STUDY PROGRAMME
OCCUPATIONAL SAFETY ENGINEERING

MASTER ACADEMIC STUDIES

Study programme name:	**Occupational Safety Engineering**
Higher education institution in which the study programme is implemented:	**University of Niš, Faculty of Occupational Safety in Niš**
Educational / educational-scientific field:	**Technical and technological sciences**
Scientific, professional, or artistic discipline:	**Environmental and Occupational Safety Engineering**
Type of studies:	**Master academic studies**
Scope of studies in ECTS credits:	**60 ECTS credits**
Degree title:	**Master in Occupational Safety Engineering**
Duration of studies:	**1 year**
Maximum number of students to enrol in the study programme:	**32**
Language in which the study programme is implemented:	**Serbian**

STUDY PROGRAMME OBJECTIVES

Objectives of the master academic studies study programme **Occupational Safety Engineering** stem from the primary commitments and Strategic documents of the Faculty of Occupational Safety in Niš as a scientific-educational institution, as well as from the study programme purpose.

The **aim** of the study programme is to enhance students' competences and academic knowledge in the field of occupational safety engineering acquired during their basic academic studies, to help them develop creative capabilities of problem analysis and independent critical thinking, and to teach them to apply scientific and professional knowledge when solving the problems in the work environment and taking measures to reduce and manage occupational risk.

Programme **objectives** include the acquisition of knowledge and skills for

- Professional risk analysis and assessment;
- Development of occupational safety system in technological processes;
- Noise and vibration control;
- Assessment of EM radiation impact on humans and implementation of safety measures;
- Protection against static electricity and atmospheric discharge;
- Use of ergonomic methodology and practical ergonomic solutions;
- Project management and implementation of project management principles in preventive engineering;
- Systemic and comprehensive consideration of possibilities for reaching sustainability goals in the context of industrial systems;
- Occupational safety management;
- Creation of occupational regulatory acts;
- Use of information systems in occupational safety;
- Identification and analysis of hazardous effects of electric energy on humans and implementation of protective measures against such effects;
- Occupational health protection; understanding of the effects of workload, work conditions, and work environment on workers' health;
- Acquisition of knowledge about the fundamentals of system engineering and about the models and methods of decision-making and effectiveness assessment;
- Critical analysis of current occupational safety and health safety issues and the particularities of studying and resolving them;
- Innovative activities and team work;
- Human resource management and development in the occupational safety and health system;
- Permanent education and development of a knowledge system in occupational safety.

STUDY PROGRAMME OUTCOMES – STUDENTS' COMPETENCES UPON PROGRAMME COMPLETION

Completion of the master academic studies study programme Occupational Safety Engineering provides students with the competences to assess professional risk, create regulatory acts and plans, provide expertise for accidents, incidents, and injuries, and perform supervision in the field of occupational safety and health.

Completion of the study programme provides students with the following **general competences**:

- Identification and analysis of problems in the work environment and prediction of solutions and consequences;
- Proficiency in identification methods, procedures, and processes to reduce and manage professional risk in the work environment;
- Staying up to date with technological development and improving one's knowledge;
- Development of communication skills in the immediate and broader surrounding;
- Working in a multidisciplinary team;
- Development of professional ethics and professional responsibility.

Upon completion of the study programme, students will also acquire the following **course-specific**, or professional, **competences**:

- Assessing professional risk;
- Managing available resources in the occupational safety and health system;
- Creating reports on the state of occupational safety and health;
- Creating plans and technical documentation of occupational safety;
- Creating regulatory acts for occupational safety;
- Supervising occupational safety and health;
- Providing expertise for accidents, incidents, and injuries;
- Educating and managing knowledge in occupational safety;
- Training, making professional selections, and developing skills for safe work;
- Establishing and developing integrated management systems;
- Developing methodology, methods, and procedures for safety system management;
- Organizing and managing a safety system;
- Developing methods that integrate safety performance into company management and productivity goals;
- Using IT in occupational safety engineering.

Students with a master's degree in occupational safety engineering are able to pursue specialist and doctoral academic studies in the same or related fields of study.

STUDY PROGRAMME PURPOSE

The purpose of the master academic studies study programme Occupational Safety Engineering is to educate students to receive a master's degree in occupational safety engineering, thus meeting the needs of the society and offering the possibility of further academic progress in keeping with occupational safety and health future demands. The study programme is designed to facilitate the acquisition of competences and development of academic skills in occupational safety engineering. In view of the social, economic, and broad community importance of occupational safety and health, professionals in this field possess socially justifiable and usable competences.

The Faculty of Occupational Safety has defined the education of highly competent personnel in the field of occupational safety as one of its fundamental tasks and goals in accordance with the faculty's vision, mission, and quality policy and strategy. The content of the study programme Occupational Safety Engineering fully corresponds to the fundamental tasks and goals of the faculty.

Scientific disciplines at this level of studies allow students to master specific occupational safety theoretical knowledge and applicative skills and to develop critical thinking and the ability to work as part of a team. The versatility of elective courses encourages not only individuality and creativity in tailoring one's own course of studies, but also innovative and multidisciplinary approaches to occupational safety and health. This study programme offers possibilities to acquire basic scientific research competences and to develop professional and methodological culture to be able to continue with one's education by pursuing doctoral academic studies.

ADMISSION REQUIREMENTS

The Faculty of Occupational Safety will enrol 32 students in the first year of master academic studies study programme Occupational Safety Engineering. The number of students was established based on society's needs for the education of professionals for the protection of employees and material and natural resources, as well as based on the resources of the faculty and the interest expressed by the applicants.

The admission procedure is regulated by the Law on Higher Education, the Statute of the University of Niš, the Statute of the Faculty of Occupational Safety, the Regulations on Master Academic Studies at the Faculty of Occupational Safety in Niš, and the Call for Admissions to the first year of master academic studies at state-founded faculties. The Call for Admissions designates the number of students (total and by source of financing), admission deadlines, admission procedures, admission requirements, criteria for applicant ranking, manner and deadlines for formal complaints regarding the ranking, and the amount of tuition fee for the self-financing students.

To be eligible to apply for enrolment in the first year of master academic studies, a person must have met one of the following requirements:

- Completed basic academic studies in a corresponding or related educational-scientific field with a minimum of 240 ECTS credits;
- Obtained a higher education degree in a corresponding or related educational-scientific field in the duration of at least four years (eight semesters) according to the rules that were in force until the day the current Law on Higher Education came into force.

Applicants who completed the basic studies at the Faculty of Occupational Safety in Niš in the duration of four years (eight semesters) according to the rules that were in force until the day the current Law on Higher Education came into force are eligible to enrol in the master academic studies pursuant to the Faculty's Educational and Scientific Council's decisions No. 03-163/13, 03-163/14, and 03-163/15 from 10 April 2019. The decisions can be downloaded at

https://www.znrfak.ni.ac.rs/SERBIAN/011-03-01-MAS-OglasnaTabla.html

Applicants who completed the basic academic studies (180 ECTS) and master academic studies (120 ECTS), with a total of at least 300 ECTS in a corresponding or related educational-scientific field are also eligible to enrol in the first year of master academic studies provided that:

- they submit a written request no later than the deadline expiration for enrolment into the following academic year;
- the faculty possesses spatial and other resources;
- that the number of enrolled students has not reached the allowed maximum (32).

Foreign citizens may enrol in the study programme under the same conditions as Serbian citizens, the only added requirements being that their application submission has to contain a recognised diploma of previous education and the number of ECTS awarded or proof of the initiated diploma recognition procedure, proof of knowledge of the Serbian language in accordance with the Statute of the University of Niš (this requirement does not apply to applicants from former Yugoslav republics), as well as proof of health insurance.

Study programme admission requirements, corresponding or related educational-scientific fields, and preliminary and final applicant ranking redefined by the Regulations on Master Academic Studies at the Faculty of Occupational Safety in Niš (No. 03-230/4 from 2 July 2019), which can be downloaded at

http://www.znrfak.ni.ac.rs/SERBIAN/009-1-08-ZAKONI_Fakultet.html

STUDENT GRADING AND PROGRESS

Students' knowledge is continually tested and evaluated throughout the semester, while the final grade is given at the exam in accordance with the law and general acts. The evaluation is performed by awarding points for any type of activity and testing during the semester (pre-exam requirements) and at the exam itself, where the final grade is given according to the number of points awarded.

The pre-exam requirements are evaluated according to the following criteria:

- active participation during lectures and exercises – up to 10 points;
- project assignment –20 to 30 points;
- term papers and technical drawing assignments – 10 to 20 points;
- homework assignments (arithmetic problems, topic presentations, essays, etc.) – up to 5 points;
- preliminary exams (colloquia) – 15 to 30 points;
- laboratory practice and report completion – up to 10 points;
- participation in seminars – up to 10 points.

The study programme defines the following point distribution: a maximum of 60 points for activities and assignments during the semester (pre-exam requirements) and a maximum of 40 points for the final exam.

When the students have fulfilled all their pre-exam requirements, the teachers are obligated to enter the evaluation results (points) and the dates of completion into the student index no later than the day of the final exam. When all classes in a semester have ended, the structure and the total number of points awarded to students as part of their pre-exam requirements are published on the students' noticeboard and the faculty website.

By meeting the pre-exam requirements and completing their exams, students can receive a maximum of 100 points. For each specific course, students who have met all the pre-exam requirements specified in the syllabus and received a minimum of 30 points are eligible to take the exam.

Students may take the exam after all classes for the course have ended, during the terms determined by the law and the Regulations on Master Academic Studies at the Faculty of Occupational Safety in Niš. Exams are only written, only oral, or both written and oral. Students' exam achievements are graded from 5 (failed) to 10 (exceptional). The final exam grade is based on the total number of points the students received after meeting their pre-exam requirements and taking the exam; according to the following grading:

- from 91 to 100 points – grade 10 = exceptional;
- from 81 to 90 points – grade 9 = excellent;
- from 71 to 80 points – grade 8 = very good;
- from 61 to 70 points – grade 7 = good;
- from 51 to 60 points – grade 6 = sufficient;
- up to 50 points – grade 5 = failed.

The final exam grade and the total number of points received from the pre-exam requirements and the exam itself are entered into exam records, into the student index, and into the individual student's exam application, and then validated by the professor's signature. Grade 5 (failed) is not entered into the student index. The faculty is obligated to keep permanent records of all completed exams.

SELECTION OF COURSES FROM OTHER STUDY PROGRAMMES

If they so choose, students may attend and take the exam for a course taught at another study programme at the faculty or another higher education that is unrelated to any of the courses in their selected study programme at the faculty. The number of ECTS credits thus received will not be included in the total number of points received at the students' selected study programme, which is used in the student ranking for state-budget coverage of the tuition fee. In addition, the grade received at the exam for such an unrelated course will also not be included in the grade average during the studies. Mutual rights and obligations of the higher education institutions involved, including the method of financing and the students' rights and obligations, are regulated by an inter-institutional agreement. The diploma supplement issued to students includes the number of ECTS credits received for completing the unrelated course.

Students of the faculty may complete a portion of their study programme through a compatible study programme at another higher education institution provided an agreement on ECTS credit recognition has been signed between the

faculty, or the university, and the other higher education institution (the so-called student mobility). The portion of the study programme students complete at another higher education institution may include one or more courses.

An exam completed at another higher education institution may be recognized provided that the course belongs to a compatible study programme of the same level and type of studies and has a syllabus that is compatible with the corresponding course at the Faculty of Occupational Safety. To have their exam recognized, students are required to submit an exam recognition request, a certificate of exam completion, compatible study programme details, and the proof of payment of exam recognition fees. The decision on the exam recognition is made by the Teaching Committee with consent from the teacher of the given course.

REQUIREMENTS FOR SWITCHING STUDY PROGRAMMES

Considering that the master academic studies last only one year, it is not possible to switch study programmes at the faculty or another higher education institution during the school year.

Students of master academic studies at the faculty or another higher education institution may enrol in another study programme at the faculty through reapplying for master academic studies. Upon successful admission, students may submit a request for the recognition of exams completed during their previous master academic studies.

An exam completed within another study programme at the faculty or at another higher education institution may be recognized provided that the course belongs to a compatible study programme of the same level and type of studies and has a syllabus that is compatible with the corresponding course at the selected faculty. To have their exam recognized, students are required to submit an exam recognition request, a certificate of exam completion, compatible study programme details, and the proof of payment of exam recognition fees. The decision on the exam recognition is made by the Teaching Committee with consent from the teacher of the given course.

STUDY PROGRAMME STRUCTURE

The master academic studies (MAS) study programme Occupational Safety Engineering comprises the following elements stipulated by the Law on Higher Education: study programme name and objectives; type of studies and results of the learning process; academic degree; study programme admission requirements; list of required and elective courses with course outlines; procedure and duration of studies; credit value (ECTS) of courses and the master's thesis; course pre-requirements; procedure for selecting courses from other study programmes; and requirements for switching study programmes within the same or related fields of study.

The study programme structure complies with the Accreditation Standards for the First and Second Level of Higher Education.

The study programme lasts one year (2 semesters) and comprises 60 ECTS credits.

The study programme is implemented through:

- Required courses, which include the fundamental knowledge students need to acquire;
- Elective courses, which help students shape their educational profile more closely;
- Internship, which students do in the second semester; and
- Master's thesis, which students complete in the second semester.

The study programme comprises five required and three elective courses out of 11 offered, internship, and the master's thesis. Each course comprises a specific number of ECTS credits. The electivity factor of the study programme is 36.67 %.

Within the study programme structure, the percentage of different course types is as follows:

- Theoretical-methodological 26.25 %;
- Scientific-professional 15.42 %;
- Professional-applicative 58.33 %.

Total student activities comprise active classes (lectures, exercises, laboratory work, term papers, and other forms of active classes), individual work, preliminary exams (colloquia), examinations, writing of the master's thesis, and other activities. The average number of active classes per week is 19.73-20.10 (19.98 weekly average). The total number of lecture classes within the study programme is 16 (8.00 weekly average), the number of exercise classes is 15-16 (7.75 weekly average), other forms of active classes 0.20-0.73 (0.23 weekly

average), research study 8 (4.00 weekly average), and other classes 10 (5.00 weekly average). The remaining time of the 40-hour work week is dedicated to other individual student activities.

Internship is an integral part of the study programme. It is done in pertinent scientific research institutions, organizations dedicated to innovation activities, organizations providing infrastructural support to innovation activities, companies, and public institutions, all for the purpose of enabling students to practically apply their acquired knowledge to solving current problems of occupational safety engineering. It comprises 3 ECTS credits.

The study programme is completed upon completion and public defence of the master's thesis. Through their master's thesis, students demonstrate their ability to synthesize and apply the acquired theoretical and practical knowledge to solving occupational safety engineering problems in organizations as well as in their local community. The master's thesis comprises 12 ECTS credits in total, of which the research study comprises 8 and the writing and defence of the thesis 4 ECTS credits.

Upon completion of the studies, students receive the academic degree

Master in Occupational Safety Engineering

COURSE DISTRIBUTION BY SEMESTER AND YEAR OF STUDY

#	Code	Course name	Term paper	Active classes				Oth.	ECTS	Required/ Elective (R/E)	Course type
				Le.	Ex.	Oth.	RS				
FIRST YEAR											
1	19.MZNR01	Safety in Technological Processes	1	2	2	0	0	0	6	R	SP
2	19.MZNR02	Noise and Vibration Control	1	2	2	0	0	0	6	R	PA
3	19.MZNR03	Protection Against Hazardous Effects of Electric Energy	1	2	2	1	0.20	0	6	R	PA
4	19.MZNR04	Electromagnetic Radiation Safety	1	2	2	0	0	0	6	R	PA
5	19.MZNR05	Human Reliability Analysis	1	2	2	0	0	0	6	E	PA
	19.MZNR06	Ergonomic Design	1	2	2	0	0	0	6	E	TM
	19.MZNR07	Industrial Toxicology	1	2	2	0	0	0	6	E	SP
6	19.MZNR08	Management of Professional Risk	2	2	2	0	0	0	5	R	TM
7	19.MZNR09	Occupational Safety Management	2	2	2	0	0	0	5	E	TM
	19.MZNR10	Human Resource Management and Development	2	2	2	0	0	0	5	E	TM
	19.MZNR11	Occupational Law	2	2	2	0	0	0	5	E	TM
	19.MZNR12	Occupational Safety Sociology	2	2	2	0	0	0	5	E	TM
8	19.MZNR13	Information Systems in Safety	2	2	1	0.53	0	0	5	E	SP
	19.MZNR14	Systems Engineering	2	2	2	0	0	0	5	E	TM
	19.MZNR15	System Reliability and Safety	2	2	2	0	0	0	5	E	TM
	19.MZNR16	Project Management	2	2	1	0.53	0	0	5	E	TM
9	19.MZNR17	Internship	2	0	0	0	0	6	3	R	PA
10	19.IZR18A	Master's Thesis – Research	2	0	0	0	8	0	8	R	PA
11	19.IZR18B	Master's Thesis – Writing and Defence	2	0	0	0	0	4	4	R	PA
Total classes (lectures/exercises + other) and credits				16	15-16	0.2-0.73	8	10	60		
Total active classes per year				39.73-40.20				10	60		

Abbreviations:

- Le. – Lectures
- Ex. – Exercises
- Oth. – Other forms of classes
- RS – Research study
- TM – Theoretical-methodological
- SP – Scientific-professional
- PA – Professional-applicative

LIST OF REQUIRED COURSES

1. Safety in Technological Processes
2. Noise and Vibration Control
3. Protection Against Hazardous Effects of Electric Energy
4. Electromagnetic Radiation Safety
5. Management of Professional Risk
6. Internship
7. Master's Thesis – Research
8. Master's Thesis – Writing and Defence

Course name: Safety in Technological Processes

Course status: Required | **Course code:** 19.MZNR01

ECTS credits: 6

Requirements: -

Course aim

Acquisition of knowledge necessary for the analysis of technological processes from the perspective of occupational safety.

Learning outcome

Acquisition of knowledge and skills for:

- identification of pollutants and energy in technological processes;
- control of processes and operations in terms of occupational safety.

Course outline

Theoretical lessons

Technological system – work environment as a system: Technology and technological system; Work environment as a system; Connectedness of elements in a system according to the law on conservation of mass and energy; Selection of input and output elements of technological processes from the occupational safety perspective. **Technological processes in metallurgy and the work environment**: Iron production; Copper production; Lead and zinc production; Aluminium production. **Technological processes in the metalworking industry and the work environment**: Mechanical metal processing; Thermal and thermochemical metal processing; Degreasing; Corrosion; Galvanic metal processing; Application of coatings. **Technological processes in inorganic chemical industry and the work environment**: Sulphuric acid production; Nitric acid production; Phosphoric acid production; Sodium hydroxide, chlorine, and hydrochloric acid production; Ammonia production; Artificial fertilizer production; Sodium polyphosphate production; **Technological processes in organic chemical industry and the work environment**: Detergent production; Soap production; Pulp and paper production; Paint and varnish production; Plastic mass production; Rubber production. **Technological processes of non-metal production and the work environment**: Mortar binder production; Lime production; Cement production; Plaster production; Glass production. **Technological processes in food industry and the work environment**: Milk and dairy production; Meat production and processing; Bread production; Non-alcoholic drink production; Alcoholic drink production; Tobacco production and processing.

Practical lessons

Auditory and calculation exercises, which successively follow the theoretical lessons; analysis of practical examples for determining critical control points of technological processes in the work environment. Research study within industry practice is encouraged.

Literature

[1.] Krstić Ivan (2018). *Tehnološki sistemi i zaštita*. Niš: Univerzitet u Nišu, Fakultet zaštite na radu u Nišu.

[2.] Krstić Ivan (2019). *Zaštita u tehnološkim procesima – interni materijal za pripremu ispita.* Niš: Univerzitet u Nišu, Fakultet zaštite na radu u Nišu.

[3.] Anđelković Branislav, Krstić Ivan (2002). *Tehnološki procesi i životna sredina*. Niš: Jugoslovenski savez Društava inženjera i tehničara zaštite.

Number of active classes (weekly)

Lectures	2	Auditory exercises	2	Other forms of classes	-	RS	-	Other classes	-

Teaching methods

Lectures, auditory (calculation) exercises, office hours. Interactive work with students.

Grading (maximum number of points: 100)

Pre-exam requirements	Points	**Exam**	Points
Activity during lectures	5	Written exam (practical part of the exam)	10
Activity during exercises	5	Oral exam (theoretical part of the exam)	30
Colloquium 1	20		
Colloquium 2	20		
Term paper	10		

Course name: Noise and Vibration Control		
Course status: Required	**Course code:**	19.MZNR02
ECTS credits: 6		
Requirements: -		

Course aim

- Acquiring theoretical knowledge and practical skills in noise and vibration control in the work environment;
- Enabling students to solve specific problems in the work environment, caused by noise and vibration.

Learning outcome

Acquisition of skills for

- calculation of occupational noise levels;
- calculation of vibration transsmision and the efficiency of elements for vibration isolation;
- use of advanced techniques for measurement of machine systems noise and vibration;
- use of noise and vibration to identify sources and diagnose their state;
- adequate selection of measures and procedures for reduction of noise and vibration level.

Course outline

Theoretical lessons

Occupational noise sources and their characteristics: Machines: Machines with rotational and translational motion. Electrically, pneumatically, and hydraulically powered machines. Mobile machines (vehicles). Tools. Characteristics: Sound strength and source directivity. **Calculation of occupational noise levels:** Calculation of outdoor noise. Calculation of indoor noise. **Advanced noise-measuring techniques:** Narrowband and bandwidth frequency analysis. Sound intensity measurement. **Application of noise for diagnostic purposes:** Identification of noise sources based on the spectral noise content. Identification of noise sources using the sound intensity method. **Basic principles of noise reduction:** Noise control at source position. Control on transmission paths. Control at the receiver position. **Noise reduction at the source**: Noise reduction using vibration isolation. Noise reduction using source enclosuring. Noise reduction using acoustic elements. Noise reduction using acoustic screens. **Acoustic treatment of rooms:** Reasons for acoustic treatment of rooms. Effects of acoustic treatment of rooms. Porous absorbers. Mechanical resonators. Acoustic resonators. Comparison of acoustic materials. Acoustic absorbers with variable characteristics. Calculation of noise level reduction. **Noise reduction at the receiver position**: Personal protective equipment (PPE): basic characteristics, selection, and efficiency calculation of PPE. **Dynamics of single degree oscillators:** Undamped free oscillations. Damped free oscillations. Undamped forced oscillations. Damped forced oscillations. **Basic principles of vibration isolation:** Purpose and aim of vibration isolation. Evaluation of vibration isolation. Selection of vibration isolator. Types and characteristics of vibration isolators. Application of vibration isolators. **Dynamics of two degrees oscillators:** Free vibrations. Undamped dynamic vibration absorber. Isolation of non-rigid foundations. **Advanced techniques for measuring machine systems vibrations.** Measurement of total vibrations. Frequency analysis of vibration signals. Standards and regulations. **Application of vibration for diagnostic purposes:** Maintenance of the state of machine systems using vibrations. Diagnostics of the state of vibration sources based on total vibrations. Diagnostics of the state of vibration sources based on the narrowband spectrum.

Practical lessons

Calculation exercises

Calculation of acoustic quantities that define noise source and indoor space. Selection of acoustic materials and calculation of noise level reduction achieved using acoustic treatment of the room. Evaluation of a room's soundproofing. Elaboration of vibration isolation principles: Calculation of the vibration transmission coefficient. Selection of design options and calculation of parameters for vibration isolation pads depending on vibration characteristics and the machine as the vibration source, for the purpose of maximum reduction of the vibration transmission coefficient. Design of projects concerning noise level reduction in industrial environments and vibration reduction in machine structures.

Literature

[1] Cvetković Dragan, Praščević Momir (2005). *Buka i vibracije*. Niš: Univerzitet u Nišu, Fakultet zaštite na radu u Nišu.

[2] Uzunović Ratko (1997). *Zaštita od buke i vibracija: menadžment kvalitetom i okolinom*. Beograd: Lola Institut.

[3] Simonović Miodrag, Kalić Dušan, Pravica Petar (1982). *Buka – štetna dejstva, merenja i zaštita*. Niš: Institut za dokumentaciju i zaštitu na radu „Edvard Kardelj", Niš.

[4] Bias David, Hansen Colin (1996). *Engineering Noise Control: Theory and Practice*. Spon Press.

[5] Fahy Frank (2001). *Fundamentals of Engineering Acoustics*. Academic Press.

Number of active classes (weekly)

Lectures	2	Auditory exercises	2	Other forms of classes	-	RS	-	Other classes	-

Teaching methods

Lectures, auditory (calculation) exercises, office hours. Interactive work with students. Multimedia presentations during lectures.

Grading (maximum number of points: 100)

Pre-exam requirements	Points	**Exam**	Points
Activity during lectures	5	Written exam (practical part of the exam)	20
Activity during exercises	5	Oral exam (theoretical part of the exam)	20
Project assignment 1	25		
Project assignment 2	25		

Course name: Protection Against Hazardous Effects of Electric Energy		
Course status: Required	**Course code:**	19.MZNR03
ECTS credits: 6		
Requirements: -		

Course aim

Acquisition of knowledge about electric hazard regulations and safety requirements, methods for controlling the adequacy of implemented protective measures against hazardous effects of electric energy.

Learning outcome

Students will be able to

- apply the prescribed methods for controlling the adequacy of equipment and installations;
- inspect and test electrical installations;
- inspect and test electrical equipment;
- inspect and test personal protective equipment.

Course outline

Theoretical lessons

Verification of efficiency of applied protective measures in distribution systems: Inspection elements: Documentation review. Verification by inspection (Inspection of electric shock safety. Inspection of safety measures against fire propagation and thermal influence of conductors. Selection and setup of safety devices and supervision devices. Proper installation of switchgears. Selection of equipment and safety measures against external influences. Presence of schematics, warning signs, and similar information. Protective and neutral conductors, electric circuits, fuses, current clamps, and other equipment. Connection of conductors and accessibility and availability of space for work and maintenance. **Testing elements:** Testing of continuity of the protective conductor and the main and auxiliary conductor equipotential bonding. Electrical installation isolation resistivity. Protection using electrical separation of circuits. Resistivity of floors and walls, automatic power off, main and auxiliary equipotential bonding and functionality. Testing devices for overcurrent and differential current protection, testing insulation monitoring devices, testing devices for protection against two-phase operation. **Measurement of electrical parameters:** Measurement of specific earth resistance, ground resistance, conductor continuity, resistance of electrical installation isolation, resistance of isolating floors and walls, conductibility of surfaces for static electricity conduct, and conductibility of materials for static electricity conduct. **Inspection and testing of isolating protective tools and equipment:** isolation gloves, isolation footwear, isolation rods, voltage indicators, isolation panels, fuse pliers, benches, cloths, electric installation tools, manual isolation tools, helmets, and isolation oils. **Organizational measures:** Safety measures during works in power facilities in the de-energized state, near energized objects, and in the energized state.

Practical lessons

Auditory exercises: Rules and technical regulations for protection against hazardous effects of electric energy. Control of safety measures against hazardous effects of electric energy. Methods for measuring safety parameters of electrical equipment and electrical installations. **Laboratory work:** Familiarizing students with the practical application of safety parameter measurement methods in electrical installations. Testing of protection devices against overcurrent, fault current, and dangerous touch voltage. Application of methods for testing electrical isolation equipment and protective tools.

Literature

[1] Vićović Dragan, Hadžić Zoran (2007). *Električne instalacije niskog napona*. Beograd: Savez mašinskih i elektrotehničkih inženjera i tehničara Srbije (SMEITS).

[2] Dotlić Gojko (2006). *Elektroenergetika kroz standarde, zakone, prvilnike i tehničke preporuke*. Beograd: Savez mašinskih i elektrotehničkih inženjera i tehničara Srbije

(SMEITS).
[3] Janjić Aleksandar, Vučković Dragan (2020). *Električne instalacije i osvetljenje*. Niš: Univerzitet u Nišu, Elektronski fakultet u Nišu.
[4] Tomović Slavko (2004). *Električne instalacije niskog napona*. Beograd: Tehnička knjiga.
[5] Vučković Ljubiša, Cvetković Miroslava (2001). *Zaštita od požara i eksplozija usled dejstva električne energije. Praktikum za laboratorijske i terenske vežbe*. Niš: Univerzitet u Nišu, Fakultet zaštite na radu u Nišu.

Number of active classes (weekly)

Lectures	2	Auditory exercises	2	Other forms of classes	1	RS	-	Other classes	-

Teaching methods

Lectures and presentations, auditory exercises, laboratory work, and office hours.

Grading (maximum number of points: 100)

Pre-exam requirements	Points	**Exam**	Points
Activity during lectures	5	Oral exam (theoretical part of the exam)	40
Activity during exercises	5		
Colloquium 1	15		
Colloquium 2	15		
Laboratory work	20		

Course name: Electromagnetic Radiation Safety		
Course status: Required	**Course code:**	19.MZNR04
ECTS credits: 6		
Requirements: -		

Course aim

Acquisition of knowledge from the theory of macroscopic electromagnetic fields, EM radiation sources, and methods of calculation, measurement, and protection against EM radiation.

Learning outcome

Students' ability to understand the phenomena and principles regarding

- occupational and environmental non-ionizing EM radiation;
- procedures of EM calculation, simulation, and measurement;
- protection against quantum corpuscular radiation (UV, IR);
- protection against ionizing EM radiation;
- methods of assessing biological effects on humans and of selecting and using safety measures.

Course outline

Theoretical lessons

Introduction. Theory of EM fields and waves: Complete system of equations of macroscopic electromagnetic field in stationary environments. **Technical systems as EM radiation sources:** Telecommunication devices. Antennas and propagation of EM waves. EM energy transfer. Artificial sources of EM radiation. EM field of electrical devices. Low-frequency (transformers, power lines, electrolytic tanks, etc.) and high-frequency (radio and TV frequency, mobile communication, radars, electrothermics, etc.) EM sources. **Electromagnetic compatibility:** Basic terms, interference sources, transfer path, interference types**,** electromagnetic compatibility testing, CE marking. **Methods for EM field calculation:** Analytical and numerical methods. Modelling of objects and sources in the EM field. **Humans in EM field:** EM radiation dosimetry. Measurement of low- and high-frequency EM fields. Radiation exposure standards and regulations. Biological effects of EM radiation. **Protection against quantum corpuscular EM radiation:** Heat radiation measurement, regulation, and protection. UV radiation measurement, regulation, and protection. Ionizing radiation measurement, regulation, and protection.

Practical lessons

Exercises. Examples of the application of fundamental laws of EM field theory. Examples of calculation and simulation. Examples of creating an environmental impact assessment study. Practical measurements in the field. Examples of designing a system for the monitoring of and protection against EM fields of different frequencies.

Literature

[1] Krstić Dejan (2020). *Elektromagnentna zračenja u životnoj sredini*. Niš: Univerzitet u Nišu, Fakultet zaštite na radu u Nišu.

[2] Petković Dejan, Krstić Dejan, Stanković Vladimir (2008): *Elektromagnetni talasi i zračenje* (Elektromagnetna zračenja – Izvodi sa predavanja i vežbi - Sveska 5). Niš: Univerzitet u Nišu, Fakultet zaštite na radu u Nišu.

[3] Krstić Dejan, Sokolović Dušan (2020). *Metode i rezultati istraživanja štetnog dejstva elektromagnetnih zračenja u životnoj sredini*. Niš: Univerzitet u Nišu, Fakultet zaštite na radu u Nišu.

[4] Veličković Dragan (1997). *Elektromagnetna zračenja*. Niš: Univerzitet u Nišu, Fakultet zaštite na radu u Nišu.

[5] Barnes Frank, Greenebaum Ben (2007). *Handbook of Biological Effects of Electromagnetic Fields, Bioengineering and Biophysical Aspects of Electromagnetic Fields*, 3rd ed. USA, FL: CRC Press.

Number of active classes (weekly)

Lectures	2	Auditory exercises	2	Other forms of classes	-	RS	-	Other classes	-

Teaching methods

Lectures and auditory exercises. Blackboard, multimedia presentations, videos.

Grading (maximum number of points: 100)

Pre-exam requirements	Points	**Exam**	Points
Activity during lectures	5	Written exam (practical part of the exam)	10
Activity during exercises	5	Oral exam (theoretical part of the exam)	30
Colloquium	30		
Term paper	20		

Course name: Management of Professional Risk

Course status: Required	**Course code:**	19.MZNR08

ECTS credits: 5

Requirements: -

Course aim

Acquisition of knowledge and skills to select optimal solutions and apply safety and protective measures with the purpose of managing professional risk.

Learning outcome

Acquisition of skills to:

- identify risk based on system parameters in the work environment;
- understand, organize, and implement procedures of managing professional risk;
- implement measures to reduce the level of professional risk.

Course outline

Theoretical lessons

Elements of management of professional risk: Risk identification based on work environment system parameters. Analysis of occupational safety measures with the purpose of eliminating or reducing risk. Occupational safety and health record keeping. Reports on inspections and tests of work equipment and on examinations of conditions in the work environment. **Context of organizations:** Internal and external context. Understanding of the needs and expectations of employees and other stakeholders. Determination of the subject matter and the field of application for the OH&S management system. **Leadership and worker participation:** OH&S policy. Organizational roles, responsibilities, and authorizations. Worker consulting and participation. **Planning:** Measures regarding risks and opportunities. Hazard identification and risk and opportunity assessment. Determination of legal and other requirements. OH&S goals and planning for their achievement. **Support:** Resources. Competency. Awareness. Communication. **Realization of operative activities:** Hazard elimination and OH&S risk reduction. Preparedness for emergencies and emergency response. **Performance evaluation:** Internal audit. Review by the management. **Improvement:** Corrective measures.

Practical lessons

Auditory exercises successively follow the theoretical lessons and include analyses of practical examples of management of professional risk in the workplace and the work environment. Students present their term papers covering different areas of management of professional risk. Students are encouraged to conduct their research directly within industry practice.

Literature

[1] Krstić Ivan, Anđelković Branislav (2013). *Profesionalni rizik*. Niš: Univerzitet u Nišu, Fakultet zaštite na radu u Nišu.

[2] Anđelković Branislav (2002). *Rizik tehnoloških sistema i profesionalni rizik*. Niš: Jugoslovenski savez društava inženjera i tehničara zaštite.

[3] Borjanović Srđan (2008). *Metod za procenu rizika na radnom mestu i u radnoj okolini*. Beograd: Institut za medicinu rada Srbije "Dr Dragomir Karajović".

[4] Jocić Neda (2008). *Vodič za procenu i upravljanje rizikom*. Petrovaradin: „Futura"doo.

[5] Jocić Neda (2010). *Vodič za upravljanje dokumentovanim evidencijama*. Beograd: „Jugozaštita"doo.

Number of active classes (weekly)

Lectures	2	Auditory exercises	2	Other forms of classes	-	RS	-	Other classes	-

Teaching methods Lectures, Auditory exercises, office hours. Interactive work with students.			
Grading (maximum number of points: 100)			
Pre-exam requirements	Points	**Exam**	Points
Activity during lectures	5	Written exam (practical part of the exam)	10
Activity during exercises	5	Oral exam (theoretical part of the exam)	30
Colloquium	30		
Term paper	20		

Course name: Internship		
Course status: Required	**Course code:**	19.MZNR17
ECTS credits: 3		
Requirements: Internship is completed in the second semester.		

Course aim

Becoming familiar with the operational process in the company (institution) in which the internship is done, with its goals, and with its organizational units. Meeting the team and learning about the project students join as part of the internship, selected according to the study programme they chose. Understanding of the work process in the company (institution), the operative processes, and occupational risks. Participation in design projects, document creation, or quality control, in keeping with the work process and the possibilities of the work environment.

Learning outcome

Students' ability to:

- improve their abilities to join the workforce after their studies;
- acquire a clear insight into the possibility of practically applying the acquired theoretical, scientific, and professional knowledge and skills covered in the study programme;
- solve specific issues in the scientific field Environmental and Occupational Engineering within the selected company or institution;
- understand the role of a person with a master's degree in occupational safety engineering within the organizational structure of a company or institution;
- develop responsibility, professional work approach, and team communication skills;
- use experiences of other professionals employed at the company (institution) of the internship in order to expand their practical knowledge and increase their motivation.

Course outline

Internship content is fully compliant with internship aims and is created specifically for each student, according to the activity of the company (institution) where the internship is done and according to the demands of the profession for which a student is educated. Students become familiar with the structure of the company (institution) and its operation objectives, adapt their own involvement to the study programme they chose, and regularly fulfil their work duties, which correspond to the duties of regular employees of the company (institution). Students provide an account of their involvement during the internship and critically reflect upon their experience and the knowledge and skills they acquired during the internship.

As a rule, students choose a company (institution) from the government, private, or public sector for their internship. The internship may be done in institutions within Serbia that have a written agreement with the Faculty of Occupational Safety or that give consent for accepting student interns.

At a student's proposal, the vice dean for education approves the internship at a chosen company (institution) and then issues the written internship order form. Based on the internship logbook, which needs to record at least 90 internship classes, and the certificate of internship signed by the authorized person and stamped with the company (institution) seal, confirming that the internship has been completed, the student is awarded 3 ECTS after the internship defence before the professors appointed for the defence by the Teaching and Scientific Council of the faculty.

Number of active classes (weekly)

Lectures	-	Auditory exercises	-	Other forms of classes		RS	-	Other classes	6

Teaching methods Consultations during the internship and creation of the internship logbook.
Grading (maximum number of points: 100) Completed internship and creation and defence of the internship logbook are graded using the descriptors “defended” or “not defended”.

Course name: Master's Thesis – Research		
Course status: Required	**Course code:**	19.IZR18A
ECTS credits: 8		
Requirements: Enrolment in the second semester		

Course aim

Use of basic, theoretic-methodological, scientific-professional, and professional-applicative knowledge and methods to solve specific problems. Individual research study, which can have a practical, investigative, or theoretical-methodological character. Acquisition of required skills through solving complex issues and problems and identification of opportunities to practically apply the previously acquired knowledge.

Learning outcome

Students' ability to:

- independently formulate and analyze problems and to critically examine potential solutions;
- independently apply previously acquired knowledge from the various fields they studied in order to examine the structure of a given research problem, as well as to apply systems analysis in order to draw conclusions about the possible ways of solving the given research problem;
- independently use literature, thus expanding their knowledge by studying different methods and publications that deal with similar issues;
- analyze and identify problems within a given topic and propose the ways to solve them;
- consider the place and role of engineers in their chosen field;
- develop team spirit and teamwork;
- apply acquired engineering knowledge and skills to solve problems in practice;
- stay up to date with and utilize new developments in their profession.

Course outline

According to their preferences and affinity, students choose their research study area, specifically the course within which they will conduct their research associated with their previously approved topic of the master's thesis. The mentor defines the research study task according to the requirements, complexity, and structure of a specific research.

Students study the problem and its structure and complexity, and study professional literature, including scientific and professional publications dealing with the given or similar topic; after analyzing the literature, they draw conclusions about potential problem solutions. By examining the literature, students learn about the methods used to solve similar problems and about the previous engineering practice regarding problem solutions. The research study also requires students to stay up to date with primary knowledge, to organize and conduct experiments and numerical simulations, to process data statistically, and to write a research paper from the narrow scientific field of their research study topic.

The mentor evaluates the research study based on a student's defence of the research paper and approves the writing of the master's thesis, which includes the results of the research study.

Number of active classes (weekly)

Literature

Number of active classes (weekly)									
Lectures	-	Auditory exercises	-	Other forms of classes	-	RS	8	Other classes	-
Teaching methods With the mentor's aid, students individually solve a given problem and research the subject matter, after which they write a research paper.									
Grading (maximum number of points: 100)									
Pre-exam requirements			Points	**Exam**				Points	

Course name: Master's Thesis – Writing and Defence									
Course status: Required				**Course code:**			19.IZR18B		
ECTS credits: 4									
Requirements: Completion of exams for all courses in the study programme									
Course aim Combination of the theoretical background and the research study to solve a specific problem, for the purpose of examining the structure and performing a systems analysis of the problem in order to draw conclusions about the possible ways of solving it. Gaining experience of presenting the results of the research study in written form and orally, during the master's thesis defence.									
Learning outcome Students' ability to: • independently present the results of their research by writing their thesis and presenting it orally at the thesis defence; • write the thesis according to a required form; • clearly and satisfactorily elaborate on their proposed solutions to the given problem through an oral presentation of the thesis and response to the subsequent questions.									
Course outline By combining the research study and the theoretical background of the given problem, students write their master's thesis, which has to contain the following elements: abstract with key words in Serbian, table of contents, introduction, research text body (formulation of the research problem and subject matter, presentation of the current state of the given research field, theoretical or practical portion of the research, results and discussion), conclusion, list of cited literature (minimum of ten references, of which at least six have to be academic and professional publications and at least one has to be written in a foreign language), and appendices. The committee for master's thesis evaluation and defence evaluates the written thesis and approves the public oral defence of the master's thesis, which is organized before a committee of three members, one of whom is the mentor. During the oral defence, the candidate presents the results of their research and then answers the questions by committee members, thus demonstrating the ability to orally present a project.									
Literature									
Number of active classes (weekly)									
Lectures	-	Auditory exercises	-	Other forms of classes	-	RS	-	Other classes	4
Teaching methods With the mentor's aid, students write their master's thesis and prepare for the oral defence. Students consult with the mentor and other members of the committee for master's thesis evaluation and defence.									
Grading (maximum number of points: 100)									

Pre-exam requirements	Points	**Exam**	Points
Written thesis	30	Thesis defence	70

LIST OF ELECTIVE COURSES

1. Human Reliability Analysis
2. Ergonomic Design
3. Industrial Toxicology
4. Occupational Safety Management
5. Human Resource Management and Development
6. Occupational Law
7. Occupational Safety Sociology
8. Information Systems in Safety
9. Systems Engineering
10. System Reliability and Safety
11. Project Management

Course name: Human Reliability Analysis		
Course status: Elective	**Course code:**	19.MZNR05
ECTS credits: 6		
Requirements: -		

Course aim

Acquisition of knowledge on the origin of human errors, methods of analysis and quantification of human reliability, and methods for human error reduction.

Learning outcome

Students' ability to:

- recognize the nature of human behaviour and to describe, critically analyze, and interpret relevant causes of accidents and human errors;
- identify the factors influencing human reliability and to choose and apply a suitable method of human reliability analysis;
- assess human reliability, individually or in a team;
- create human error databases and to formulate error mechanisms and performance shaping factors;
- design procedures and strategies for human error reduction.

Course outline

Theoretical lessons

Introduction: Term, definitions, and classifications of human errors. Nature and causes of human errors. **Theories on accidents and human errors:** Iceberg model. SHELL model. Domino theory. Rasmussen's model. Reason's model of active and latent errors. Kirwan's theory. **Basic stages of human reliability assessment:** Human error identification: task analysis, human error analysis, validation of complex problems. Error presentation: Fault Tree Analysis – FTA, Event Tree Analysis - ETA. Testing of error significance. Human error quantification. Databases on human errors. External and psychological error mechanisms. Performance shaping factors. Assessment of error impact on risk level in a system. Human error mitigation: reduction, operator training models for acting in risk events, quality assurance, documentation. **Human error identification methods:** Human HAZard and OPerability Study − Human HAZOP. Systemic Human Error Reduction and Prediction Approach – SHERPA. **Human error quantification methods:** Absolute Probability Judgement – APJ, Success likelihood index method – SLIM, Technique for Human Error Rate Prediction – THERP, Human Error Assessment and Reduction Technique – HEART. **Synergy of methods:** Development trends of human reliability assessment methods. **Case studies:** Practical application of the methods.

Practical lessons

Auditory/calculation exercises follow the theoretical lessons and include a presentation and defence of a term paper on a topic included in the course syllabus.

Literature

[1] Stojiljkovic Evica (2020). *Human Reliability Assessment*. University of Niš, Faculty of Occupational Safety. (in Serbian).

[2] Taylor J. Robert (2015). *Human Error in Process Plant Design and Operations: A Practitioner's Guide*. 1st Edition. CRC Press. Taylor and Francis Group, LLC.

[3] Spurgin J. Anthony (2010). *Human Reliability Assessment: Theory and Practice*. CRC Press. Taylor and Francis Group, LLC.

[4] Petersen Daniel (1996). *Human Error Reduction and Safety Management*. Edition 3. New Jersey: John Wiley & Sons, Inc.

Number of active classes (weekly)									
Lectures	2	Auditory exercises	2	Other forms of classes	-	RS	-	Other classes	-

Teaching methods

Lectures, auditory (calculation) exercises, and office hours. Interactive work with students. Use of multimedia presentations during lectures.

Grading (maximum number of points: 100)			
Pre-exam requirements	Points	**Exam**	Points
Activity during lectures	5	Written exam (practical part of the exam)	20
Activity during exercises	5	Oral exam (theoretical part of the exam)	20
Colloquium 1	20		
Colloquium 2	20		
Term paper	10		

Course name: Ergonomic Design

Course status: Elective	**Course code:**	19.MZNR06

ECTS credits: 6

Requirements: -

Course aim

Acquisition of knowledge about ergonomic design of complex systems using an interdisciplinary approach.

Learning outcome

Students who successfully complete the syllabus are able to:

- understand fundamental ergonomic principles, concepts, and methods of research of ergonomic systems;
- apply fundamental ergonomic principles in the design of complex ergonomic systems;
- assess ergonomic risk, individually or in a team;
- assess compatibility of humans and systems.

Course outline

Theoretical lessons

Introduction: Origin and development of ergonomics. Goals and tasks of ergonomics. Corrective and systems ergonomics. Ergonomic systems. Ergonomic principles. **Concepts, methods, and techniques of ergonomic design**: Psychological methods. Physiological methods. Mathematical methods. Imitational methods. **Ergonomic design of work space and operator activities**: Anthropometrics (basic dimensions, anthropometric measurements, data processing, work postures, work spaces, workplace design – sitting and standing). Biomechanics. **Information reception and processing**: Information reception. Information processing. Memorization. Decision-making. **Human operator and control and management systems**: Operator's information processing capacity. Visual field and visual angles. Visual information encoding. Stress and fatigue in operators. Work environment conditions. Physiological work conditions. Psychosocial work conditions. Anthropometric work conditions. **Ergonomic risk**: Ergonomic risk factors. Ergonomic risk assessment methods.

Practical lessons

Auditory/calculation exercises follow the theoretical lessons and include the presentation and defence of the graphic assignment in areas included by the course syllabus.

Literature

[1] Grozdanović Miroljub (1999). *Ergonomsko projektovanje delatnosti čoveka operatora*. Niš: Univerzitet u Nišu, Fakultet zaštite na radu u Nišu.

[2] Pavlović-Veselinović Sonja (2013). *Ergonomski rizik*. Niš: Univerzitet u Nišu, Fakultet zaštite na radu u Nišu.

[3] Pheasant Stephen, Haslegrave M. Christine (2018). *Bodyspace: Anthropometry, ergonomics and the design of work*. CRC Press.

[4] Tosi Francesca (2020). *Design for ergonomics*. Springer.

[5] Konz Stephan (2018). *Work design: occupational ergonomics*. CRC Press.

Number of active classes (weekly)

Lectures	2	Auditory exercises	2	Other forms of classes	-	RS	-	Other classes	-

Teaching methods

Lectures, auditory (calculation) exercises, and office hours. Interactive work with students. Use of multimedia presentations during lectures.

Grading (maximum number of points: 100)

Pre-exam requirements	Points	**Exam**	Points
Activity during lectures	5	Written exam (practical part of the exam)	40
Activity during exercises	5		
Colloquium	30		
Graphic assignment	20		

Course name: Industrial Toxicology		
Course status: Elective	**Course code:**	19.MZNR07
ECTS credits: 6		
Requirements: -		

Course aim

Acquisition of knowledge about the properties of toxic substances and biochemical, metabolic, and physiological changes after ingestion of toxins by workers in industrial facilities.

Learning outcome

Students' ability to:

- identify major toxic substances found in the work environment, individually or in a team;
- perform a risk assessment;
- take proper safety measures against occupational toxic substances.

Course outline

Theoretical lessons

Introduction to industrial toxicology: Definition, subject matter, and tasks of industrial toxicology. Basic terms and principles in industrial toxicology. **Classification of toxic substances:** Classification according to physical properties, chemical composition, and physiological effect. Anoxic substances. Systemic poisons. Sensitising substances. Substance particles. **Professional poisoning:** Intake pathways of toxic substances. Absorption via digestive and respiratory systems and the skin. Excretions of toxic substances from the body. Biological half-life of excretion. Simultaneous effect of toxic substances. Poisoning from non-metals and metals (lead and lead alkalis, mercury, cadmium, phosphorus, arsenic, manganese, nickel, etc.). Poisoning from upper respiratory irritants. Poisoning from lower respiratory irritants. Poisoning from simple asphyxiants. Poisoning from chemical asphyxiants. Poisoning from solvents. Poisoning from aliphatic hydrocarbons. Poisoning from aromatic hydrocarbons. Poisoning from amino and nitro derivatives of hydrocarbons. Poisoning from halogen derivatives of hydrocarbons. Poisoning from alcohols, aldehydes, ketones, ethers, and esters. **Biological indicators of professional poisoning:** Types of biological monitoring. Biological monitoring using biomarkers (classification of biological monitoring according to biomarker type). Factors influencing the metabolism and excretion of metabolites in a biological sample. Time required for toxic substances to appear in a biological sample. **Assessment of risk from the effects of toxic substances**. **Occupational safety measures for exposure to toxic substances.**

Practical lessons

Practical application of the methods of sampling and analyzing gases, vapours, and aerosols from the occupational atmosphere. Interpretation of obtained results. Writing of term papers on a given topic, followed by their oral presentation and defence.

Literature

[1] Popović Danilo (2008). *Toksikologija – interni materijal za pripremu ispita.* Niš: Univerzitet u Nišu, Fakultet zaštite na radu u Nišu.

[2] Kuljak Savo (2004). *Industrijska toksikologija i zaštita okoline*. Bečej: Sojaprotein - Sektor upravljanja kvalitetom.

[3] Jokanović Milan (2001). *Toksikologija*. Beograd: Elit Medika.

[4] Harbison Raymond, Bourgeois Marie, Johnson Giffe (2015). *Hamilton and Hardy's Industrial toxicology – sixth edition*. New Jersey: John Wiley and Sons.

<table>
<tr><td colspan="10">Number of active classes (weekly)</td></tr>
<tr><td>Lectures</td><td>2</td><td>Auditory exercises</td><td>2</td><td>Other forms of classes</td><td>-</td><td>CIR</td><td>-</td><td>Other classes</td><td>-</td></tr>
<tr><td colspan="10">Teaching methods
Lectures, auditory/calculation exercises, office hours.</td></tr>
<tr><td colspan="10">Grading (maximum number of points: 100)</td></tr>
<tr><td colspan="3">Pre-exam requirements</td><td>Points</td><td colspan="4">Exam</td><td colspan="2">Points</td></tr>
<tr><td colspan="3">Activity during lectures</td><td>5</td><td colspan="4">Oral exam (theoretical part of the exam)</td><td colspan="2">40</td></tr>
<tr><td colspan="3">Activity during calculation exercises</td><td>5</td><td colspan="4"></td><td colspan="2"></td></tr>
<tr><td colspan="3">Activity during laboratory work</td><td>10</td><td colspan="4"></td><td colspan="2"></td></tr>
<tr><td colspan="3">Colloquium 1</td><td>20</td><td colspan="4"></td><td colspan="2"></td></tr>
<tr><td colspan="3">Colloquium 2</td><td>20</td><td colspan="4"></td><td colspan="2"></td></tr>
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Course name: Occupational Safety Management		
Course status: Elective	**Course code:**	19.MZNR09
ECTS credits: 5		
Requirements: -		

Course aim

Acquisition of knowledge about management and implementation of occupational safety measures for the purpose of preventive action as a primary goal of occupational safety measure implementation.

Learning outcome

Students' ability to:

- manage occupational safety in a business system;
- minimize occupational risk and eliminate hazards;
- safeguard the mental and physical health of employees and take preventive measures against harmful effects to employee health.

Course outline

Theoretical lessons

Management: Definition of management. Basic functions of management (planning, organization, human resource management, governance, and control). Classification of management processes. Role and task of managers. Characteristics, knowledge, and capabilities of managers. **Goal of OH&S management system**: Essence of the OH&S management system – provision of a framework for managing OH&S risks and opportunities. Goal and predicted outcomes of the OH&S management system – prevention of occupational injuries and health effects on employees and provision of safe and healthy workplaces. **Risk minimization:** Elimination of hazards and minimization of OH&S risks within an organization. Implementation of effective preventive and safety measures. Success factors of the OH&S management system. Use of the OH&S management system as a strategic and operative decision by an organization. Implementation and maintenance of the OH&S management system. Effectiveness of the OH&S management system. **Influence on predicted outcomes of the OH&S management system**: Influence of governance, dedication, responsibility, and ultimate responsibility of top management on the outcomes of the OH&S management system. Management and promotion of culture within an organization. Influence of communication. Influence of consultations with and participation of employees and their representatives. **Psychosocial risks**: Importance and impact of psychosocial risks on employees. Classification of psychosocial risks. Psychosocial risks and stress. Prevention of psychosocial risks. Healthy workplace.

Practical lessons

Auditory exercises include the presentation and defence of the term paper on a topic included in the course syllabus.

Literature

[1] Živković Snežana (2011). *Uloga i značaj lica za bezbednost i zdravlje na radu u privrednim društvima u Srbiji*. Niš: Univerzitet u Nišu, Fakultet zaštite na radu u Nišu.

[2] Živković Snežana, Palačić Darko (2015). *Upravljanje bezbednošću u poslovnim organizacijama u Srbiji i Hrvatskoj - komparativna analiza*. Niš: Univerzitet u Nišu, Fakultet zaštite na radu u Nišu.

[3] Živković Snežana (2014). *Safety management in Serbia and Croatia (Work-related problems of occupational safety specialist in companies in Serbia and Croatia)*. Saarbrücken: Lambert Academic Publishing.

<table>
<tr><td colspan="10">Number of active classes (weekly)</td></tr>
<tr><td>Lectures</td><td>2</td><td>Auditory exercises</td><td>2</td><td>Other forms of classes</td><td>-</td><td>RS</td><td>-</td><td>Other classes</td><td>-</td></tr>
<tr><td colspan="10">Teaching methods
Lectures, term papers (exercises), discussions, office hours.</td></tr>
<tr><td colspan="10">Grading (maximum number of points: 100)</td></tr>
<tr><td colspan="4">Pre-exam requirements</td><td>Points</td><td colspan="3">Exam</td><td colspan="2">Points</td></tr>
<tr><td colspan="4">Activity during lectures</td><td>5</td><td colspan="3">Oral exam (theoretical part of the exam)</td><td colspan="2">40</td></tr>
<tr><td colspan="4">Activity during calculation exercises</td><td>5</td><td colspan="3"></td><td colspan="2"></td></tr>
<tr><td colspan="4">Colloquium 1</td><td>15</td><td colspan="3"></td><td colspan="2"></td></tr>
<tr><td colspan="4">Colloquium 2</td><td>15</td><td colspan="3"></td><td colspan="2"></td></tr>
<tr><td colspan="4">Term paper</td><td>20</td><td colspan="3"></td><td colspan="2"></td></tr>
</table>

Course name: Human Resource Management and Development		
Course status: Elective	**Course code:**	19.MZNR10
ECTS credits: 5		
Requirements: -		

Course aim

Acquisition of knowledge about basic theoretical issues of human resource management and the particularities of their development in an occupational and environmental safety and protection system. Development of competences for professional interventions in human resource management (HRM) in organizations in terms of employee protection and occupational and environmental safety. Acquisition of knowledge and skills for efficient action for the purpose of human resource development (HRD) in this field. Development of critical thinking about various aspects of human resource management and development, consideration of possibilities for innovative approaches and actions aimed at improving occupational and environmental safety performance.

Learning outcome

- Possession of a developed knowledge system about modern concepts, strategies, processes, and possibilities of HRM that are necessary for identifying the current state of human resources in an organization, preparing the measures for improving safety performance, and hiring human resources in a way that improves safety culture and develops humane and motivating work conditions;
- Developed competences – knowledge and skills for efficient HRD;
- Understanding and consideration of all stages of HRM directly associated with the processes of occupational and environmental safety, which will enable the accomplishment of strategic business and safety goals.

Course outline

Theoretical lessons

Human resource management: Historical development, term, subject matter, aims, activities, factors, and challenges. HRM as a phase of the management process. **Strategic human resource management:** term, aims, strategy formulation, strategy types, application, and control. **Work analysis and design** (of risks, hazards, and harms), work redesign and redesigning techniques (in terms of occupational and environmental safety). **Human resource planning:** term, characteristics, aims, activities. **Staffing**: term, aim, factors, recruitment process, external and internal sources. **Candidate selection**: Term, aims, significance. Individual differences between candidates. Selection process. Methods and instruments. Evaluation of the selection process. **Human resource development** – employee socialization and orientation. **Career development**: term, characteristics, significance, planning, phases, career anchors, career management. **Training and development**: organizational learning, knowledge management, andragogical cycle, process, phases, traditional and modern approaches. **Evaluation of work success:** term, aims, subject, functions, process, methods, quality evaluation. **Employee awards and motivation**: significance, aims, motivation, incentives, awards. **Particularities of human resource management and development** for occupational safety and health, for environmental protection and sustainable development, for protection against fires, disasters, and other emergencies. **Global changes in the occupational and natural environment and human resource management in the future**: changes, challenges, HRM in the future.

Practical lessons

Auditory exercises, which follow the theoretical lessons and include the presentation and

defence of term papers, which pertain to the current issues of HRM and HRD in terms of occupational and environmental safety (especially occupational safety and health). Analysis of innovative approaches and case studies of HRM using the examples of different work organizations in the national and international economic context.

Literature

[1] Nikolić Vesna (2019.) *Menadžment ljudskih resursa – interni materijal za pripremu ispita.* Niš: Univerzitet u Nišu, Fakultet zaštite na radu u Nišu.

[2] Galjak Mirjana, Nikolić Vesna (2019). *Menadžment u zaštiti.* Leposavić: Visoka tehnička škola strukovnih studija.

[3] Nikolić Vesna, Anđelković Branislav (2018). *Sistem bezbednosti i zaštite & Razvoj ljudskih resursa i upravljanje znanjem,* (određ. poglavlja). Niš: Univerzitet u Nišu, Fakultet zaštite na radu.

[4] Nikolić Vesna, Živković Nenad (2017). *Bezbednost radne i životne sredine, vanredne situacije i obrazovanje,* (određ. poglavlja). Niš: Univerzitet u Nišu, Fakultet zaštite na radu.

[5] Nikolić Vesna (2012). *Tendencije upravljanja i razvoja ljudskih resursa u budućnosti,* u: Upravljanje ljudskim resursima i sigurnost. Zagreb: Visoka škola za sigurnost.

Number of active classes (weekly)

Lectures	2	Auditory exercises	2	Other forms of classes		RS	-	Other classes	-

Teaching methods

Lectures, conversation and discussions, demonstrations, case studies, office hours

Grading (maximum number of points: 100)

Pre-exam requirements	Points	**Exam**	Points
Activity during lectures	5	Oral exam (theoretical part of the exam)	40
Activity during exercises	5		
Colloquium 1	15		
Colloquium 2	15		
Term paper	20		

Course name: Occupational Law

Course status: Elective	**Course code:**	19.MZNR11

ECTS credits: 5

Requirements: -

Course aim

Acquisition of extended theoretical knowledge about the legal institutes for occupational safety and legal and labour relations and analysis of legal decisions in the fields of occupational safety and legal and labour relations.

Learning outcome

Students' ability to:

- interpret laws, collective contracts, subordinate legislation, and other regulations pertaining to the implementation of occupational safety measures;
- practically apply the said acts;
- supervise the enforcement of the said acts.

Course outline

Theoretical lessons

Term, subject matter, and method of occupational law. International occupational safety legislation. Occupational safety regulations by the International Labour Organization and the EU. **National occupational safety legislation.** Constitution of the Republic of Serbia. Labour Law. Law on Occupational Safety and Health. Strategic documents regarding occupational safety. **National social security legislation.** Law on Health Insurance. Law on Pension and Disability Insurance. **National healthcare legislation.** Law on Health Protection. **Criminal legislation in occupational safety.** Criminal code – crimes infringing upon work-based rights. **Supervision over the enforcement of occupational safety regulations.**

Practical lessons

Auditory exercises, which follow the theoretical lessons and include the presentation and defence of term papers on a topic included in the course syllabus, analysis of various legislative acts, and visits to relevant institutions.

Literature

[1] Jovanović Predrag (2015). *Radno pravo*. Novi Sad: Univerzitet u Novom Sadu, Pravni fakultet.

[2] Ministarstvo za rad, zapošljavanje, boračka i socijalna pitanja (prir.) (2018). *Propisi iz oblasti bezbednosti i zdravlja na radu*. Beograd: Socijalno-ekonomski savet Republike Srbije.

[3] Nikolić Radomir, Peurača Dragoljub (2014). *Bezbednost i zdravlje na radu - Priručnik za praktičnu primenu*. Niš: Atlantis

[4] Petrović Aleksandar (2009). *Međunarodni standardi rada*. Niš: Univerzitet u Nišu, Pravni fakultet.

Number of active classes (weekly)

Lectures	2	Auditory exercises	2	Other forms of classes	-	RS	-	Other classes	-

Teaching methods

Lectures (including presentations and discussions), exercises (term papers and analyses of legislative acts), and office hours.

Grading (maximum number of points: 100)			
Pre-exam requirements	Points	**Exam**	Points
Activity during lectures	5	Oral exam (theoretical part of the exam)	40
Activity during exercises	5		
Colloquium 1	15		
Colloquium 2	15		
Term paper	20		

Course name: Occupational Safety Sociology		
Course status: Elective	**Course code:**	19.MZNR12
ECTS credits: 5		
Requirements: -		

Course aim

Familiarizing students with direct and indirect causes of compromised human integrity in the work environment, especially with the social factors within and outside the work environment, which contribute or do not contribute to safe work. Familiarizing students with the methodology of sociological research of the causes and effects of compromised human integrity in the work environment.

Learning outcome

Students' ability to:

- acknowledge social factors when developing occupational safety and health measures and thus contribute to the humanization of work and to safe work conditions;
- adhere to the ethical code of engineers and professionally perform engineering tasks;
- empirically investigate the causes of compromised physical, mental, and ethical human integrity in the work environment;
- face the technical, social, and ecological environment, in which they act and for which they are responsible;
- participate in the creation of the risk assessment document and strategic documents.

Course outline

Theoretical lessons

Subject matter and method of occupational safety sociology: Occupational injuries and professional diseases as the subject matter of social studies. Subject matter of occupational safety sociology and its relationship with related sciences. Scientific method elements and the tasks of methodology. Method of occupational safety sociology. Scientific research stages for the subject matter of occupational safety sociology (research subject and formulation of hypotheses). Data collection methods: observation, examination, content analysis, and comparison. Data sorting and processing and scientific explanation and conclusion. **Sociological study of work:** Definition of work, definition and elements of the work environment, types of work environments. People and their work activities, natural and work environment, influence of work environment elements and the work process on people. **Theories about causes of occupational injuries and professional diseases:** Accident-proneness theory, Heinrich's theory, Hepburn's theory, Epidemiological theory, Behavioural theory, Energy release theory. **Causes and types of compromised human integrity in the work environment:** Definition of physical, psychological, and moral integrity of humans. Causes and types of compromised human integrity in the work environment. Definition and causes of occupational injuries and professional diseases. Causes and types of compromised human integrity and creation of safe work conditions in the industrial work environment. Causes and types of compromised human integrity and creation of safe work conditions in the agricultural work environment. Causes and types of compromised human integrity and creation of safe work conditions in the work environment of social activities. **Life outside of work and safe work:** way of life, housing location and conditions, family relations, and additional incomes and safe work conditions. **Work ethics and relationship toward work:** work motivation, personal traits, socio-economic relations, and motivation for work and safe work conditions. **Society and safe working**

conditions: Factors determining the relation of the society toward the creation of safe work conditions. Creation of safe work conditions in our country. Work humanization and creation of safe work conditions. Technology as a determinant of work and safe work conditions. **Modern world and safe work conditions:** Global issues in today's world and creation of safe work conditions. Countries in economic transition and safe work conditions. **Professional engineering ethics:** Engineering ethics and ethical code of engineers and technicians of Serbia. Engineering ethics and preservation of the psychophysical integrity of employees.

Practical lessons

Auditory exercises: discussions about the changes in the occupational domain and the work environment caused by technical and technological progress and about adherence to the principles of engineering ethics. Discussions about social factors outside the work environment and their importance for occupational safety. Familiarizing students with research instruments and their construction and use. Practical data collection, sorting, and processing using SPSS software, writing reports and presenting them through individual and group presentations. Defence of term papers.

Literature

[1] Bolčić Silvano (2003). *Svet rada u transformaciji*. Beograd: Plato.
[2] Marković Ž. Danilo (2001). *Sociologija bezbednog rada*. Niš: Prosveta.
[3] Svensen Laš (2012). *Filozofija rada*. Beograd: Geopolitika.
[4] Đorđević Dragoljub, Đurović Bogdan (Prir.). (2011). *Profesionalna etika inženjera*. Niš: Univerzitet u Nišu, Mašinski fakultet.
[5] Volti Rudi (2011). *An Introduction to the Sociology of Work and Occupations*. London: SAGE Publications.

Number of active classes (weekly)

Lectures	2	Auditory exercises	2	Other forms of classes	-	RS	-	Other classes	-

Teaching methods

Lectures, auditory exercises, presentations, discussions, term papers, office hours, individual and group work

Grading (maximum number of points: 100)

Pre-exam requirements	Points	**Exam**	Points
Activity during lectures	5	Oral exam (theoretical part of the exam)	40
Activity during exercises	5		
Colloquium 1	15		
Colloquium 2	15		
Term paper	20		

Course name: Information Systems in Safety

Course status: Elective	**Course code:**	19.MZNR13

ECTS credits: 5

Requirements: -

Course aim

Acquisition of knowledge about information systems and networks and their application in the domain of safety.

Learning outcome

Knowledge about organization, types, and application of information systems and information and communication networks in safety engineering. Students' ability to:

- understand the principles and concepts of information systems;
- understand how computer networks and general-purpose networks work;
- use available online services and content.

Course outline

Theoretical lessons

Definition and fundamental concepts of information systems: Definition, functions, and components of information systems. Fundamental concepts of information systems. Application areas of information systems. Application of information systems. **Data**: Data acquisition and storage. Memory technologies. Databases, data models, and program tools. **Networks**: Communication transfer technologies. Types of computer networks. Characteristics of computer networks. Layered architecture of communication networks. OSI reference model. Computer network topologies. Sharing of hardware and software resources. Telecommunication systems. Communication links. Local networks. Wireless technologies. Location services. Network hardware components. Routing. Protocols. Network addressing. **Online services**: URL addresses. Web services. Web applications. Content management systems. Interactive Internet services. Data search. Geographic information systems. Sensor networks. Compromised services of information systems.

Practical lessons

Auditory and calculation exercises, which follow the theoretical lessons. Analysis of information and communication technology, consideration of various applications of information systems, and analysis of practical examples from occupational safety, all of which stimulates research and use of information systems in engineering practice.

Literature

[1] Tanenbaum Andrew, Wetherall David (2013). *Računarske mreže* (5. izdanje). Beograd: Mikroknjiga.

[2] Seen James (2011). *Informaciona tehnologija – principi, praksa, mogućnosti*. Beograd: Kompjuter biblioteka.

[3] Rainer Kelly, Turban Efraim (2009). *Uvod u informacione sisteme*. Beograd: Mikroknjiga.

[4] Shay William (2004). *Savremene komunikacione tehnologije i mreže*. Čačak: Kompjuter biblioteka.

Number of active classes (weekly)

Lectures	2	Auditory exercises	1	Other forms of classes	0.53	CIR	-	Other classes	-

Teaching methods

Lectures, auditory (calculation) exercises, and office hours

Grading (maximum number of points: 100)			
Pre-exam requirements	Points	**Exam**	Points
Activity during lectures	5	Oral exam (theoretical part of the exam)	40
Activity during exercises	5		
Colloquium 1	25		
Colloquium 2	25		

Course name: Systems Engineering

Course status: Elective	**Course code:** 19.MZNR14

ECTS credits: 5

Requirements: -

Course aim

Acquisition of knowledge about fundamental characteristics, processes, and disciplines of systems engineering and about models and methods of decision making and effectiveness assessment.

Learning outcome

Students' ability to:

- connect engineering and managerial demands in order to analyze and solve safety problems;
- develop and apply methods and procedures for the assessment of safety system effectiveness;
- analyze systems using the systems engineering approach to improve performance;
- participate in teamwork and decision-making.

Course outline

Theoretical lessons

Introduction to systems engineering: Definition, elements, and processes of systems engineering. Systems analysis. System lifecycle. **Systems engineering process**: Identification of requirements, operational requirements, and requirements of the surrounding. Identification of performance measures. Functional analysis and allocation of requirements. Optimization. Risk in the systems engineering process. System specification. Models and tools for system description. Basic disciplines of systems engineering. **Systems engineering management**: Planning and organization of processes of systems engineering. Standardization of the systems engineering process. Program support. **Teamwork and decision making:** Assessment of teamwork effectiveness. Program support for effective application of the principles of systems engineering in an integrated team surrounding. Models and methods for assessing system effectiveness. Multiple-criteria analysis methods (ELECTRE, PROMETHEE, AHP). Hierarchical organization and ranking of key performance indicators.

Practical lessons

Auditory and calculation exercises, which follow the theoretical lessons. Consideration of the use of systems engineering methods for system specification and analysis of practical examples. Defence of term papers dealing with occupational safety, which stimulates research and practical application of the methods considered.

Literature

[1] Walden David, Roedler Garry, Fosberg Kevin, Hamelin Douglas, Shortell Thomas (2015). *INCOSE Systems engineering handbook: a guide for system life cycle processes and activities,* 4th Edition. New Jersey: John Wiley & Sons.

[2] Blanchard Benjamin (2004). *System engineering management*. New Jersey: John Wiley & Sons, Inc.

[3] Papić Ljubiša, Milovanović Zdravko (2007). *Održavanje i pouzdanost tehničkih sistema*. Prijevor: DQM.

[4] Čupić Milutin, Suknović Milija (2010). *Odlučivanje*. Beograd: Univerzitet u Beogradu, Fakultet organizacionih nauka.

Number of active classes (weekly)

Lectures	2	Auditory exercises	2	Other forms of classes	-	RS	-	Other classes	-

Teaching methods Lectures, auditory (calculation) exercises, office hours. Interactive work with students.			
Grading (maximum number of points: 100)			
Pre-exam requirements	Points	**Exam**	Points
Activity during lectures	5	Written exam (practical part of the exam)	40
Activity during exercises	5		
Colloquium	20		
Term paper	30		

Course name: System Reliability and Safety

Course status: Elective | **Course code:** 19.MZNR15

ECTS credits: 5

Requirements: -

Course aim

Acquisition of knowledge about primary indicators of system reliability and safety, qualitative and quantitative methods for system reliability and safety analysis, and about technological solutions for increasing the reliability of safety systems.

Learning outcome

Students' ability to:

- quantify and interpret system reliability and safety indicators;
- apply methods for identification, assessment, and evaluation of hazards;
- evaluate technical safety measures.

Course outline

Theoretical lessons

Reliability theory fundamentals: Definitions and elements of reliability. Types of reliability. Indicators of reliability of repairable and non-repairable systems. **Characteristics of random variables**: Functions of time distribution until/between failures. Continuous and discrete distributions. **Reliability of different system structures**: Reliability block diagram. Series structure of system elements. Parallel structure of system elements. Combined structure of system elements. Models of system reliability. **Optimization of reliability**: Increase of system reliability. Reliability allocation. Optimization of reliability costs. **Methods of system reliability analysis**: Fault tree analysis. Failure mode and effects analysis (criticality/detection). **Reliability of human operator and the human-machine system**: Operator reliability indicators. Reliability of the human-machine system. Methods for increasing operator reliability. **Fundamentals of safety theory**: Basic terms and indicators of safety. Equivalence of reliability and safety indicators. System safety requirements and functional safety. Risk and safety levels. Methods of safety level quantification. **Technological solutions for the increase of safety system reliability**: Redundancy, diversity, optimal reserve, maintenance. **Methods of identifying safety functions**: Hazard and operability analysis. What-if analysis. Checklist.

Practical lessons

Auditory/calculation exercises follow the theoretical lessons. Presentation and defence of the term paper on a topic included in the course syllabus.

Literature

[1] Savić Suzana, Grozdanović Miroljub, Stojiljković Evica (2014). *System Reliability and Safety*. University of Niš, Faculty of Occupational Safety. (in Serbian).

[2] Ivanović Gradimir, Stanivuković Dragutin, Beker Ivan (2010). *Pouzdanost tehničkih sistema*. Novi Sad: Fakultet tehničkih nauka; Beograd: Mašinski fakultet, Vojna akademija.

[3] Stambolić Mihajlo (2005). *Sigurnosni instrumentalni sistemi u procesnoj industriji*. Beograd: Građevinska knjiga.

[4] Tait Robin, Cox Sue (1998). *Safety, Reliability and Risk Management*. Edition 2. London: Taylor & Francis.

[5] Stephans A. Richard (2004). *System Safety for 21st Century*. New Jersey: John Wiley & Sons, Inc. Hoboken.

Number of active classes (weekly)

Lectures	2	Auditory exercises	2	Other forms of classes	-	RS	-	Other classes	-

Teaching methods Lectures, auditory (calculation) exercises and office hours. Interactive work with students. Use of multimedia presentations during lectures.			
Grading (maximum number of points: 100)			
Pre-exam requirements	Points	**Exam**	Points
Activity during lectures	5	Written exam (practical part of the exam)	20
Activity during exercises	5	Oral exam (theoretical part of the exam)	20
Colloquium 1	30		
Colloquium 2	10		
Term paper	10		

Course name: Project Management		
Course status: Elective	**Course code:**	19.MZNR16
ECTS credits: 5		
Requirements: -		

Course aim

Acquiring knowledge about the concept, methods, techniques, and application of project management principles in preventive engineering and other related (organizational and technical) disciplines.

Learning outcome

Students should be able to:

- plan and monitor projects;
- organize project activities;
- apply modern software tools for project management;
- apply the project management concept in planning and implementation of various occupational and environmental safety related projects.

Course outline

Theoretical lessons

Introduction to project management: Development and importance, of the concept. Areas of application. Certification bodies. **Basic characteristics of a project:** Definition, framework/scope, project goals, "triple constraint". Planning, identification and selection of resources. Critical factors. Project integration. Process groups and project lifecycle. **Project planning and monitoring:** SWOT analysis, SMART goals, Logical framework matrix (*LFM*). **Project management methods and techniques:** Gantt charts, WBS-PBS–OBS diagrams, network planning. **Network diagrams:** rules for drawing and numbering network diagrams, time analysis, critical path method (*CPM*). **Organization of project management:** Project quality management. Managing scope, time, and costs, project progress evaluation. Project risk management. Project implementation, monitoring and control. **Software tools for project management:** overview of relevant software packages, introduction to *MS Project*.

Practical lessons

Audio-visual exercises that follow the theoretical lessons, calculation exercises (applying CPM method: creation of a network diagram structure, event numbering, progressive and regressive time calculation, identification of critical path within a network diagram), application of project management software tools (MS Project), presentation and defence of a project assignment on a topic from the course syllabus.

Literature

[1.] Jovanović Predrag (2005). *Upravljanje projektom*. Univerzitet u Beogradu, Beograd: Fakultet organizacionih nauka.

[2.] Stanimirović Predrag (2009). *Mrežno planiranje i MS PROJECT*. Univerzitet u Nišu, Niš: Prirodno matematički fakultet.

[3.] Glisovic Srdjan (2018). *Environmental Life Cycle Management as a Framework for Successful Project Development, Management and Safety*. The European Society of Safety Engineers.

[4.] Petronijević Predrag (2006). *Brzi vodič kroz MS PROJECT*. Univerzitet u Beogradu, Građevinsko-arhitektonski fakultet.

[5.] Project Management Institute (2013). *A Guide to the Project Management Body of Knowledge*, Fifth Edition (*PMBOK Guide*). Newtown Square, PE: Project Management Institute.

<table>
<tr><td colspan="10">Number of active classes (weekly)</td></tr>
<tr><td>Lectures</td><td>2</td><td>Auditory exercises</td><td>1</td><td>Other forms of classes</td><td>0.53</td><td>RS</td><td>-</td><td>Other classes</td><td>-</td></tr>
<tr><td colspan="10">Teaching methods
Lectures, exercises, office hours. Term paper defence.</td></tr>
<tr><td colspan="10">Grading (maximum number of points: 100)</td></tr>
<tr><td colspan="4">Pre-exam requirements</td><td>Points</td><td colspan="3">Exam</td><td colspan="2">Points</td></tr>
<tr><td colspan="4">Activity during lectures</td><td>5</td><td colspan="3">Written exam (practical part of the exam)</td><td colspan="2">25</td></tr>
<tr><td colspan="4">Activity during exercises</td><td>5</td><td colspan="3">Oral exam (theoretical part of the exam)</td><td colspan="2">15</td></tr>
<tr><td colspan="4">Colloquium 1</td><td>15</td><td colspan="3"></td><td colspan="2"></td></tr>
<tr><td colspan="4">Colloquium 2</td><td>20</td><td colspan="3"></td><td colspan="2"></td></tr>
<tr><td colspan="4">Term paper</td><td>15</td><td colspan="3"></td><td colspan="2"></td></tr>
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