetables. Semi-prepared fruit products. Frozen fruit technology. Technology of finished fruit products (compote, fruit salad, sweet jam, jam, etc.). Fruit juices, technologies for the production of clear, murky, bulky juices. Concentrates, fruit syrups, citrus bases, fruit in alcohol. Fruit drying technology. Fruit vinegar. Freezing technology of vegetables (peas, beans, carrots, broccoli etc.). Pasteurized-marinated vegetables, production of ajvar. Sterilized vegetables. Biologically Conserved Vegetables.
Technology of dried vegetables and mushroom processing. Waste utilization in the fruit and vegetable processing industry
Practical teaching:
The concept of quality, quality conditions and a sensor analysis of fruits, vegetables and processed products.
Determination of dry matter (total and soluble dry matter).
Determination of mineral matter (total, soluble in water, insoluble in HCl, sulphates and ash without kitchen salt).
Determination of the acidity and quantity of certain acids.
Determination of carbohydrates (natural invert, total invert, sucrose, starch, pectic substances, crude cellulose).
Determination of chloride in vegetables. Determination of vitamin C. Determination of natural and artificial coloring matters. Demonstration and determination of artificial sweeteners. Determination of preservative agents

Literature:

1. Niketić-Aleksić Gordana.,"Tehnologija voća i povrća"Poljoprivredni fakultet Beograd, 1988.
2. Zlatković B.,"Tehnologija prerade i čuvanja voća"Poljoprivredni fakultet, Beograd, 2003.
3. Čabrilo S.,"Tehnologija voća i povrća-praktikum", VTŠ Požarevac 1999.

Number of active teaching classes: 60				Other classes:
Lectures: **2 x 15 = 30**	Practical classes: **2 x 15 = 30**	Other teaching forms:	Study research work:	

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

Knowledge evaluation (maximum 100 points)

Pre-exam obligations	**Points**	**Final exam**	**Points**
Activity during lectures	10	Written exam	
Practical classes		Oral exam	50
Colloquia	20		

Seminar papers	20		
Assessment methods:			

Study programme: Technological Engineering

Type and level of studies: Undergraduate Vocational Studies

Course title: Informatics Fundamentals

Teacher: Ivković V. Nebojša

Course status: Compulsory

Number of ECTS: 5

Prerequisites: None

Course aim:

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

Course outcomes:

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

Syllabus:

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

Literature:

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

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

Teaching methods::

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

Study programme: TECHNOLOGICAL ENGINEERING Module 2: Food Engineering

Type and Level of Studies: UNDERGRADUATE VOCATIONAL STUDIES

Course code and title: INSTRUMENTAL METHODS OF ANALYSIS

Teacher (Surname, middle initial, name): Aksentijević M. Snežana

Course status: Elective

Number of ECTS credits: 5

Prerequisites: no

Course aims: The objective of the course is to provide students with theoretical and practical knowledge related to qualitative and quantitative instrumental methods of sample analysis. Students need to understand the problems related to the analysis of complex samples, to know how to properly sample, to select and apply the appropriate method of analysis, and to properly process and interpret the results.

Learning outcomes: Acquiring theoretical and practical knowledge related to sample analysis; developing the ability to recognize the problem and to choose the appropriate method for solving it; mastering the techniques of sampling, preparation and analysis of real samples; process the measurement results from the aspect of accuracy and precision..

Syllabus

Theoretical instruction: Introduction. Characteristics of physical quantities in instrumental methods of qualitative and quantitative analysis. Gravimetric methods of analysis - sedimentation, settling and rinsing of sediment, drying, annealing, gravimetric factor. Potentiometry - direct potentiometry, potentiometric titration. Refractometry - refractive index, refractometers, dispersion measurement. Turbidimetry - turbidity meter, application of turbidimetry. Chromatography - adsorption chromatography, subone chromatography, ion exchange, gas and liquid chromatography, chromatogram, chromatography applications. Colorimetric and photometric methods - principles of colorimetry, principles of photometry, colorometer, photometer. Mass spectrometry - theoretical basis of the method, mass spectra, gas chromatograph - mass spectrometer. Atomic Absorption Spectrometry - principles of method, spectral, chemical, ionization and physical disturbances, application. Infrared spectroscopy - infrared spectrophotometers, liquid and solution analysis, gas analysis, solid sample analysis, qualitative and quantitative analysis. Ultraviolet Spectroscopy - UV spectra, application. Nuclear magnetic resonance - instruments, techniques of work.

Practical teaching: Introduction to laboratory work. Measurement in instrumental analysis (unit system, measurement error, presentation of results). Gravimetric determination of individual elements, calculation of gravimetry and calculation examples. Measurement of pH, potentiometric determination of sulfuric acid, phosphoric acid and acetic acid. pH-metric titration of single-phase and multicore acids. Determination of the concentration of the solution (aqueous solutions of fruits and vegetables, milk and milk products, drinks) by measuring the index of refraction. Refractometric determination of dry matter in fruits, milk and dairy products. Determination of oxides of carbon, nitrogen and sulfur in the air. Determination of the distribution coefficient. Spectrometric determination of metals in water.

Auditory exercises: Each student selects a method in agreement with the mentor, presents the method to other students through the presentation of a seminar paper for a particular example of practical application in the technological engineering of the chosen method.

Literature:

1) S. Aksentijević, Metode analize zagađujućih materija, Visoka poslovno-tehnička škola strukovnih studija, Užice, 2015.

2) T. M. Đurkić, S. D. Grujić, M. D. Laušević, „Metode analize zagađujućih materija“, Tehnološko-metalurški fakultet, Beograd, 2015.

3) J. Mišović, T. Ast, Instrumentalne metode hemijske analize, Tehnološko-metalurški fakultet, Beograd, 1992.

4) Lj. Fotić, M. Laušević, D. Skala, M. Bastić, Instrumentalne metode hemijske analize, Praktium za vežbe, Tehnološko-metalurški fakultet, Beograd, 1992.

5) D. Antonović, Instrumentalne metode u organskoj hemiji, Zbirka zadataka, Tehnološko-metalurški fakultet, Beograd, 2003.

Number of active teaching classes: 60				Other classes:
Lectures: 30	Practical classes: 30	Other teaching forms:	Study research work:	
Teaching methods: Lectures, exercises, assignments, projects, consultations.				
Knowledge evaluation (maximum 100 points)				
Pre-exam obligations	**Points**	**Final exam**	**Points**	
Activity during lectures	**10**	Written exam		
Practical classes	**10**	Oral exam	50	
Colloquia	**2x10=20**			
Seminar papers	**10**			
Assessment methods:				

Study programme: Technological Engineering

Type and level of studies: Undergraduate Vocational Studies

Course title: Mathematics 1

Teacher: Ljubica Ž. Diković

Course status: Compulsory

Number of ECTS: 6

Prerequisites: None

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

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

Syllabus:

Theoretical instruction:

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

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

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

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

Practical instruction:

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

Literature:

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

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

Study programme: Technological Engineering

Type and level of studies: Undergraduate Vocational Studies

Course title: Mathematics 2

Teacher: Ljubica Ž. Diković

Course status: Compulsory

Number of ECTS: 6

Prerequisites: Passed exam in Mathematics 1

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

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

Syllabus:

Theoretical instruction:

Functions of a real variable. Review of basic functions.

Arrays. Boundary values of an array.

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

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

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

Practical instruction:

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

Literature:

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

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

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

Knowledge evaluation (maximum number of points: 100)

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

Study programme: TECHNOLOGICAL ENGINEERING – Module 2: Food Engineering

Type and Level of Studies: UNDERGRADUATE VOCATIONAL STUDIES

Course code and title: MEAT INDUSTRY - TECHNOLOGY FOR PROCESSING MEAT AND BY-PRODUCTS

Teacher (Surname, middle initial, name): Theoretical instruction **Gordana D. Stanković** Practical teaching – **Konstantinović S. Jelena**

Course status: Compulsory

Number of ECTS credits: 5

Prerequisites: passed Chemistry exam

Course aims:
Processing the theory and practice of meat technology, acquiring appropriate knowledge and implementation of the technology of meat processing

Learning outcomes:
Students should gain knowledge in the field of meat technology

Syllabus
Theoretical instruction:
Introduction - slaughterhouses, characteristics of basic plants and production departments. The concept of meat
Structure, composition and biochemical changes in meat, color of meat
Race types and categories of cattle for slaughter
Assessment of livestock for slaughter
The health condition of the cattle for slaughter
Transportation and preparation of cattle for slaughter
Slaughter and primary meat processing
Refining, cutting and grading classification of meat. Categorization of meat.
Freezing of meat, meat hygiene
Basic principles of meat processing and preservation. Flavoring, general principles of processing, thermal processing, smoke and drying of meat
Technology of cured meat products
Technology of sausage preparation.
Technology of durable canned meat.
The technology of pollinated meat cans
Technology of the accompanying products in the meat industry
Practical teaching:
Sensor analysis
Determination of the chemical composition of the meat
Determination of ph value
Determination of salt content in products made from meat
Determination of phosphor-pentoxide content in products made from meat
Determination of starch content in meat cans
Determination of the content of the preoxide number, the acidic degree of the saponification number in the fats

Literature:

1. Joksimović . J. Tehnologija suhomesnatih proisvoda i kobasica, Poljoprivredni fakultet Beograd 1978
2. Paunović. N. Tehnologija mesa, VTŠ Požarevac, 2002

Number of active teaching classes: 60				Other classes:
Lectures: **2 x 15 = 30**	Practical classes: **2 x 15 = 30**	Other teaching forms:	Study research work:	

Teaching methods: Multimedia, verbal and textual

Knowledge evaluation (maximum 100 points)

Pre-exam obligations	**Points**	**Final exam**	**Points**

Activity during lectures	10	Written exam	
Practical classes	-	Oral exam	50
Colloquia	20		
Seminar papers	20		
Assessment methods:			

Study programme: TECHNOLOGICAL ENGINEERING Module 2: Food Engineering

Type and Level of Studies: UNDERGRADUATE VOCATIONAL STUDIES

Course code and title: MICROBIOLOGY

Teacher (Surname, middle initial, name): Marinković S. Tatjana

Course status: Compulsory

Number of ECTS credits: 6

Prerequisites: no

Course aims: General Microbiology aims to introduce students to the basic characteristics of microorganisms. Regarding the systematics and classification of microorganisms, the emphasis is on bacteria, yeast and molds that are important for food production, as the triggers of alimentary intoxications.

Learning outcomes: Students should acquire knowledge from the basics of mycobiology, food poisoning, pathogenic foods transmitted by microorganisms.

Syllabus

Theoretical instruction:

Introduction to mycobiology
Morphology of bacteria
Physiology, Multiplication, Genetics and Ecology of Microorganisms
Metabolism, Taxonomy of microorganisms
Bacteria, fungi, viruses, division, characteristics of the most important families, genera and species
Methods and techniques for detection, isolation of microorganisms
Prevention of reproduction and contamination by microorganisms
Microbiology of meat and meat products, milk and dairy products, flour and bakery, water, fruits and vegetables, confectionery products
Microbiology of food poisoning
Virus and parasites transmitted by food and water
Mycotoxins
Legislative on the microbiological safety of food and methods of carrying out analyzes and superanalysis of foods

Practical teaching:

Getting acquainted with work in microbiological labs;
Methods of microscopy and observation of the preparation
Making native preparations; Basic and special types of staining in microbiology
Getting acquainted with instruments and appliances in microbiology
Isolation of microorganisms
Identification of significant microorganisms.
Making substrates and dilutions
Determination of the number of microorganisms in milk and dairy products, meat and meat products, flour and products of flour, water, confectionery, fruit and vegetables

Literature:

1.Marinkovic T, Marinkovic D. Mikrobiologija, Visoka zdravstveno sanitarna skola strukovnih studija VISAN, Beograd, 2014.
2. Govedarica M. G. Dimitrijević, Milošević M. – Mikrobiologija voća i proizvoda od voća Novi Sad 2005
3.Vlahović M. Medicinska mikrobiologija, Beograd 2005
4.Xavec, Melnik, Aldelbers, Medicinska mikrobiologija, Beograd 2005
5.Simić D. Opšta mikrobiologija – naučna knjiga Beograd 2000
6.Jemcev – Đurić, Mikobiologija – Vojno izdavački zavod Beograd 2002

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

Teaching methods: Lectures, exercises, assignments, projects, consultations.			
Knowledge evaluation (maximum 100 points)			
Pre-exam obligations	**Points**	**Final exam**	**Points**
Activity during lectures	**10**	Written exam	
Practical classes	**10**	Oral exam	50
Colloquia	**30**		
Seminar papers			
Assessment methods:			

Study programme: TECHNOLOGICAL ENGINEERING – Module 2: Food Engineering

Type and Level of Studies: UNDERGRADUATE VOCATIONAL STUDIES

Course code and title: MILK INDUSTRY – TECHNOLOGY FOR PROCESSING MILK AND BY-PRODUCTS

Teacher (Surname, middle initial, name): Theoretical instruction - **Stanković D. Gordana** Practical teaching – **Marko M. Dimitrijević**

Course status: Compulsory

Number of ECTS credits: 5

Prerequisites: passed Chemistry 2 exam

Course aims:
To process modern theory and practice in the field of milk technology.

Learning outcomes:
To provide students with certain knowledge in designing and implementing technology of processing milk and milk products.

Syllabus
Theoretical instruction:
Formation, secretion and milk production
Chemical composition of milk
Physico-chemical and physical properties of milk
Consumable milk
Fermented milk drinks
Technological process of cheese production
Classification and typec of cheese
Butter. Smelted cheeses
Indigenous dairy products
Butter
Concentrated and dried milk products
Ice cream.
Processing of whey
Practical teaching:
Taking samples of milk and milk products.
Milk and liquid milk products, detection of milk components.
Determination of dry components, fat, protein, lactose
Determination of mineral components in milk
Lactic acid in milk and dairy products.
Control pasteurization, sterilization; determination of volume, viscosity, freezing point.
Fermented dairy products, sour cream, butter.
Cheese, dry matter, fat, proteins, ash, chlorides, pH, acidity in cheese, rheological characteristics of cheese
Condensed milk, powdered milk, whey powder and whey powder
Ice cream and frozen desserts

Literature:

1. Đorđević, J. „Mleko – hemija i fizika mleka“, Naučna knjiga Beograd. 1985.
2. Dozet, N, Adžić, N, Stanišić M, Živić, N, „Autohtoni mlečni proizvodi“, Beograd 1996.
3. Carić, M, Milanović, S, Vucelja, D, „Standardne metode analize mleka u mlečnih proizvoda“, Novi Sad, 2000.
4. Puđa, P. "Tehnologija mleka i sirarstvo – Opšti deo", Novi Sad 2009.

Number of active teaching classes: 60				Other classes:
Lectures: **2 x 15 = 30**	Practical classes: **2 x 15 = 30**	Other teaching forms:	Study research work:	

Teaching methods: Lectures, exercises, assignments, projects, consultations.			
Knowledge evaluation (maximum 100 points)			
Pre-exam obligations	**Points**	**Final exam**	**Points**
Activity during lectures	10	Written exam	
Practical classes		Oral exam	50
Colloquia	20		
Seminar papers	20		
Assessment methods:			

Study programme: Technological Engineering

Type and level of studies: Undergraduate Vocational Studies

Course title: New Technologies and Management

Teacher: Ljiljana M. Trumbulović-Bujić, Teaching Assistant: Zečević Marko

Course status: Elective

Number of ECTS: 6

Prerequisites: passed exam in Chemistry 1, Chemistry 2 and Materials

Course aim: Introducing students not only to conventional materials and technologies, but also to new materials and technologies with significant advantages in certain uses.

Course outcomes: Providing students with innovative thinking skills that will enable them to welcome new products and technologies in order to start their own businesses.

Syllabus:

Theoretical instruction:

Materials science, materials technology and their correlation. Polymeric materials – development, properties, structure, types (thermoplastic, thermoreactive, elastomers). Ceramic materials - development, properties, structure, types (traditional and modern), ceramics engineering characteristics. Composite materials - development, properties, structure, types (particle-reinforced, fibre-reinforced, laminates). Biomaterials. Electronic materials.

The importance and goals of new technologies. Component technologies. Designing new processes. The classification and structure of new technologies. Technological systems –metal and alloy production, rubber production, cellulose production, ceramics and glass production, fabric production. Non-manufacturing technological systems. Nanotechnology.

Practical instruction:

Auditory activities (New materials – their composition, structure, properties; Classification and use of new materials; Advantages of new technologies over old ones; Information and hybrid technologies; Nanotechnology. Unconventional processing. New casting technologies; Powder metallurgy technologies.)
Preparation of two seminar papers - working with text, searching literature on the Internet, in libraries.
Practical classes include the demostration of practical processes – in companies.

Literature:

1. Ljiljana Trumbulović, Materijali, polimeri, keramika, kompoziti, Visoka poslovno-tehnička škola strukovnih studija Užice, ISBN 978-86-83573-64-6, COBISS BIHID.9809158, 2015.
2. F. Ćatović, Nauka o materijalima, Tehnički fakultet u Bihaću, ISBN 9958-604-03-5, COBISS.BIH-ID. 9809158, 2005.
3. M. Levi Jakšić, Upravljanje tehnologijom i operacijama, Čigoja štampa, Beograd, 2000.
4. M. Teciazić Stevanović, Osnovi tehnologije TMF Beograd, ISBN 86-7401-065-2, 2005.
5. M.Plavšić, Polimerni materijali, Naučna knjiga, Beograd, 1996.
6. M. Jovanović, D. Adamović, V. Lazić, N. Ratković, Mašinski materijali, Univerzitet u Kragujevcu, Mašinski fakultet u Kragujevcu, ISBN 86-80581-55-0, COBISS.SR-ID 105498380
7. B. Cvejić, Mašinski materijali, Visoka tehnička škola Uroševac, ISBN 86-7746-029-2, COBISS.SR-ID 1182563396, 2004.

Number of active teaching classes: 90				Other classes:
Lectures: 45	Practical classes: 45	Other forms of instruction:	Research study:	

Teaching methods: Dialogue, monologue, demonstrations of practical work, work with texts, studying literature

Knowledge evaluation (maximum number of points: 100)

Pre-exam obligations	**Points**	**Final exam**	**Points**
Activity during lectures	5	Written exam	50
Practical classes	5	Oral exam	-

Colloquia	30		-
Seminar papers	10		

Study programme: TECHNOLOGICAL ENGINEERING

Type and Level of Studies: UNDERGRADUATE VOCATIONAL STUDIES

Course code and title: OCCUPATIONAL SAFETY

Teacher (Surname, middle initial, name): Marjanović M. Vesna

Course status: Compulsory

Number of ECTS credits: 6

Prerequisites: no

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

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

Syllabus

Theoretical instruction: Introduction to occupational safety (concept, subject and historical development of occcupational safety). Legal framework for occupational safety and health (International law, National regulations: the Constitution of the Republic of Serbia, Law on Occpational Safety and Health). Work-related injuries, occupational ailments and work-related illnesses. Basic sources and causes of hazards and injuries at work: a) subjective causes, b) objective causes. Types and characteristics of harmful effects (harmul effects caused by psychic and psycho-physiological efforts, harmful effects related to the organization of work, harmful effects caused by other people, harmful effects caused by or arising in the process of work: physical (noise and vibrations), harmful effects of radiation (thermal, ionizing or non-ionizing, laser, ultrasonic), adverse effects of microclimate (temperature, humidity and air flow rate), inappropriate lighting, chemical hazards, dust and fumes, harmful effects caused by the use of dangerous materials and hazards (mechanical hazards occurring while using work equipment, hazards associated with workplace characteristics, hazards arising from the use of electricity; fire and explosion hazards) in the workplace and work environment, and means of protection. General and specific measures in the field of occupational health and safety (for manual transmission of cargo, exposure to chemicals and biological hazards, in agriculture, to vibration and noise, when performing construction works).
Practical teaching: Demonstration of practical examples of good and poorly organized occupational safety and health system in particular businesses.
Basic characteristics of OHSAS 18001, 2007.

Literature:

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

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

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

Knowledge evaluation (maximum 100 points)

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

Assessment methods:

Study programme: TECHNOLOGICAL ENGINEERING

Type and Level of Studies: UNDERGRADUATE VOCATIONAL STUDIES

Course code and title: PHYSICAL CHEMISTRY

Teacher (Surname, middle initial, name): Aksentijević M. Snežana

Course status: Compulsory

Number of ECTS credits: 6

Prerequisites: passed Chemistry 1 and 2

Course aims: Introducing students to basic physical-chemical concepts, laws and principles. Theoretical bases for studying the structure and aggregate states of matter, as well as the physical processes and balance of phases in the material systems, as well as the chemical reactions and chemical equilibria, are established. The basics of chemical kinetics, as well as electrochemistry, are given.

Learning outcomes: Understanding and adopting basic physical-chemical concepts and principles. Identification and understanding of physical-chemical processes, Understanding of experimental physical-chemical methods, measurement and data processing methods

Syllabus

Theoretical instruction: Introduction to Physical Chemistry. Structure of material particles. Particles and waves. Quantum theory and periodic system of elements. Quantum-mechanical understanding of the chemical bond. Gaseous state. General equation of the kinetic theory of a gaseous state. Equation of ideal gas state. Gas laws. Real gases. Van der Waals equation. Solid state of matter. Miller Indices. Methods for testing the structure of crystals. Irregularities in crystals. Liquid state. The theory of liquid state. Vapour pressure liquid. Liquid crystals. Surface phenomena. Laplace's equation. Adsorption isotherms. Transport phenomena. Diffusion, viscosity and thermal conductivity according to kinetic theory. Experimental methods for determining viscosity. Chemical kinetics. Kinetics of simple reactions. Kinetics of complex reactions. The influence of temperature on the speed of the chemical reaction. Balance in solutions. Colligative properties of nonelectrolyte solution. Balance of distribution. Colligative properties of electrolyte solution. Properties of electrolyte solution. Electrical and molar conductivity of electrolytes. Electrochemical thermodynamics. Galvanic cells. Types of electrodes. Types of galvanic cells. Irregular processes on electrodes. Theoretical voltage decomposition. Types of preload. Kinetics of the process on electrodes. Electrochemical corrosion of metals.

Practical teaching: Computational and experimental exercises follow lecture materials.

Computational Exercises: particle wave properties, viscosity of liquids, crystalline material parameters, collagen properties in ideal solution, Nerst's law of distribution, chemical kinetics, equilibrium potential of individual electrodes, electromotive forces of electrochemical clutches).

Laboratory exercises: Determination of the distribution coefficient. Determination of the equivalence point by means of conductometric titration. Determination of the Freundlich's adsorption isotherm. Determination of the rate of decomposition of hydrogen peroxide. Determination of the concentration of the solution by measurements of the refractive index

Literature:

1) S. Đorđević, V. Dražić, Fizička hemija, TMF, Beograd, 2010.
2) S. Aksentijević, Fizička hemija, zbirka zadataka, VPTŠ, Užice, 2014.
3) Lj. Vračar i drugi, Eksperimentalna fizička hemija, TMF, Beograd, 2010.

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

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

Knowledge evaluation (maximum 100 points)

Pre-exam obligations	**Points**	**Final exam**	**Points**
Activity during lectures	**10**	Written exam	

Practical classes	**10**	Oral exam	60
Colloquia	**20**		
Seminar papers			
Assessment methods:			

Study programme: TECHNOLOGICAL ENGINEERING

Type and Level of Studies: UNDERGRADUATE VOCATIONAL STUDIES

Course code and title: PHYSICS

Teacher (Surname, middle initial, name): Ćetković S. Miloje

Course status: Compulsory

Number of ECTS credits: 6

Prerequisites: no

Course aims: Getting acquainted with mechanical, wave, thermal, electromagnetic, optical, atomic and nuclear phenomena. Getting the basis for studying technical sciences and teaching subjects from the narrow professional fields. Introducing a multidisciplinary approach to environmental issues

Learning outcomes: Developing the necessary analytical skills of students for the application of basic natural laws and for understanding and solving simple versions of various engineering problems; Development of critical and self-critical thinking and approach to protection; Basic knowledge and understanding of physical sources of pollution and measures of protection of working and environment.

Syllabus

Theoretical instruction: Place and role of physics and its influence on the development of technical disciplines; Kinematics and dynamics of the material point, the dynamics of rotation; Work, power, energy, maintenance laws, crash theory; Gravitation; Elasticity of solid bodies; Mechanical oscillations, waves, sound. Noise. Protection against noise in the environment. Statics, fluid dynamics, surface stress and capillary phenomena, viscosity and viscous fluid motion; Thermal expansion and calorimetry and phase transitions; Molecular-kinetic theory; Thermodynamics; Heat propagation; Electrostatic force, electric field; Laws of geometric optics, optical instruments; Photometry; Wave optics, stimulated radiation; Quantum nature of electromagnetic radiation. Wavelength properties of particles; Pine theory. X-ray radiation; Heisenberg's relation to indeterminacy; Atomic core; Mass defect and core core energy; Radioactivity; Nuclear reactions.

Practical teaching: Computational assignments in areas covered in lectures.

Laboratory exercises: Follow lectures from subjects. Training for working with measuring instruments and measuring devices

Literature:

1.V.Vučić, D.Ivanović, Fizika I, II, III, Građevinska knjiga, više izdanja.

2.M. Arsin, M. Ćuk, S. Milojevnć, M. Miloradović, J. Purić, 3. Radivojevpć, D. Radivojević, M. Savković, P. Todorov, Ž. Topolac, Fizika za više škole, Savremena administracija, više izdanja.

3.M. Ćetković: Praktikum računskih i laboratorijskih vežbanja iz fizike, Priboj, 2013.

4.V. Sajfert: Fizika, Univerzitet u Novom Sadu, Tehnički fakultet „Mihajlo Pupin“, Zrenjanin, 1999.

5.V. Sajfert: Zbirka zadataka iz fizike, Univerzitet u Novom Sadu, Tehnički fakultet „Mihajlo Pupin“, Zrenjanin, 2002.

6.V. Sajfert: Praktikum iz fizike, Univerzitet u Novom Sadu, Tehnički fakultet „Mihajlo Pupin“, Zrenjanin, 2002.

7.Grupa autora,Bezbednost i zdravlje na radu, knjiga 1, Modul 1, Užice, 2011

8.D.Pavlović, Praktikum računskih vežbanja iz fizike, Naučna knjiga, više izdanja

9.V.Vučić i grupa autora, Osnovna merenja u fizici, Naučna knjiga

10. V.Georgijević, Tehnička fizika, Zavod za izdavanje udžbenika i nastavna sredstva

				Other classes:
Lectures: 30	Practical classes: 30	Other teaching forms:	Study research work:	

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

Knowledge evaluation (maximum 100 points)

Pre-exam obligations	**Points**	**Final exam**	**Points**
Activity during lectures	**5**	Written exam	30
Practical classes	**10**	Oral exam	20

Colloquia	**35**		
Seminar papers			
Assessment methods:			

Study programme: TECHNOLOGICAL ENGINEERING

Type and Level of Studies: UNDERGRADUATE VOCATIONAL STUDIES

Course code and title: PROCESSING DEVICES

Teacher (Surname, middle initial, name): Ćrović A. Nataša

Course status: Compulsory

Number of ECTS credits: 6

Prerequisites: no

Course aims: Introducing students to basic machines, stoves and appliances used in the process of obtaining, processing, transporting and storing various materials. Students apply the acquired knowledge about equipment and the way of performing certain processes to practice, in support of ecological behavior. Special attention is paid to developing awareness of various dangers affecting people and equipment during technological processes, as well as to the organizational and other measures necessary for safe operation.

Learning outcomes: Enabling students to apply the acquired knowledge while working with specific devices and using them in technological processes.

Syllabus

Theoretical instruction: Stoves. Casting machinery. Transport devices for intermittent and continuous transport. Devices of floor and hanging transport. Auxiliary devices. Coolers. Energy installations. Water filtration and water transport equipment. Pumps. Pressurized vessels. Compressors. Electronic devices. Gas purification equipment.
Basic Safety and Health Regulations on Movement and basic safety requirements for belt conveyors.

Practical teaching: Auditory and demonstration exercises in appropriate production facilities.

Literature:

1. R. Drobnjak, B. Kovačević, Procesni uređaji, skripta sa predavanja, VPTŠ, Užice 2004.
2. R. Popović, M. Živojinović, Tehnološke mašine i uređaji, ICIM, Kruševac, 1999.
3. R. Drobnjak i autori, Bezbednost i zdravlje na radu, knjiga 1 za studente VPTŠ Užice, opšti deo, 2011.
4. R. Drobnjak i autori, Bezbednost i zdravlje na radu, knjiga 3 za studente VPTŠ Užice, 2011.

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

Teaching methods: Lectures, demonstration exercises in appropriate production facilities, consultations and a seminar paper..

Knowledge evaluation (maximum 100 points)

Pre-exam obligations	**Points**	**Final exam**	**Points**
Activity during lectures	**10**	Written exam	50
Practical classes	**10**	Oral exam	
Colloquia			
Seminar papers	**30**		

Assessment methods:

Study programme: TECHNOLOGICAL ENGINEERING – Module 2: Food Engineering

Type and Level of Studies: UNDERGRADUATE VOCATIONAL STUDIES

Course code and title: PRODUCT QUALITY CONTROL

Teacher (Surname, middle initial, name): Nataša Ćirović, Practical classes: Krička-Bosiljčić B. Tijana

Course status: Compulsory

Number of ECTS credits: 5

Prerequisites: no

Course aims:

Studying and mastering the basic principles of production processes in various industrial branches. Mastering the principles of chemical analysis of real systems that include raw materials, products and intermediate products and their application in quality control of industrial products as well as improvement of technological procedures.

Learning outcomes:

Training students for individual and team work on the application of standard and new methods for controlling and improving quality in industrial production.

Syllabus

Theoretical instruction:

Introduction to technology, its mission and importance. The role of quality control in the industry and possible directions for improving the quality of products and production processes. Fuels, fuel types and methods for quality control. Production and analysis of inorganic materials. Quality control of raw materials and products in metallurgy. Fats and oils, and surfactants. Manufacture of sugar, starch and cellulose. Quality control of food products. Quality control of leather products. Plastic masses and gum, their production processes and quality testing methods. Pesticides, their mechanism of action, production and methods of testing.

Practical teaching:

Auditory and demonstration practical teaching in appropriate production facilities.

Literature:

1. M. Jančetović, Komercijalno poznavanje robe, Beogradska poslovna škola visoka škola strukovnih studija, Beograd, 2010.
2. S. Stevanović, K. Trivunac, Industrijska hemijska analiza, skripta, Tehnološko – metalurški fakultet, Beograd, 2008. 2008.
3. D. Vitorović, Hemijska tehnologija, Naučna knjiga, Beograd, 1987.

Number of active teaching classes: 60				Other classes:
Lectures: **2 x 15 = 30**	Practical classes: **2 x 15 = 30**	Other teaching forms:	Study research work:	

Teaching methods: Lectures, demonstration exercises in appropriate production facilities, consultations and seminar work.

Knowledge evaluation (maximum 100 points)

Pre-exam obligations	**Points**	**Final exam**	**Points**
Activity during lectures	10	Written exam	50
Practical classes	10	Oral exam	
Colloquia	-		
Seminar papers	30		

Assessment methods:

Study programme: TECHNOLOGICAL ENGINEERING – Module 2: Food Engineering

Type and Level of Studies: UNDERGRADUATE VOCATIONAL STUDIES

Course code and title: PROFESSIONAL INTERSHIP

Teacher (Surname, middle initial, name): Assistant Director in Charge of Teaching Process, Head of the study program of basic vocational studies and teacher in charge of professional practice

Course status: Compulsory

Number of ECTS credits: 4

Prerequisites: no

Course aims:

Realization of tasks given by the teachers of the College in charge of professional practice and the teachers in charge of practice in business systems in which professional practice is carried out; acquiring competences for carrying out activities in the field of food engineering: performing and controlling technological processes in the food industry (processing of meat and obtaining products in the meat industry, milk processing and obtaining products in the milk industry, processing and obtaining fruit and vegetable products), as well as technological processes of cooling, freezing and drying of all food products, control of raw materials, intermediate products and final products and contribution to solving practical problems in the field of food engineering.

Learning outcomes:

Possession of knowledge, skills and competences to apply acquired knowledge, successful solving of complex problems in the field of work in unforeseen situations. Student should apply skills of successful communication in interaction and cooperation with others from different social groups. Student should use equipment, instruments and devices relevant to the field of work.

Syllabus

Content of the professional internship:

Student is systematically introduced into the problem of food engineering, trained to solve specific problems, and student should prepare for later final work. All this is described in the Daily journal of professional practice, whose authenticity is confirmed by signature and seal from the person in charge of the business system in which the professional practice is realized. The same person provides a descriptive assessment of the engagement of a student during the realization of the professional practice.

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

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

Knowledge evaluation (maximum 100 points)

Pre-exam obligations	**Points**	**Final exam**	**Points**
Report on completed assignments given by teachers in charge of professional practice	40	Oral Defense of the Report of Professional Practice and reports on realized activities provided by the person from the business system	30
Development of the Report of Professional Practice	30		

Assessment methods:

Study programme: TECHNOLOGICAL ENGINEERING

Type and Level of Studies: UNDERGRADUATE VOCATIONAL STUDIES

Course code and title: RADIATION AND PROTECTION

Teacher (Surname, middle initial, name): Ćetković S. Miloje

Course status: Elective

Number of ECTS credits: 5

Prerequisites: passed TRANSMISSION PHENOMENA

Course aims: Introducing students with radiation, radiation sources, radiation influence on living things, especially on humans, about doses and acceptability of the risks of certain forms of radiation; Education of quality experts, who will respond to the requirements of the market and modern technologies.

Learning outcomes: Developing the necessary capabilities of students for understanding radiation, measuring and expressing appropriate doses, and understanding and solving simple radiation protection problems, as well as analyzing and evaluating environmental risks; Education and knowledge management for environmental protection

Syllabus

Theoretical instruction: Discovery of radioactivity; Discovery of X-rays; Properties of radioactive radiation; Effects of different forms of radiation to life; Radioactive decay; Dosage; Units; Risk factors; Radiation sources; Cosmic sources; Earth Radiation; Internal and external irradiation; Radon; Movement of radionuclides in the natural environment; Building materials and radiation increase; Energy conservation and radon; Radon in the water; Burning of coal and increasing radiation; Geothermal energy and radiation; Production and use of artificial fertilizers as sources of additional contamination; Artificial sources; Use of radiation in industry; Medical sources; Medical diagnostics; Use of radionuclides; Radiological therapy; Nuclear precipitation; Nuclear explosions; Nuclear missiles; Bombs with depleted uranium; Nuclear energy; Nuclear waste; Types of radioactive materials; Nuclear waste processing; Disposal of nuclear waste; Other sources; Nuclear accidents; Influence of radiation on human; Deadly doses; Sensitivity of the human organism to radiation depending on age; Genetic changes as a result of radiation activity; Carcinogenic effects of radiation; Smoking and radiation; The inheritable defects as a result of radiation; Risk acceptability; Risks of how we feel and how real they are.

Practical teaching: Exercises that follow lectures.

Literature:

1.B. Pavlović, Fizika Predavanja II deo, Tehnološko-metalurški fakultet, Beograd, 2000
2.Lazar Marinkov, Osnovi nuklearne fizike, PMF, Novi Sad, 2002.
3.S. Macura, J. Radić-Perić, ATOMISTIKA, Službeni list, Beograd, 2004. glava 11.
4.R. Pavlović, Radiografija, IBK, Beograd, 1988.
5.M. Ćetković: Praktikum računskih i laboratorijskih vežbanja iz fizike, Priboj, 2013.
6.V. Sajfert: Fizika, Univerzitet u Novom Sadu, Tehnički fakultet „Mihajlo Pupin“, Zrenjanin, 1999.
7.V. Sajfert: Zbirka zadataka iz fizike, Univerzitet u Novom Sadu, Tehnički fakultet „Mihajlo Pupin“, Zrenjanin, 2002.
8.Grupa autora,Bezbednost i zdravlje na radu, knjiga 4, Modul 4, Užice, 2011

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

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

Knowledge evaluation (maximum 100 points)

Pre-exam obligations	**Points**	**Final exam**	**Points**
Activity during lectures	**5**	Written exam	30
Practical classes	**10**	Oral exam	20
Colloquia	**35**		
Seminar papers			

Assessment methods:

Study programme: Mechanical Engineering

Type and level of studies: Undergraduate Vocational Studies

Course title: Russian 1

Teacher: Terzić V. Svetlana

Course status: Elective

Number of ECTS: 6

Prerequisites: None

Course aim: Teaching students how to use specialized literature relating to a specific vocational area; developing students' language skills (reading, translation, conversation); combining lexical and grammatical structures. Developing reading comprehension skills and teaching students how to use bilingual technical dictionaries. Developing text analysis skills, as well as precise and concise communication skills. Increasing public awareness of the importance of being familiar with fundamental concepts of mechanical engineering using discipline-related texts.

Course outcomes: Providing continuous foreign language education upon high school completion. Developing communication skills and the skills that will enable students to cooperate with the immediate social and international environment. Acquiring knowledge and developing skills necessary for the successful use of the Russian language for the purpose of keeping pace with latest innovations and using them in practice. Students master vocabulary for specific purposes, can use specialized literature and can communicate successfully in Russian. Special emphasis is placed on using the information available on the Internet. Students use specialized literature to prepare final theses.
Students use Russian successfully in oral and written communication in every-day situations.

Syllabus:

Theoretical instruction:
The syllabus is divided into two, mutually interrelated parts. The first one comprises LSP texts, which will introduce students to specific vocabulary relating to mechanical engineering They will use this vocabulary in speaking activities about vocation-related topics. The other part comprises phonetics and grammar, necessary for developing reading comprehension skills, as well as listening comprehension skills. As for phonetics, special attention is paid to the correct pronunciation of soft consonants and iotified vowels. As for grammar, students will learn types of nouns, comparison of adjectives, numbers, and verbs of movement.

Practical instruction:
Students master language for specific purposes though translation of texts and conversation about topics relating to mechanical engineering.

Literature:

1. Marojević, Radmilo, 1983, Gramatika ruskog jezika, Beograd, Zavod za udžbenike i nastavna sredstva
2. Piper, Predrag, Gramatika ruskog jeyika, Yavet, Beograd, 2005.
3. Partina A.S. Архитектурные термины, Стройиздат, Moskva, 1994.

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

Teaching methods: Monologue and dialogue.

Knowledge evaluation (maximum number of points: 100)

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

Study programme: Technological Engineering

Type and level of studies: Undergraduate Vocational Studies

Course title: Russian 2

Teacher: Terzić V. Svetlana

Course status: Elective

Number of ECTS: 6

Prerequisites: Passed examination in Russian 1.

Course aim: Teaching students how to use specialized literature relating to a specific vocational area; developing students' language skills (reading, translation, conversation); combining lexical and grammatical structures. Increasing public awareness of the importance of being familiar with fundamental concepts of ecological engineering using profession-specific texts.

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

Syllabus:

Theoretical instruction:

Joint ventures – present participles. Advertisements – past participles. Commercial and industrial palaces – definite pronouns. Conversation in a Moscow bank – adverbs of reason, adverbs of purpose. Tourism – active present and past participles. World tourism congress – passive present and past participles. Environmental protection – economy vs. ecology. Ecology-related texts.

Practical classes:

Listening exercises to practise coping with unfamiliar business situations, using specific management-related terminology.

Literature:

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

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

Teaching methods: Monologue and dialogue-based methods.

Knowledge evaluation (maximum number of points: 100)

Pre-exam obligations	**Points: 70**	**Final exam**	**Points: 30**
Active participation during lectures	10	Written exam	20
Practical classes		Oral exam	30
Colloquia	40	-	-
Seminar papers		-	-

Study programme: Technological Engineering

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

Course title: Sociology

Teacher: Vesna Vasović

Course status: Compulsory

Number of ECTS: 6

Prerequisites: none

Course aim: Teaching students about what is specifically human, about everything that is the result of human activities, as well as promoting the awareness of the importance of social and working environment.

Learning outcomes: Introducing students to the social orientation, as well as providing them with skills for critical and independent thinking about issues related to society and labour.

Syllabus:

Theoretical instruction:

Society and truth, development of sociology – its position among other sciences – the role and classification of theories – classical theories – modern and postmodern theories – the system in general and social system – the global social system – society and nature – human energy – types of social action – social relations and their types – the concepts of *institution* and *organization* and their types – social groups and their importance in the global social system – the classification of social groups – the concept of *nation* and its development throughout history, the model of nations, the caracteristics of a nation – castes, social classes, professions, intelligence – bureaucracy and technocracy – the concept, characteristics and models of *elite* - social power as common energy – power, government, authority – the importance of social power in the global social development – environmental problems – the importance of ecological culture – the necessity for sustainable development, ecological awareness and education, basic approaches to ecological problems and how to solve them – the national environmental policy – the EU environmental policy – the concept of *settlement* and its types – the concept and types of *marriage* and its accompanying institutions – the concept of *family*, its functions and accompanying institutions– population – the consequences of human reproduction – the concept of *economy* as a social catogory – job insecurity – the importance of safety and health at work – state – law – forms of political government – political subjects – the power of the ecology movement – the concept, types and cultures of *culture* – the culture of symbolic communication (language and signs) – the concept of *meaning* and its functions – cognitive and experiential culture – reasonable knowledge – the concept of *science* and its types – the concept and types of *mythology* – the concept, types and functions of *religion* – the concept, types and functions of *art* – normative culture (the concept, essence, nature, types) – traditional culture – everyday life culture – cultural values – cultural needs – *personality*, the concept and social character – the concept and types of *socialization* and *personalization* – old and new concepts of changes – the appearance of the unique world system – stratification – the division of the world (center, periphery, third world, transition zone).

Practical instruction:

Development of the sociological view of the world – research methods in sociology – the founder of sociology – Auguste Compte – the approaches to an individual and society in Emile Durkheim's work – the nature and causes of social changes in Max Weber's work – premodern world and industrial society – organizations and modern world and a ten-minute test – nation, national identity and globalization – the future of bureaucracy – the criticism of the logic of growth and urban “dinossaurs“ – the ecological criticism of modern society – greening the world of life and work, ecological parties and movements – demographic transition and population dynamics – the analysis of unemployment, job insecurity – new social movements and political parties – new religious movements – identity, kitsc and trash – popular culture and cultural imperialism – poverty, social exclusion under the conditions of new divisions.

Literature:

1. M.Pečujlić, V.Milić, Sociologija, Službeni glasnik, Beograd, 2005.
2. E.Gidens Sociologija, Ekonomski fakultet, Centar za izdavačku delatnost, Beograd, 2007.

<table>
<tr><td colspan="5">3. Marković Ž. Danilo, Socijalna ekologija, Zavod za udžbenike i nastavna sredstva, Beograd, 2005.
4. Nadić Darko, Ekologizam i ekološke stranke, Službeni glasnik, Beograd, 2007.
5. Nadić Darko, Ekološka politika Evropske unije, skripta, Beograd, 2006.
6. Đukić Petar, Pavlovski Mile, Ekologija i društvo, EKO centar, Beograd, 1999.
7. Bezbednost i zdravlje na radu, knjiga 2
8. Primenjeni deo - Vesna Vasović i grupa autora, VPTŠ, Užice, 2011.</td></tr>
<tr><td colspan="4">Number of active teaching classes: 60</td><td rowspan="2">Other classes:</td></tr>
<tr><td>Lectures:
2x15=30</td><td>Practical classes:
2x15=30</td><td>Other forms of instruction:</td><td>Research study:</td></tr>
<tr><td colspan="5">Teaching methods:
Workshops, auditory methods, colloquia, consultations, demonstrations and other methods.
Using board and chalk, overhead projector and foils, video presentations, examples from practice, brochures, instructions, paper, notebooks and other demonstration materials.</td></tr>
<tr><td colspan="5">Knowledge (maximum number of points: 100)</td></tr>
<tr><td>Pre-exam obligations</td><td>Points</td><td>Final exam</td><td colspan="2">Points</td></tr>
<tr><td>Activity during lectures</td><td>10</td><td>Written exam
Or as agreed with students</td><td colspan="2">50</td></tr>
<tr><td>Practical classes</td><td>10</td><td>Oral exam</td><td colspan="2">The same option</td></tr>
<tr><td>Colloquia</td><td>20</td><td></td><td colspan="2"></td></tr>
<tr><td>Seminar papers</td><td>10</td><td></td><td colspan="2"></td></tr>
</table>

Study programme: TECHNOLOGICAL ENGINEERING

Type and Level of Studies: UNDERGRADUATE VOCATIONAL STUDIES

Course code and title: SOURCES OF POLLUTION IN ENVIRONMENT AND WORKPLACE

Teacher (Surname, middle initial, name): Trumbulović-Bujić M. Ljiljana

Course status: Compulsory

Number of ECTS credits: 6

Prerequisites: passed Chemistry 1 and 2

Course aims: Training students for the application of scientific and professional achievements in solving the problems of environmental pollution that by scale, types and consequences already have such a magnitude that they pose a danger to the entire humanity. This involves learning about the qualitative and quantitative changes in the physical, chemical and biological components of the environment (water, air, soil, food) that lead to violation of ecosystem law.

In order for our needs and activities to be in line with the requirements of the ecosystem, it is necessary to constantly review the positive and negative changes occurring in it. The complex optimization of production systems in interaction with the environment is a demand and a goal of the market in every developed society.

Learning outcomes: Training students for organizing and planning all necessary activities studied in the subject in the field of ecology, basic knowledge and understanding of sources of pollution and measures of protection of working and environment, preparation of reports and environmental reporting, project management and innovations in the environmental protection system, adequately solving problems of routine importance. Based on the acquired knowledge and skills, the student acquires professional competence for: organization of environmental protection in the business system and implementation of integrated pollution prevention and control, as well as in assembly of integrated license documentation.

Syllabus

Theoretical instruction: Environmental pollution - natural and artificial pollution sources, Air pollution sources, Air polluting materials, Greenhouse effect, Ozone hole, Water pollution sources, Hazardous and hazardous substances as sources of pollution of water, Sources of pollution from wastewater, Municipal wastewater, Industrial waters , Eutrophication, Sources of pollution of the sea and the oceans, Soil sources of pollution, Polluting materials, Process of extraction and processing of mineral resources as sources of pollution, Chemical industry as a source of pollution of land, pollution sources, road traffic, erosion, acid rain and settlements as a source of pollution, disposal of waste materials as source of pollution of soil, sources of pollution of food (chemical, biological and radionuclides), artificial and mineral fertilizers as source of pollution, pesticides as a source of pollution of food, radiation in the environment, non-ionizing and ionizing radiation, sources of pollution of working and environment from noise.

Practical teaching: Auditory exercises (air pollution sources, types of air quality testing, air sampling, preservation, transport and sample handling to test, water sampling, preservation, transport and sample handling to test, sampling of foodstuffs, transport and handling of samples for testing), Legislation and harmonization of the regulations of the Republic of Serbia with the EU in the field of protection of air, water, land, food, radiation and noise pollution.

Preparation of seminar work - method of work on text, literature-internet study, library.

Laboratory exercises: Determination of concentrations of gaseous pollutants (sulfur dioxide, nitrogen oxides) in the air, Determination of concentration of soot and suspended particles in the air, Analysis of precipitants (total precipitants, ash, burning and non-combustible substances), Determination of the physical and chemical properties of water (temperature, humidity, suspended matter, sediment, smell and color), Determination of the content of heavy metals in food (Pb.Cd, Zn, Cu, Sn, Fe, As, Hg), Determination of pollution of the environment from noise.

Literature:

1. Lj.Trumbulović Bujić: Izvori zagađenja životne i radne sredine, Savez inženjera metalurgije Srbije, Beograd, (2011), isbn 978-86-87183-20-9, cobiss.sr-id 183495692, 2011..

2. D. Baloš: Osnovi zaštite životne sredine, VTŠ Novi Sad, 2004.

3. A. Ćerić i grupa autora : Upravljanje difuzionim zagađenjem, Institut za hidrotehniku u Sarajevu, BiH, 2004. 4. D.Nikolić: Zaštita životne sredine, Univerzitet u Prištini, 2001. 5. ISO 14001, Zakon o zaštiti vazduha, Zakon o vodama, Zakon o zaštiti životne sredine				
Number of active teaching classes: 60				Other classes:
Lectures: 30	Practical classes: 30	Other teaching forms:	Study research work:	
Teaching methods: Lectures, exercises, assignments, projects, consultations.				
Knowledge evaluation (maximum 100 points)				
Pre-exam obligations	**Points**	**Final exam**	**Points**	
Activity during lectures	**5**	Written exam	50	
Practical classes	**5**	Oral exam		
Colloquia	**30**			
Seminar papers	**10**			
Assessment methods:				

Study programme: TECHNOLOGICAL ENGINEERING

Type and Level of Studies: UNDERGRADUATE VOCATIONAL STUDIES

Course code and title: TECHNOLOGICAL PROCESSES

Teacher (Surname, middle initial, name): Ćirović A. Nataša

Course status: Compulsory

Number of ECTS credits: 6

Prerequisites: no

Course aims: Acquiring basic academic knowledge about the mechanisms and operations of heat and mass transfer that are used in the process industry and their application.

Learning outcomes: Students will possess a basic knowledge of heat and mass transfer operations and ability to independently solve problems regarding conduction, convection, radiation, condensation, boiling, evaporation, crystallization, drying of materials, distillation, rectification, absorption, extraction and adsorption.

Syllabus

Theoretical instruction: Mechanisms of heat transfer (conduction, convection and radiation). Heat transfer without and with phase change. Transmission coefficients. Condensation. Pairing. Heat exchangers. Crystallization. Drying. Mechanisms of mass transfer, equilibrium, number of degrees, height and number of transmission units, working lines and transmission coefficients. Rectification. Absorption. Extraction liquid - liquid. Adsorption.

Practical teaching: Computational exercises: solving specific computational problems, illustrated by individual parts of the material presented at the lecture.

Literature:

1. D. Simonović, D. Vuković, S. Cvijović, S. Končar - Đurđević: Tehnološke operacije II -Toplotne operacije, Tehnološko - metalurški fakultet, Beograd, 1986.
2. M. Sovilj, Difuzione operacije, Tehnološki fakultet, Novi Sad, 2004.
3. M. Sovilj, Đ. Vataji, D. Petrović, T. Kuljanin: Praktikum za laboratorijske vežbe iz Tehnoloških operacija (dijagrami, nomogrami, tabele), Tehnološki fakultet, Novi Sad, 1993.

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

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

Knowledge evaluation (maximum 100 points)

Pre-exam obligations	**Points**	**Final exam**	**Points**
Activity during lectures	**10**	Written exam	50
Practical classes	**10**	Oral exam	
Colloquia			
Seminar papers	**30**		

Assessment methods:

Study programme: TECHNOLOGICAL ENGINEERING

Type and Level of Studies: UNDERGRADUATE VOCATIONAL STUDIES

Course code and title: THERMODYNAMICS

Teacher (Surname, middle initial, name): Marjanovć M. Vesna

Course status: Compulsory

Number of ECTS credits: 6

Prerequisites: passed PHENOMENA OF TRANSMISSION

Course aims: Introducing students with: (1) setting up mass and energy balances, energy properties, thermodynamic laws and their application in various physical, chemical and other practice-relevant processes; (2) methods for determining the thermodynamic values of ideal gas and real fluids; (3) terminology, mechanisms and basic calculations in the field of heat transfer.

Learning outcomes: Students gain knowledge required to set up mass and energy balances for processes in chemical or related industries. They are able to determine the thermodynamic size of the ideal gas state and real fluid. They are familiar with the way of thinking, logic and terminology in the field of heat transfer and sources of information. Furthermore, the knowledge gained in this course will enable students to better understand thermodynamic content in other subjects.

Syllabus

Theoretical instruction: BASIC TERMODYNAMICS. Thermodynamic system and the environment. Types and limits of the thermodynamic system. Thermodynamic sizes of the condition. The zeroth law of thermodynamics. Equations of state of ideal gas and real fluids. Reversible and irreversible processes. Heat and work. Total energy of the system. Internal energy. Entalpia. Heat capacity. LAWS OF CONSERVATION OF ENERGY. General material and energy balances. The first law of thermodynamics for a closed thermodynamic system. Izochoric, Isobaric, Isothermal, Adiabatic, and Polytropic change in the closed system. The first law of thermodynamics for an open thermodynamic system. Application of energy balance to flow processes. SECOND LAW OF THERMODYNAMICS AND ENTROPY'S BALANCES. The concept of entropy. The relation between entropy and thermodynamic temperature. Different formulations of the Second Law of Thermodynamics. Mathematical formulation of the second law of thermodynamics. Application of the Second Law of Thermodynamics to Circular Processes. Karno's right-hand circular process and the thermodynamic degree of usefulness of the circular process. Right-handed and left-handed circular processes. Change in entropy for isochoric, isobaric, isothermal adiabatic and polytropic change in the state. Entropy balance and reversibility of the process. Entropy and irreversibility of the process. The principle of increasing the entropy of the system. MAXIMUM WORK AND NERNST'S THEOREM. Maximum work for circular and monothermic processes. Maximum work of chemical processes. Change of Helmholtz and Gibbs energy. Thermal effect of chemical reaction. Hess's and Kirchhoff's law. Equilibrium conditions for processes under isochoro isothermal and isobaro-isothermal conditions. Gibs-Helmholt's equation. Nernst's theorem. The third law of thermodynamics and absolute entropy. THE MIXTURE OF IDEAL GASES. Shares of mass and shares of volume. Partial pressure. Apparent molar masses, gas constants, thermal capacity, internal energy, enthalpy, and entropy of the mixture. REAL FLUIDS. Aerated water. Phase diagrams. Single-phase and two-phase areas. Upper and lower boundary curve. Definition of the basic sizes of the state in the two-phase area. Basic changes of water vapor condition. Clausius-Clapeyron equation. Humid air. Absolute, relative humidity and density of humid air. Enthalpy of humid air. Processes with humid air. HEAT TRANSFER. Modes of heat transfer. Heat conducting (Temperature field, Temperature gradient, Heat flow and Fourier's law). Conducting heat through a single-layered and multilayered flat, cylindrical and spherical wall. Convection heat without phase transformation of the fluid (Newton's law). Convective heat exchange between fluid flow and surface of a flat, cylindrical and spherical wall. Passing of heat. Heat passing through a one-layered and multilayered flat, cylindrical and spherical wall. Heat transfer by radiation. Law of thermal radiation. Heat exchange by radiation between solids.

Practical teaching: Computational exercises: The equations of the state of pure fluids (ideal and real gas); Application of the first law of thermodynamics to a closed system; Application of the First Law of Thermodynamics to the Open System; Energy analysis of the flow process; Calculating the change in entropy for examples of reversible and irreversible changes of the condition; Application of the Second Law of Thermodynamics to Circular Processes; Determination of the sizes of the condition of the ideal gaseous mixtures; Thermodynamic sizes of the condition and changes of water vapor condition; Changes of humid air condition; Determination of heat flow and heat flux in heat conduction; Determination of heat flow and heat flux in heat convection; Determination of heat flow and coefficient of heat passing through.

Literature:

1. Đorđević B, Valent V, Šerbanović S, Termodinamika sa termotehnikom, Beograd, TMF, 2010.
2. Đorđević B. i ostali, Zbirka zadataka iz termodinamike sa termotehnikom, Beograd, TMF, 2007.
3. Ninković R. i ostali, Teorijski osnovi neorganske hemijske tehnologije, Beograd, TMF, 2003.
4. Voronjec D. i ostali, Rešeni zadaci iz termodinamike sa izvodima iz teorije, Beograd, MF, 2001.
5. Marjanović V, Termodinamika – teorijske osnove sa računskim zadacima, Užice, VPTŠ, 2015.

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

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

Knowledge evaluation (maximum 100 points)			
Pre-exam obligations	**Points**	**Final exam**	**Points**
Activity during lectures	**5**	Written exam	45
Practical classes	**10**	Oral exam	
Colloquia	**40**		
Seminar papers			
Assessment methods:			

Study programme: TECHNOLOGICAL ENGINEERING

Type and Level of Studies: UNDERGRADUATE VOCATIONAL STUDIES

Course code and title: WASTE MENAGEMENT

Teacher (Surname, middle initial, name): Trumbulovič-Bujić M. Ljiljana

Course status: Compulsory

Number of ECTS credits: 6

Prerequisites: passed Sources of working and living environment pollution

Course aims: To introduce students with management techniques and modification processes that include reducing waste generation, recycling waste, processing and waste disposal. The aim is for students to gain a multidisciplinary approach to waste management issues, and to use the latest knowledge to solve problems in this area, which meets the requirements of the market and modern technologies.

Learning outcomes: Student will gain professional competence:
- to organize and plan all necessary activities in the field of environmental protection and to develop an innovative approach in thinking to conquer new recycling technologies,
- for the application of knowledge in the field of waste management in practice,
- to participate in the preparation of studies on risk assessment of hazardous substances and hazardous waste,
- for the implementation of waste management and hazardous waste management..

Syllabus

Theoretical instruction: Types of solid waste, Secondary raw materials, Primary preparation of secondary raw materials, Industrial waste, Industrial landfills, Resources and recycling sec. raw materials Fe and steel and non-ferrous metals, municipal solid waste, recycling municipal wastes, Hazardous Wastes, Treatment, Recycling and Storage of Hazardous Waste, Medical Waste, Chemical Waste, Waste Management Strategies, Planning, Organization, Characterization of Waste and Losses, Development of Waste Minimization Options, Waste Reduction Methods.

Practical teaching: Auditory exercises -Available capacities of secondary raw materials in our country - overview of condition, state of primary preparation and processing of waste in our country, Recycling of industrial waste examples from practice, Treatment processes for plastic and rubber waste, Disposal and storage of medical waste, Waste management in the pharmaceutical industry, Recycling of liquid waste, Waste management strategy, Assessment procedure, checks and methods of waste minimization, Waste reduction methods

Preparation of the project task - method of work on the text, study of literature, practical experience.

Practical teaching

Practical classes include demonstration of practical work - demonstration exercises in the enterprise: Primary preparation and processing of waste, Recycling of industrial waste.

Literature:

1. Zakon o upravljanju otpadom, „Sl.glasnik RS“, br.36/2009, 88/2010 i 14/2016
2. Lj.Trumbulović Bujić: Izvori zagađenja životne i radne sredine, Savez inženjera metalurgije Srbije, (2011). , Beograd, ISBN 978-86-87183-20-9, COBISS.SR-ID 183495692, 2011.
3. D. Baloš: Osnovi zaštite životne sredine, VTŠ Novi Sad, 2004.
4. M. Đukanović: Sprečavanje zagađenja i strategija upravljanja otpadom, VTŠ Novi Sad, 2005.
5. I.Ilić i grupa autora: Resursi i reciklaža sekundarnih sirovina, RTB Bor, 2002.
6. Z.Aćimović, Đ.Simović:Proizvodnja legura aluminijuma iz sekundarnih sirovina, TMF Beograd, 2005.

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

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

Knowledge evaluation (maximum 100 points)

Pre-exam obligations	**Points**	**Final exam**	**Points**
Activity during lectures	5	Written exam	50
Practical classes	5	Oral exam	
Colloquia	30		
Seminar papers	10		

Assessment methods:

Study programme: TECHNOLOGICAL ENGINEERING Module 2: Food Engineering

Type and Level of Studies: UNDERGRADUATE VOCATIONAL STUDIES

Course code and title: WASTEWATER TREATMENT TECHNOLOGIES

Teacher (Surname, middle initial, name): Ćirović A. Nataša

Course status: Elective

Number of ECTS credits: 5

Prerequisites: passed Chemistry 1 and 2

Course aims: Acquiring basic knowledge about water quality, water pollutants, basic quality indicators and types of wastewater. Introduction to theoretical principles and practical aspects of the basic mechanical, chemical and biological processes of wastewater treatment and their connection with practical examples of designing systems for treatment of municipal and / or different industrial wastewater.

Learning outcomes: By mastering the theoretical bases and practical aspects of the processes involved in sewage treatment, students are trained to understand the processes and work in plants for the treatment of municipal and / or industrial wastewater. It is of particular importance to raise awareness about the necessity of maintaining and improving the quality of water and water resources.

Syllabus

Theoretical instruction: Importance and properties of water. Natural and usable water cycle. Classification and composition of natural waters. Types and quantities of wastewater. Physical parameters of wastewater quality (temperature, blur, color, odor, suspended part of solids, precipitated fraction of suspended part of solids). Chemical parameters of waste water quality: The content of individual inorganic substances (hydrogen ion content - pH of water, ammonium ion, nitrates, nitrites, chlorides, sulfates, phosphates, manganese, calcium, heavy metals). Total content of the largest part of organic material (biochemical oxygen consumption - VRK5, chemical consumption of oxygen - NRK, total organic carbon - TOS, phenols). The content of individual dissolved gases (oxygen dissolved in water). Biological parameters of wastewater quality (determination of sanitary water quality). Criteria for wastewater pollution. Selfpurification of water collector. Oxygen balance in contaminated water, oxygen curve, calculation of the required degree of wastewater treatment. Wastewater remediation. Basic processes and basic lines in wastewater treatment systems. Primary wastewater treatment. Removal of coarse suspended and floating material (grids, sieves). Removal of inert material, oil and grease (gritters, grease pickers). Removal of suspended particles (precipitation, flotation, filtration). Secondary treatment of wastewater. Physical chemical processes (flocculation, adsorption, striping, aeration, extraction, evaporation). Chemical processes (removal of heavy metals by chemical precipitation, neutralization, oxidation by chemical agents, reduction of oxidation agents). Aerobic and anaerobic biological processes. Tertiary treatment of wastewater. Removal of nitrogen and phosphate, biodegradable organic matter, dissolved inorganic matter. Purification of wastewater with soil. New trends in the protection and improvement of water.

Practical teaching: Audit and experimental exercises follow theoretical lessons. Visits to industrial plants for treatment of industrial wastewater.

Literature:

1. S. Gaćeša, M. Klašnja, Tehnologija vode i otpadnih voda, Beograd, Jugoslovensko udruženje pivara, 1994.
2. D. Marković i autori, Fizičko – hemijski osnovi zaštite životne sredine, Beograd, Fakultet za fizičku – hemiju, 1996.
3. R. Ninković, Neorganska hemijska tehnologija, praktikum, TMF Beograd, 2001.
4. V. Marjanović, Materijal sa predavanja, VPTŠ Užice, 2010.
5. Dragan Povrenović, Milena Knežević, Osnove tehnologije prečišćavanja otpadnih voda, TMF, 2013.

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

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

Knowledge evaluation (maximum 100 points)

Pre-exam obligations	**Points**	**Final exam**	**Points**
Activity during lectures	10	Written exam	50
Practical classes	10	Oral exam	
Colloquia	20		
Seminar papers	10		
Assessment methods:			