STUDY PROGRAMME
EMERGENCY MANAGEMENT

MASTER ACADEMIC STUDIES

Study programme name: Higher education institution in which the study programme is implemented: Educational / educational-scientific field:	**Emergency Management** **University of Niš, Faculty of Occupational Safety in Niš** **Technical and technological sciences**
Scientific, professional, or artistic discipline: Type of studies: Scope of studies in ECTS credits:	**Environmental and Occupational Safety Engineering** **Master academic studies** **60 ECTS credits**
Degree title: Duration of studies:	**Master in Disaster and Fire Safety Engineering** **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 **Emergency Management** 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 enable students to apply scientific and professional achievements to solve the problems of the safety of humans and natural and material resources, and to develop emergency management systems.

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

- Development of strategies for safety system management during emergencies;
- Knowledge of international standards, national regulations, and methodological foundations of assessing the risk from natural and other disasters;
- Acquisition of theoretical and practical knowledge about the tasks and operations of civil protection within the emergency safety system;
- Development of strategic and tactical plans for emergency intervention and rescue;
- Development of plans and programs for accident response and for coordination and management of accident mitigation;
- Hazard identification and risk management pertaining to fires and emergencies;
- Analysis of factors influencing human reliability, use of methods for human reliability assessment, and development of strategies for human error reduction during emergencies;
- Modelling and simulation of fires as dynamic systems in space and time;
- Investigation of fire causes, fire traces, methods of determining the fire point of origin, procedures and methods for trace examination, and the operative stages of ire investigation, which are used to write a fire scene investigation report;
- Use of an emergency decision support system;
- Knowledge of methods, facilities, and technologies for the management of torrential watercourses and torrential watersheds and for torrential flood defence;
- Identification of problems in the functioning of the energy sector during

emergencies and maintenance of energy system stability;

- Use of methods for quantifying pollutant toxicity and for predicting environmental effects during emergencies;
- Information dissemination to the public and other relevant subjects during emergencies;
- Development of competences for professional interventions within human resource management in organizations during crises and emergencies;
- Development of critical thinking about the various aspects of human resource management and consideration of possibilities to apply innovative approaches in the emergency management system;
- Use of information systems and communication networks during emergencies;
- Development of project management and use of methods, techniques, and principles of project management in emergency management;
- Innovation activities and teamwork in emergency management;
- Permanent education and development of a knowledge system in emergency management.

The defined aims and objectives indicate three fundamental goals of this study programme:

- Preparing students to directly transition from studying to performing fire safety and emergency management jobs;
- Developing students' knowledge and awareness of the need for lifelong education in the field of emergency management;
- Preparing students to continue their education by pursuing doctoral studies at the Faculty of Occupational Safety in Niš or other higher education institutions in the same or similar fields of study.

STUDY PROGRAMME OUTCOMES – STUDENTS' COMPETENCES UPON PROGRAMME COMPLETION

Completion of the master academic studies study programme **Emergency Management** provides students with the general and course-specific competences that are relevant for emergency management, whereby they acquire highly specialised academic knowledge, abilities, and skills to rely on a variety of disciplines when solving complex emergency problems.

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

- Application of multidisciplinary knowledge from various fields of research; use of a holistic perspective to analyse and solve emergency management problems;
- Development of communication skills within the immediate and broader surrounding during emergencies;
- Proficiency regarding procedures, processes, and methods for identifying and assessing the risk of natural disasters;
- Analyses and syntheses of the data collected from previous accidents in order to predict the effects and solve problems in new emergencies;
- Staying up to date with and using new technical and technological solutions in the field of fire safety engineering and emergency management;
- Use of IT in emergency management;
- Capacity building and cooperation improvement aimed at enhancing the quality of life in the immediate and broader work and living environment;
- Communication and teamwork (in a multidisciplinary team) and the use of innovative approaches to emergency management;
- Development of professional ethics and professional responsibility for solving emergency management problems.

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

- Definition, coordination, and implementation of an emergency management system, including the selection of practical tools methods, and techniques;
- Definition of technical, organizational, and personal characteristics of good emergency management;
- Hazard identification in emergencies, analysis of cause-and-effect relationships, and use of technical safety measures before, during, and after emergencies;
- Use of methodologies for natural disaster risk assessment;
- Use of methodologies for conducting studies of computer fire simulations and analysing simulation results to solve practical fire safety problems;
- Visual analysis of fires while they are active and visual analysis of subsequent fire traces;
- Creation of databases on human errors in emergencies and formulation of error mechanisms and performance shaping factors;
- Design of procedures and strategies for human error reduction;
- Implementation of preventive and operative safety measures;
- Organization, coordination, and management of civil protection in case of emergencies;
- Selection, use, and handling of intervention and rescue equipment in specific situations;

- Development of risk reduction plans and protection and rescue plans for emergencies;
- Use of information systems and decision support systems for independent solution of decision-making issues in emergency management;
- Assessment of soil vulnerability from erosion and torrential floods and planning of climate change protection and adaptation measures;
- Understanding, control, and monitoring of energy sector operation during emergencies;
- Analysis of ecotoxicological test results and of the effects of pollutants on individual organisms, populations, and ecosystems;
- Establishment of public relations in environmental protection and management, fire safety, and emergency management;
- Development of leadership and possession of a developed system of knowledge about modern concepts, strategies, processes, and possibilities of human resource management for emergency management;
- Use of available online services and content to deal with emergencies;
- Innovation activities and teamwork in emergency management;
- Planning of and staying up to date with projects, organization of project activities, and use of modern software tools for project management in the emergency management system;
- Optimization and management of available resources in the emergency management system.

Learning outcomes – Possession of highly specialised academic knowledge of the field of emergency management; critical analysis, understanding, and practical application within the context of protecting human lives and natural and material resources; developed management skills to innovatively solve complex emergency problems; socially responsible decision making; project implementation; undertaking of research and other initiatives in emergency management and occupational and environmental engineering.

The acquired competences enable master students to work in the Sector for Emergency Management, in state administration bodies and public institutions, in inspection services, in research institutions, in project and consulting teams (developing emergency protection and rescue plans or conducting natural disaster risk assessments), as well as in industry, the civil sector, and the like.

Upon study programme completion, in addition to highly specialised academic knowledge, which concerns the theoretical principles and processes of emergency management, and the ability to critically evaluate it and use it in practice, students will acquire competences to pursue specialist academic or doctoral academic studies in the same or related fields of study.

STUDY PROGRAMME PURPOSE

The purpose of the master academic studies study programme **Emergency Management** is to educate students to receive a master's degree in disaster and fire safety engineering, thus meeting the needs of the society and offering the possibility of further academic progress in keeping with contemporary demands of safety, fire safety, and emergency management. The study programme is designed to provide acquisition of competences and development of academic skills in emergency management. In view of the social, economic, and broader community importance of the safety of humans and natural and material resources, and, accordingly, the importance of emergency management, professionals in this field possess socially justifiable and useful competences.

Scientific disciplines on this level of studies allow students to master specific emergency management theoretical knowledge and applicative skills and to develop critical thinking and ability to work as part of a team, while 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 safety system management during emergencies. This study programme allows students to acquire basic scientific research competences and to develop professional and methodological culture so as to continue with their education by pursuing doctoral studies.

ADMISSION REQUIREMENTS

The Faculty of Occupational Safety will enrol 32 students in the first year of master academic studies study programme Emergency Management. 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 re defined 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 Emergency Management 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 10 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 25.42 %;
- Scientific-professional 15.00 %;
- Professional-applicative 59.58 %.

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 20.10-20.38 (20.22 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 0.67-1.20 (0.47 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 fire safety engineering and emergency management. 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 fire safety engineering and emergency management 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 Disaster and Fire Safety Engineering

The diploma supplement more specifically designates the study programme within the degree title

Master in Disaster and Fire Safety Engineering – Emergency Management

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.MZOP03	Fire Modelling and Simulation	1	2	2	0.67	0	0	6	R	PA
2.	19.MUVS01	Emergency Management Systems	1	2	2	0	0	0	6	R	TM
3.	19.MZNR05	Human Reliability Analysis	1	2	2	0	0	0	6	R	PA
4.	19.MUVS02	Civil Protection	1	2	2	0	0	0	6	R	PA
5.	19.MUVS03	Decision Making Theory	1	2	2	0	0	0	6	E	TM
	19.MUVS04	Soil Erosion and Torrential Flood Protection	1	2	2	0	0	0	6	E	PA
	19.MUVS05	Energy Sector and Emergencies	1	2	2	0	0	0	6	E	TM
	19.MZZS06	Ecotoxicology	1	2	2	0	0	0	6	E	SP
6.	19.MZOP09	Intervention and Rescue Tactics	2	2	2	0	0	0	5	R	SP
7.	19.MMZS11	Information and Public Relations	2	2	2	0	0	0	5	E	TM
	19.MUVS06	Human Resource Management within Emergency Management	2	2	2	0	0	0	5	E	TM
8.	19. MUVS07	Information and Communication Networks and Systems	2	2	1	0.53	0	0	5	E	SP
	19. MUVS08	Disaster Risk Assessment	2	2	2	0	0	0	5	E	SP
	19.MZNR16	Project Management	2	2	1	0.53	0	0	5	E	TM
	19.MZOP10	Fire Expertise	2	2	2	0	0	0	5	E	PA
9.	19.MUVS09	Internship	2	0	0	0	0	6	3	R	PA
10.	19.UVS10A	Master's Thesis – Research	2	0	0	0	8	0	8	R	PA
11.	19.UVS10B	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	8.67 – 9.20		10	60		
Total active classes per year				40.20-40.67				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. Fire Modelling and Simulation
2. Emergency Management Systems
3. Human Reliability Analysis
4. Civil Protection
5. Intervention and Rescue Tactics
6. Internship
7. Master's Thesis – Research
8. Master's Thesis – Writing and Defence

Course name: Fire Modelling and Simulation		
Course status: Required	**Course code:**	19.MZOP03
ECTS credits: 6		

Requirements: -

Course aim

Acquisition of knowledge about the principles of formulating mathematical models and solving them using computers. Acquisition of knowledge about the modelling and simulation of fire as a dynamic system in time and space.

Learning outcome

Students' ability to:

- identify the problem, set goals, and elaborate a simulation model;
- apply the methodology for computer-based fire simulation;
- analyze simulation results in order to solve practical fire safety issues.

Course outline

Theoretical lessons

Modelling and models: Definitions. Stages of modelling (problem definition, model construction, data collection). Types of models (physical, mathematical, conceptual, computer). **Algorithms**: Recursive and iterative. Series and parallel. Stochastic and Deterministic. **Mathematical models**: Linear and nonlinear. Static and dynamic. Explicit and implicit. Discrete and continuous. Deterministic and Probabilistic. Finite element models. **Computer simulation**: Definition. Simulation elements (real system, model, computer). Classification of simulation models. **Fire modelling:** Procedure of modelling (real fire, physical model, mathematical model, numerical model, computer model). Constraints of modelling. **Fire models:** Definition. Probabilistic (Stochastic) and Deterministic models. Classification of models according to output parameters (within specific fire stages, temperature regime of fire, temperature and movement of fire products, response time of alarms and sprinklers, evacuation). Classification of models according to control volume definition (zone and field models). **Probabilistic models**: Model description. Types of models (network, statistical, simulation models). Monte Carlo simulation (direct, dynamic, and kinematic method). **Deterministic models**: algebraic, zone, and field models. **Zone models:** Model description. Model constraints. Types of models (one-zone and two-zone models). **Field Models – CFD models**: Model basics (differential equations of the conservation of mass, energy, and impulse, ideal gas law, etc.). Types of models (Reynolds Averaged Navier-Stokes (RANS) equations, Large Eddy Simulation (LES), and direct numerical simulation (DNS)). **Fire modelling process**: Definition of modelling goal. Adoption of fire scenarios. Entry of input data. Fire model selection. Model verification through sensitivity analysis. Calculation of fire parameters. Output data. **Fire modelling**: Dynamics and parameters of indoor fires. Fire alarm and suppression systems. Dynamics and parameters of outdoor fires. **Fire simulation software packages**: **CFAST (Consolidated Model of Fire and Smoke Transport) and FDS (Fire Dynamics Simulator).**

Practical lessons

Learning about the features of fire simulation software packages. Definition of fire scenarios. Definition of input (types and distribution of mass fire load, location and thermal properties of hotspots, geometry of the space under fire, ambient conditions, simulation time, definition of numerical network resolution and sensors that measure heat flux and temperature) and output parameters of a fire (calculation of fire parameters: combustion rate and heat release amount, fire development and smoke movement, smoke temperature, concentration of combustion products, heat radiation

intensity, heat flux temperature and intensity on hard surfaces, creation of a diagram of how they change over time, etc.).

Literature

[1.] Pešić Dušica, Zigar Darko (2019). *Modeliranje i simulacija požara – interni materijal za pripremu ispita*. Niš: Univerzitet u Nišu, Fakultet zaštite na radu u Nišu.

[2.] Guan Heng Yeoh, Kwok Kit Yuen (2009). *Computational Fluid Dynamics in Fire Engineering: Theory, Modelling and Practice*. Oxford: Butterworth-Heinemann.

[3.] James G. Quintiere, Colleen A. Wade (2016). *Compartment Fire Modeling*. New York: Springer.

[4.] Donatella Spano, Valentina Bacciu, Michele Salis, Costantino Sirca (2012). *Modelling Fire Behaviour and Risk*. Lecce: Centro Euro-Mediterraneo sui Comiamenti Climatici.

[5.] Ivan Antonov, Rositsa Velichkova, Svetlin Antonov, Kamen Grozdanov (2020). *Mathematical Modeling and Simulation of Development of the Fires in Confined Spaces*. In Fire Safety and Management Awareness. London: IntechOpen Limited.

Number of active classes (weekly)

Lectures	2	Auditory exercises	2	Other forms of classes	0.67	RS	-	Other classes	-

Teaching methods

Lectures (including multimedia presentations and discussions), exercises (auditory and practical (using PCs)), and office hours

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	15		
Colloquium 2	15		
Term paper	20		

Course name: Emergency Management Systems		
Course status: Required	**Course code:**	19.MUVS01
ECTS credits: 6		

Requirements: -

Course aim

Acquisition of knowledge about the causes, development, and effects of emergencies and about institutional frameworks for emergency management.

Learning outcome

Students' ability to:

- identify emergency occurrence indicators;
- manage risk of emergency occurrence;
- implement technical safety measures before, during, and after an emergency.

Course outline

Theoretical lessons

Emergencies: Basic terms, classification, characteristics, and development stages. Natural emergencies – earthquakes, landslides, floods, cyclones, natural fires, infectious diseases (characteristics and effects). **Technical and technological emergencies** – classification of technological systems according to hazard level; causes of emergencies; accidents in chemical industry, petroleum industry, and transport. Emergencies of a social nature – social unrest, terrorist actions, diversions. **International legislation system for emergency management:** International organizations and associations in emergency management. Legislation system for emergency management in Serbia. **Standards for emergency risk management**. Standards and standardization. Emergency risk management. Criteria for hazard identification and determination of the probability of emergency occurrence. **Technical and technological solutions as an element of emergency management**. Planning and regulation of optimal distribution of economic zones and buildings. Rules and standards of building and infrastructure construction. Protection of critical infrastructure and potentially hazardous buildings. Engineering and technical safety measures in the event of earthquakes, floods, landslides, rockfalls, torrential floods, and snow avalanches. Monitoring emergencies. **Emergency management in Serbia**. Characteristics of management when declaring emergencies. Structure of the emergency protection and rescue system. Emergency management sector. Emergency protection and rescue plans. System of notification, early warning, and alerting.

Practical lessons

Practical lessons comprise exercises, which follow the theoretical lessons, and include the analysis of emergency event examples. Student research is guided towards a term paper on a topic concerning emergency management, which they have to present and defend.

Literature

[1.] Anđelković Branislav, Milošević Lidija (2017). *Sistemi upravljanja vanrednim situacijama*, Izvodi sa predavanja.

[2.] Elona Pojani, Julinda Keci (Editors). (2020). *Disaster risk management in the Western Balkans: a comprehensive approach on technical and economic perspectives*. Novi Sad: Faculty of Technical Science.

[3.] (2020). *Glossary of terms in disaster risk management and fire safety / Rečnik pojmova iz upravljanja rizikom od katastrofalnih događaja i požara*. Novi Sad: Fakultet tehničkih nauka.

[4.] Coppola P. Damon (2015). *Introduction to International Disaster Management*. Amsterdam: Elsevier.

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

Teaching methods

Lectures, auditory exercises, and office hours. Writing of a term paper on an emergency management topic.

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	30		
Term paper	20		

Course name: Human Reliability Analysis		
Course status: Required	**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.] Jenkins P. Daniel, Stanton A. Neville, Salmon M. Paul, Rafferty A. Laura, Walker H. Guy, Baber Chris (2013). *Human Factors Methods: A Practical Guide for Engineering and Design*. Second Edition. USA: Ashgate Publishing.

[4.] Salmon M. Paul, Stanton A. Neville, Lenne G. Michael, Jenkins P. Daniel, Rafferty A. Laura, Walker H. Guy (2011). *Human Factors Methods and Accident Analysis: Practical Guidance and Case Study Applications*. USA: Ashgate Publishing.

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

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: Civil Protection		
Course status: Required	**Course code:**	19.MUVS02
ECTS credits: 6		

Requirements: -

Course aim

Acquisition of theoretical and practical knowledge about the tasks and methods of civil protection in the emergency protection system.

Learning outcome

Students' ability to:

- implement preventive safety measures;
- implement operational safety measures;
- organize, coordinate, and manage civil protection activities in the event of emergencies.

Course outline

Theoretical lessons

Introduction. Elements and tasks of civil protection. Basic characteristics of civil protection organization. **Evacuation**. Emergency events and the onset of panic. Evacuation procedure. Evacuation procedure in specific cases. Evacuation of animals and property. Calculation of the necessary evacuation time. Evacuation exits and routes. Creation of the evacuation plan. End of evacuation. Formation of an evacuation and rescue team. **Causes of emergencies. Fire**. Development and propagation. Causes affecting fire development and propagation. Fire propagation rate, fire temperature, fire load. Smoke and smoke-filled areas. **Explosions**. Explosive materials. Explosivity concentration limits. **Natural disasters and other accidents**. **Earthquakes.** Definition of earthquakes, consequences of earthquakes, seismic characteristics of Serbia, measurement of earthquake energy, safety, rescue, and human behaviour during earthquakes. **Floods**. Flood defence stages. Flood protection measures. Preventive safety measures. Operational safety measures. **Landslides.** Elements of landslides. Classification of landslides. Types of landslides. Landslide recovery. **Other disasters.** Droughts, hail, ice on water courses. Epidemics, zoonoses, and epiphytotics. **Technical and technological accidents.** Release of hazardous materials in excessive concentrations. Leftover unexploded ordnance. Radiological contamination, radioactive materials. **Rescue**. Handling of injured persons. Check-up of injured persons. First aid. Rescue from affected buildings. Rescue from heights. Rescue from depths. Fire rescue. Rescue from the rubble. Explosion rescue. Rescue due to hazardous materials. Rescue from floods. Flood protection and rescue actions and operations. Ice control activities and operations. Rescue due to snow, snow banks, and avalanches. Rescue due to frostbite. Rescue units for inaccessible areas. Rescue due to lightning strikes and electric shocks. Rescue due to strong winds. Rescue of animals. CBRN contamination protection. Decontamination. Disinfection. Rodent control. Disinsectizaton. Fumigation. Rescue of property.

Practical lessons

Practical lessons are thought as part of exercises, which follow the theoretical lessons and include the project assignment – Evacuation plan with a theoretical and a graphical part.

Literature

[1.] Mihajlović Emina (2016). *Civilna zaštita*. Niš: Univerzitet u Nišu, Fakultet zaštite na radu u Nišu.
[2.] Jazić Aleksandar (2017). *Vanredne situacije i savremeni trendovi razvoja sistema zaštita*. Beograd: Institut za međunarodnu politiku i privredu.

Number of active classes (weekly)

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

Teaching methods

Lectures, auditory exercises, and office hours. Lectures are based on meaningful verbal receptive learning: presentation of background information, presentation of new material, association with previously acquired knowledge, introduction of suitable examples, drawing of conclusions and making of connections with the background information. Exercises are based on interactive learning and completion of a project assignment.

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		
Project assignment	20		

Course name: Intervention and Rescue Tactics

Course status: Required **Course code:** 19.MZOP09

ECTS credits: 5

Requirements: -

Course aim

Acquisition of knowledge to develop strategic and tactical plans for emergency interventions.

Learning outcome

Students' ability to:

- organize, participate, and plan command and operational-tactical actions in emergencies;
- select, use, and handle equipment for intervention and rescue in emergencies.

Course outline

Theoretical lessons

Fire extinguishment. Command of tactical actions of fire extinguishment and rescue: Operational headquarters. Integrated command during large-scale fires, accidents, and explosions. **Tactical firefighting training of fire and rescue units:** Training system. Operational plans of fire suppression and rescue. Pre-fire plans. Analysis of fire and rescue and other interventions. Psychological and physical training of firefighters/rescuers. **Basic rules of fire extinguishment in buildings and different parts of buildings:** Extinguishment of cellar fires. Extinguishment fires on floors. Extinguishment of attic and roof fires. Extinguishment of fires in high-rise buildings. Extinguishment of fires in industrial facilities. **Extinguishment of fires on means of transport:** Extinguishment of motor vehicle fires. Extinguishment of rail transport fires. Extinguishment of airplane fires. **Extinguishment of fires in other specific situations:** Extinguishment of forest fires. Extinguishment of explosive material fires. Extinguishment of fires in radioactive environments. Extinguishment of fires on electrical installations and facilities. **Technical rescue interventions of fire and rescue units:** Procedures, equipment, and agents for technical interventions. Support for victims and rescuers. Helicopter rescue interventions. **Firefighting interventions for accidents involving toxic materials (ammonia, chlorine):** First aid. Stopping leaks from a damaged pipeline. Use of wooden wedges. Use of steel clamps for pipes. Use of pipe sealing cushions. Stopping leaks from a damaged tank in gas phase zones. **Firefighting interventions for accidents involving industrial mutagens:** Hydrogen peroxide. **Firefighting interventions for accidents with teratogens and embryotoxins:** Mercury and its compounds.

Practical lessons

Exercises include calculations in the classroom and demonstrations outside the classroom.

Literature

[1.] Cvetanović Sveta (2020). *Taktika intervencija i spasavanja – interni materijal za pripremu ispita.* Niš: Univerzitet u Nišu, Fakultet zaštite na radu u Nišu.

[2.] Karabasil Dragan, Jakovljević Vladimir (2007). *Ekološke intervencije*. Novi Sad: Visoka tehnička škola.

[3.] Mihajlović Emina, Mlađan Dragan, Janković Žarko (2017). *Procesi i sredstva za gašenje požara*. Niš: Univerzitet u Nišu, Fakultet zaštite na radu.

[4.] Mlađan Dragan (2009). *Sprečavanje i suzbijanje požara, havarija i eksplozija*. Beograd: KPA.

<table>
<tr><td colspan="9">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="9">Teaching methods
Lectures, auditory exercises, presentation and analysis of examples of installed alarm systems, and office hours</td></tr>
<tr><td colspan="9">Grading (maximum number of points: 100)</td></tr>
<tr><td colspan="4">Pre-exam requirements</td><td>Points</td><td colspan="2">Exam</td><td colspan="2">Points</td></tr>
<tr><td colspan="4">Activity during lectures</td><td>5</td><td colspan="2" rowspan="3">Oral exam (theoretical part of the exam)</td><td colspan="2" rowspan="3">40</td></tr>
<tr><td colspan="4">Activity during exercises</td><td>5</td></tr>
<tr><td colspan="4">Colloquium 1</td><td>30</td></tr>
<tr><td colspan="4">Term paper 1</td><td>20</td><td colspan="2"></td><td colspan="2"></td></tr>
</table>

Course name: Internship		
Course status: Required	**Course code:**	19.MUVS09
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 fire and disaster 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.UVS10A

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 solution. 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.

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
Research paper – writing	50	Research paper – defence	50

Course name: Master's Thesis – Writing and Defence		
Course status: Required	**Course code:**	19.UVS10B
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. Decision Making Theory
2. Soil Erosion and Torrential Flood Protection
3. Energy Sector and Emergencies
4. Ecotoxicology
5. Information and Public Relations
6. Human Resource Management within Emergency Management
7. Information and Communication Networks and Systems
8. Disaster Risk Assessment
9. Project Management
10. Fire Expertise

Course name: Decision Making Theory

Course status: Elective	**Course code:**	19.MUVS03
ECTS credits: 6		

Requirements: -

Course aim

Acquisition of knowledge about types and characteristics of decision-making and the decision-making support system.

Learning outcome

Students' ability to:

- make rational decisions under different conditions and demands of their surrounding;
- structure the decision-making problem and properly select a model;
- implement the decision-making support system for independent solutions of decision-making problems pertaining to emergencies.

Course outline

Theoretical lessons

Basic decision-making theories: Systems approach to decision making. Definition and stages of the decision-making process. Application of decision-making theory. **Analysis of decision making**: Structuring of decision-making problems and model selection. Problem of decision making in emergency management. Analysis of decision-making without sampling. Analysis of decision-making with sampling. Decision-making tree and sequential decision making. Utility theory. **Single-attribute decision-making under uncertainty. Multi-attribute utility theory:** Multiple-criteria analysis methods. **Group decision making**: Methods of group decision making. Information systems and support systems for decision making and group decision making. **Expert systems**: Knowledge-based decision-making support systems. Intelligent decision-making support systems. The Internet and decision-making support.

Practical lessons

Calculation exercises, which follow the theoretical lessons; presentation and defence of a term paper on a topic included in the course syllabus.

Literature

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

[2] Nikolić Milan (2012). *Metode odlučivanja.* Zrenjanin: Univerzitet u Novom Sadu, Tehnički fakultet "Mihajlo Pupin".

Number of active classes (weekly)

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

Teaching methods

Lectures and calculation/auditory exercises

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		
Term paper	20		

Course name: Soil Erosion and Torrential Flood Protection		
Course status: Elective	**Course code:**	19.MUVS04
ECTS credits: 6		

Requirements: -

Course aim

Acquisition of knowledge about soil erosion, torrential watercourses, and torrential floods as the most important factors of soil, water, and the environment in general. Learning about the methods and technologies for the regulation of torrential watercourses and drainage basins and for torrential flood defence.

Learning outcome

Students' improved ability to apply their acquired scientific and professional knowledge about the processes of water and aeolian soil erosion, torrential watercourses, and torrential floods to:

- the assessment of soil vulnerability to erosion and the planning of protective measures;
- the assessment of torrential flood threats and the planning of protective measures;
- the planning of climate change adaptation measures.

Course outline

Theoretical lessons

Definition and classification of soil erosion: definition of soil erosion, classification – surface and underground types. **Mechanism of water and aeolian erosion:** analysis of structural relations between soil-rock mass and the mechanisms of exogenous forces. **Primary factors of water and aeolian erosion**: determination of natural (soil composition, plant cover, terrain inclination, precipitation amount and distribution, wind intensity, and others) and social factors (plant cover interventions, agroecological activities, urbanization, and others) of water and aeolian erosion. **Processes and forms of water and aeolian erosion:** process of soil-rock mass destruction, forms: denudation, abrasion, and fluvial, aeolian, glacial, and karst erosion. **Torrential watercourses and torrential drainage basins**: characterization of drainage basin areas aimed at identifying basins in which torrential watercourses may be formed. **Analysis of natural characteristics of torrential drainage basins and erosion areas:** meteorological and hydrological determinants, soil composition, terrain elevation, plant cover. **Hydrology of torrential watercourses**: calculation of expected volumetric flows in relation to the drainage basin surface area, precipitation intensity and runoff coefficient, flow modelling. **Sediment transport in torrential watercourses**: origin and properties of river sediment, bed load, critical velocity. **Principles and systems for the regulation of torrential watercourses and torrential drainage basins**: prevention principle, impact reduction principle, multipurpose systems at the drainage basin. **Methods and facilities for the regulation of torrential watercourse beds**: technical and biotechnical anti-erosion works, flood flow catchment and transformation facilities, regulation works inside and outside river beds. **Torrential flood defence:** modification of water regime, regulation facilities on torrential watercourses. **Environmental bases for the regulation of torrential watercourses**: renaturalization of drainage basins and river beds.

Practical lessons

Determination of the primary factors of water and aeolian erosion. Calculation of soil loss due to water and aeolian erosion. Torrential watercourses and torrential drainage basins. Analysis of the natural characteristics and parameters of torrential drainage basins relevant for the onset of soil erosion, runoff, and sediment transport. Hydrological calculations in torrential watercourses (flood flows). Hydrological calculations in torrential

watercourses (medium and maximum water velocities, compensation and equilibrium gradients). Calculation of sediment transport in torrential watercourses.

Literature

[1] Vasović Dejan (2020). *Erozija zemljišta i zaštita od bujičnih poplava (interni materijal za pripremu ispita).* Niš: Univerzitet u Nišu, Fakultet zaštite na radu u Nišu.

[2] Kostadinov Stanimir (2008). *Bujični tokovi i erozija*. Beograd: Univerzitet u Beogradu, Šumarski fakultet [3.] Ristić Ratko, Malošević Dragan (2011). *Hidrologija bujičnih tokova*. Beograd: Univerzitet u Beogradu, Šumarski fakultet.

[3] Veljković Nebojša i dr. (2015). *Vode Srbije – u vremenu prilagođavanja na klimatske promene (urednik)*, Beograd: Agencija za zaštitu životne sredine Republike Srbije.

[4] Ajla Dorfer i dr. (2018). *Vodič za održivo upravljanje zemljištem na lokalnom nivou u Republici Srbiji*. Beograd: Agencija za zaštitu životne sredine Republike Srbije.

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)	20
Activity during exercises	5	Oral exam (theoretical part of the exam)	20
Colloquium 1	15		
Colloquium 2	15		
Term paper	20		

Course name: Energy Sector and Emergencies		
Course status: Elective **ECTS credits:** 6	**Course code:**	19.MUVS05

Requirements: -

Course aim

Acquisition of basic knowledge about problems in the functioning of the energy sector during emergencies for the purpose of reducing the effects on environmental quality as well as maintaining the state of the energy sector and stability of the energy production system. Definition of preventive and corrective safety measures to avoid problems in electricity production and corrective measures to mitigate the consequences.

Learning outcome

- Ability to understand, control, and monitor the functioning of the energy sector in emergencies.
- Acquisition of skills for environmental system management in energy sector emergencies.
- Ability to use energy indicators and analyze the application of the fundamental principles of sustainable energy development.

Course outline

Theoretical lessons

Energy system protection and rescue system in emergencies. Causes of emergencies in the energy sector. Environmental pollution sources in the energy sector and ranking of effects. Location of energy industry facilities in relation to residential areas from the safety perspective. **Planning of measures and activities for protection against and minimization of conditions for the occurrence of anthropogenic emergencies in the energy sector.** Definition of necessary preventive measures for the reduction of the impact of natural disasters on the operation of energy facilities. **Analysis of implementation of the National Protection and Rescue Strategy**. Analysis of rescue activities for people, property, the environment, and the main elements of the energy sector. Mitigation of the effects of energy facilities' cessation of operation. **Planning of the safety service operations**. Emergency service response in mines and thermal power stations in the event of earthquakes and floods. Cracking of ach pond embankment and release of ash. Uncontrolled discharge of untreated mine water. Recovery of abandoned mines and degraded soil of surface coal mines as an emergency prevention measure. Operation of small hydropower plants during a dry period and prevention of biological disturbance in rivers. Operation of wind generators during compromised stability by strong winds. **Actions of authorized bodies for emergency effects mitigation.** Organization of collective protection in emergencies and conditions for the preservation of energy stability. Authorities of state bodies for emergency effects mitigation in the energy sector. International cooperation in case of problems with electricity supply. Coordination between protection and rescue system entities in emergencies.

Practical lessons

Practical lessons comprise exercises, which follow the theoretical lessons and include the analysis of practical examples of how the energy sector works during emergencies. Exercises include the writing and defence of a term paper concerning emergencies in the energy sector.

Literature

[1] Malenović Nikolić Jelena (2020). *Energetski sektor i vanredne situacije (interni materijal za pripremu ispita)*. Niš: Univerzitet u Nišu. Fakultet zaštite na radu u Nišu.

[2] Jazić Aleksandar (2017). *Vanredne situacije i savremeni trendovi sistema zaštite.* Beograd: Institut za međunarodnu politiku i privredu.
[3] Blagojević Marija (2011). *Bezbednost, zaštita i spasavanje u vanrednim situacijama*. Beograd: Zadužbina Andrejević.

Number of active classes (weekly)

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

Teaching methods

Lectures, auditory exercises, and office hours. Writing of a term paper on a topic of energy sector functioning during emergencies.

Grading (maximum number of points: 100)

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

Course name: Ecotoxicology		
Course status: Elective	**Course code:**	19.MZZS06
ECTS credits: 6		

Requirements: -

Course aim

Acquisition of knowledge about the mechanisms of toxic effects of pollutants and the toxic effects on individual organisms, populations, and ecosystems. Learning about the methods for quantifying pollutant toxicity and predicting environmental effects.

Learning outcome

Students' ability to:

- understand the basic principles of ecotoxicology;
- understand the conditions under which the effects of pollutants impact individual organisms, populations, and ecosystems;
- understand the consequences caused by pollutants;
- analyze the results of ecotoxicological examinations and analyze exposure scenarios;
- perform risk assessment, calculate parameters, and interpret results.

Course outline Theoretical lessons

Introduction to ecotoxicology: Definition, subject matter, and tasks of ecotoxicology, basic terms and principles of ecotoxicology. **Pollutants and their fate in the ecosystem:** Primary pollutant classes (inorganic substances – metals, nonmetals, gaseous substances, radionuclides, nanoparticles, etc.; organic substances - hydrocarbons, polychlorinated biphenyls, organochloride, organophosphorus, carbamate, and pyrethroid pesticides, pharmaceuticals, etc.). Ways in which pollutants enter the environment. Factors influencing the transport and distribution of pollutants (sorption, degradation, and biodegradation of organic substances, bioaccumulation and biomagnification of persistent substances, etc.). **Impact of pollutants on individual organisms:** Exposure pathways. Toxicokinetics and toxicodynamics; Carcinogenesis, genotoxicity, mutagenesis. **Impact of pollutants on populations, communities, and ecosystems:** Population dynamics. Genetically acquired resistance to pollutants. Changes in communities and ecosystems. **Ecotoxicological risk assessment:** Biomonitoring. Biomarkers and their role in risk assessment. **Chemical accidents:** Options for prevention, action, and mitigation of harmful effects of accidents induced by toxic substances. **Regulatory aspects of ecotoxicology.**

Practical lessons

Calculations: NOAEL (no observed adverse effect level), LOAEL (lowest observed adverse effect level), TDI (tolerable daily intake), ADI (acceptable daily intake), GV (guideline value); qualitative and quantitative characterization of selected pollutants present in water, air, soil, and plants. Interpretation of results: database search for toxicity data for a given set of pollutants. Interpretation of the results obtained from the database search. Writing and defence of term papers.

Literature

[1] Golubović Tatjana (2015). *Ekotoksikologija – interni materijal za pripremu ispita*. Niš: Univerzitet u Nišu, Fakultet zaštite na radu.

[2] Vitorović Slavoljub, Milošević Milenko (2002). *Osnovi toksikologije sa elementima ekotoksikologije*. Beograd: Univerzitet u Beogradu, VIZARTIS Beograd.

[3] Jablanović Miodrag, Jakšić Predrag, Kosanović Katica (2003). *Uvod u ekotoksikologiju*. Kosovska Mitrovica: Univerzitet u Prištini, Kosovska Mitrovica.

[4] Walker Colin H., Sibly Richard M., Hopkin Steve P., Peakall David B. (2012). *Principles of Ecotoxicology.* Boca Raton, Florida: CRC Press Taylor and Francis Group.

[5] Walker Colin (2014). *Ecotoxicology – Effects of Pollutants on the Natural Environment.* Boca Raton, Florida: CRC Press Taylor and Francis Group.

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

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: Information and Public Relations		
Course status: Elective	**Course code:**	19.MMZS11
ECTS credits: 5		

Requirements: -

Course aim

Acquisition of knowledge about methods and ways of sharing information with different target groups in order to gain communication skills necessary for the manager profession. Provision of a comprehensive view of basic concepts and principles of public relations and explanation of the role and importance of public relations.

Learning outcome

Students' ability to:

- better understand communication practice and acquire communication skills;
- understand the role and function of public relations;
- establish public relations in the fields of environmental protection and management;
- communicate for the purpose of creating, maintaining, and improving good relations with the public.

Course outline

Theoretical lessons

Information: definition and structure of information, basic characteristics of information, functions of information**. Message:** definition, structure, and types of messages, redundance, factographic and value messages. **Information sharing with the public:** definition and functions of information sharing, socially engaged and tendentious information sharing. **Communication:** definition of communication, types of communication practice: interpersonal and mass communication. **Models of information and communication systems:** origin of information and communication systems, Lasswell's, Shannon and Weaver's, Vivian's, and Vreg's information and communication systems. **Functions of information and communication systems**: basic functions and derived functions of information and communication systems. **Types of communication**: written, verbal, paraverbal, and nonverbal communication. **Receiving subsystems of information and communication systems:** mass, audience, public, target public**. Public relations**: definition and parameters, strategy of public relations, communication with the public, communication with professional circles and authorized bodies. **Methods of public relations:** press conferences, lobbying and sponsorships as a method of communication with the public. **Public relations and the environment:** importance of communication, communication strategy, creation of effective communication, plan of communication: incoming information, outgoing information, messengers, personnel, training and practice, monitoring, updates, and adjustment. Territorial and local systems of notifying and informing the public during emergencies. **Communication with the media regarding the environment**: traditional and new media**.** Local media and information about the environment. **Aarhus convention and the right of citizens to timely information about the environment**: right to information about the environment, collection and delivery of information about the environment, information and communication systems and environmental protection.

Practical lessons

Auditory exercises: discussions based on content analysis about information sharing by traditional and new media concerning the environment; discussions based on analysis of information sharing and public relations in authorized institutions, primarily the

Environmental Protection Agency of Serbia with the Serbian Ministry of Environmental Protection, and the Emergency Management Sector with the Ministry of Internal Affairs; analysis of good practice examples of information sharing and of public relations; analysis of implementation of the Aarhus convention in Serbia; defence of term papers.

Literature

[1] Stojković Branimir, Radojković Miroljub (2009). *Informaciono komunikacioni sistemi*. Beograd: CLIO
[2] Mandić Tijana (2003). *Komunikologija–psihologija komunikacije*. Beograd: CLIO
[3] Blek Sem (2003). *Odnosi s javnošću*. Beograd: CLIO
[4] Bartel Van de Walle, Turoff Murray & Hiltz Starr Roxanne (2009). *Information Systems for Emergency Management*. New York & London: M.E. Sharpe
[5] Jelenković Predrag, Jelenković Ljiljana (2012). *Odnosi s javnošću u oblasti zaštite životne sredine*. Beograd: Čigoja štampa

Number of active classes (weekly)

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

Teaching methods

Lectures, presentations, discussion, 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: Human Resource Management within Emergency Management

Course status: Elective **Course code:** 19.MUVS06

ECTS credits: 5

Requirements: -

Course aim

Acquisition of knowledge about basic theoretical issues of human resource management (HRM) and the particularities of human resource development (HRD) in an emergency management system. Development of competences for professional interventions in HRM in organizations during crises and emergencies. Acquisition of knowledge and skills for efficient action for the purpose of HRD and emergency training. Development of critical thinking about various aspects of human resource management and development, consideration of possibilities for innovative approaches in the emergency management system.

Learning outcome

- Possession of a developed knowledge system about modern concepts, strategies, processes, and possibilities of HRM that are necessary for emergency management; 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;
- 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 safety goals in emergency management (e.g. planning, recruitment, or mobilization of appropriate resources with the adequate combination of emergency management experience, knowledge, and skills, etc.);
- Developed competences – knowledge and skills for efficient HRD, education, and training for emergencies;
- Developed competences – knowledge and skills for team management, communication, and conflict management in crises and emergencies;
- Ability to implement HRM policy in accordance with operational requirements, regulations, and international recommendations in the field of disaster risk reduction and emergency management.

Course outline

Theoretical lessons

Human resource management: HRM as an educational and scientific discipline (term, subject matter, aims, activities, factors, and development). Necessity and significance of HRM in the emergency management system – entities of the system for disaster risk reduction and emergency management at the national and international level. HRM in organizations during emergencies (governance, management, command – terminological distinction; basic postulates of crisis management). **Strategic human resource management:** term, aims, formulation of strategy and strategic guidelines for directing and engaging human resources in emergency management. **Work analysis, design, and redesign** (in terms of risks, hazards, harms, and occupational and environmental safety. **Human resource planning, staffing, and selection. Development, training and knowledge management for emergencies**. **Evaluation of work success, awards and motivation**. **Emergency teams and teamwork (emergency management sectors)**. **Crisis communication and conflict management. Vulnerability and increased awareness and resilience of the community to disasters and emergencies. Safety challenges and threats and human resource management in the future**.

Practical lessons

Auditory exercises, which follow the theoretical lessons and include the presentation and defence of term papers, pertaining to the current issues of HRM and HRD in terms of safety and emergency management. Analysis of case studies and innovative approaches of HRM using the examples in the national and international emergency management context.

Literature

[1] Nikolić Vesna (2019). *Menadžment ljudskih resursa – skripta.* Niš: Fakultet zaštite na radu u Nišu.

[2] Tancredi Nicholas. 2013). *Emergency & Crisis Management in Human Resource Management & Development*. IFPO. https://www.ifpo.org/wp-content/uploads/2013/08/Tancredi_Emergency_Management.pdf

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

[4] 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 u Nišu.

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

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: Information and Communication Networks and Systems		
Course status: Elective	**Course code:**	19. MUVS07
ECTS credits: 5		

Requirements: -

Course aim

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

Learning outcome

Knowledge about the methods of organizing data, communication networks, and information systems in emergency management. Students' ability to:

- understand the principles and concepts of data organization;
- understand how computer networks and general-purpose networks work;
- use available online services and content for emergency management.

Course outline

Theoretical lessons

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. Graphic data display for the purpose of risk analysis. Sensor networks. Compromised services of information systems. **Information systems in emergencies:** Use of information systems in emergencies. Public Services. GIS systems. Web services. Specialized systems. Practical examples.

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 emergency management, all of which stimulates research and use of information and communication networks in engineering practice.

Literature

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

[2] Jovanović i drugi (2012). *Geografski informacioni sistemi*. Novi Sad, Beograd: Univerzitet u Novom Sadu, Univerzitet Singidunum.

[3] Seen James A. (2011). *Informaciona tehnologija - principi, praksa, mogućnosti*. Beograd: Kompjuter biblioteka.

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

[5] Van De Walle Bartel, Turoff Murray, Roxanne Hiltzl Starr. (2010). *Information Systems for Emergency Management*. London, New York: Routledge (Taylor Francis Group). https://doi.org/10.4324/9781315703473

[6] Jin David, Lin Sally (Eds.). (2011). *Advances in Computer Science, Intelligent System and*

Environment. Advances in Intelligent and Soft Computing. Berlin, Heidelberg: Springer-Verlag. doi:10.1007/978-3-642-23753-9

Number of active classes (weekly)

Lectures	2	Auditory exercises	1	Other forms of classes	0.53	RS/IR	-	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	Written exam (practical part of the exam)	15
Activity during exercises	5	Oral exam (theoretical part of the exam)	25
Colloquium 1	30		
Term paper	20		

Course name: Disaster Risk Assessment		
Course status: Elective	**Course code:**	19. MUVS08
ECTS credits: 5		

Requirements: -

Course aim

Acquisition of methodological bases of risk assessment for natural and other disasters. Acquisition and adoption of theoretical and practical knowledge about risk reduction planning and creation of emergency protection and rescue plans. Learning about organizational/institutional aspects, regulations, and standards pertaining to disaster risk prevention and reduction.

Learning outcome

Students' ability to:

- use the necessary methodological tools for the assessment of the risk of natural and other disasters;
- create risk reduction plans and emergency protection and rescue plans;
- create protection plans for critical infrastructure and development plans for the prevention and reduction of risk of natural and other disasters;
- control the planning process and the quality of developed planning documents;
- implement regulations and standards for disaster risk prevention and reduction.

Course outline

Theoretical lessons

Concept of natural disasters, technical and technological accidents, and catastrophic events, hazards, and risks. Assessment creation process. Definition of internal and external parameters for scenario development. Determination of the nature and level of risk from potential hazard, threat, and consequences that may endanger human life and health, property, and the environment. Risk identification and definition of risk types. Risk assessment methodology and regulations concerning risk prevention and reduction; regional and national initiatives for disaster risk reduction (ARISE); monitoring of disaster risks (terminology, indicators, best practice); professional standards and methodologies for risk assessment; risk assessment techniques; planning as a process – planning goals, functions, tasks, principles, methods, and techniques; development planning of the disaster risk prevention and reduction system; creation of risk reduction plans and protection and rescue plans; creation of critical infrastructure protection plans.

Practical lessons

Application of acquired methodologies and techniques to the assessment of the risk of natural and other disasters and creation of protection and rescue plans. Practical work on creating risk reduction and protection and rescue plans. Familiarization with the equipment and tools for emergency response.

Literature

[1] Mirjana Laban, et al (Eds). (2020). *Fire safety in buildings: a Western Balkan Approach and Practice.* Novi Sad: Faculty of Technical Science.

[2] (2020). *Glossary of terms in disaster risk management and fire safety / Rečnik pojmova iz upravljanja rizikom od katastrofalnih događaja i požara*. Novi Sad: Fakultet tehničkih nauka.

[3] Landesman Linda Y., Burke Rita V. (2017) *Landesman's Public Health Management of Disasters: The Practice Guide*, American Public Health Association.

[4] Cvetković Vladimir M., Filipović Marina. (2017). *Pripremljenost za reagovanje na rizike od katastrofa*. Beograd: Zadužbina Andrejević.

[5] Keković Zoran, Savić Suzana, Komazec Nenad, Milošević Mladen, Jovanović Dragiša.

(2011). *Procena rizika u zaštiti lica, imovine i poslovanja*. Beograd: Centar za analizu rizika i upravljanje krizama.

[6] Pine John C. (2009). *Natural Hazards Analysis: Reducing the Impact of Disasters*. Taylor Francis Publishers.

Number of active classes (weekly)

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

Teaching methods

Lectures, auditory exercises, presentation of examples, and coordination of students' individual work on creating a risk assessment and a protection and rescue plan

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		
Term paper 1	20		
Colloquium 1	30		

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

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.
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" rowspan="2">Oral exam (theoretical part of the exam)</td><td colspan="2" rowspan="2">15</td></tr>
<tr><td colspan="4">Colloquium 1</td><td>15</td></tr>
<tr><td colspan="4">Colloquium 2</td><td>20</td><td colspan="3" rowspan="2"></td><td colspan="2" rowspan="2"></td></tr>
<tr><td colspan="4">Term paper</td><td>15</td></tr>
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Course name: Fire Expertise

Course status: Elective | **Course code:** 19.MZOP10

ECTS credits: 5

Requirements: -

Course aim

Study of the causes of fire outbreaks, traces of fire, ways and methods of determining the point of origin, procedures and methods for trace examination, and operational stages during forensic fire investigation, on the basis of which the investigation report is written.

Learning outcome

Students' ability to:

- visually analyze fires while they occur and traces of fire after the fact;
- interpret results obtained from fire trace analysis in the laboratory;
- determine the cause of a fire based on the analysis of collected evidence;
- write an investigation report.

Course outline

Theoretical lessons

Fire causation background: Criminalistic classification of fire causes. Classification of fire causes by the manner of heat supply or generation. **Fire causes:** Electricity. Static electricity. Welding. Natural causes. Mechanical causes. Self-ignition. **Traces of fire inside and outside buildings:** Traces on objects in the building. Traces on materials in the building. Traces on structural elements. Traces on installations in the building. Traces around the building. Traces on the building exterior. Traces inside the building. Traces at the point of origin. **Methods for determining the fire point of origin**. Static method. Dynamic method. Method of elimination. **Procedures and methods during forensic investigation**. Definition of trace, identification of traces, classification of traces. Operational stages during forensic investigation. Photography – purpose and principles of use. **Physicochemical methods for trace examination**. Non-destructive methods (X-ray fluorescence, defectoscopy, and diffraction). Destructive methods (laser microspectral analysis, atomic absorption spectroscopy, chromatographic methods). **Fire scene investigation**. General requirements for fire scene investigation. Stages of investigation during a fire. Stages of investigation after a fire. Elements of the investigation report.

Practical lessons

Revision of the most important aspects of fire expertise that were previously covered during theoretical lessons. Analysis of different fire causes based on photographs of traces from burned buildings. Writing of a fire scene investigation report for hypothetical buildings based on their contents and potential fire causes.

Literature

[1] Blagojević Milan (2017). *Tehnička ekspertiza požara i eksplozija – interni materijal za pripremu ispita*. Niš: Univerzitet u Nišu, Fakultet zaštite na radu u Nišu.
[2] Aleksić Živojin, Kostić Radoslav (1982). *Požari i eksplozije*. Beograd: Privredna štampa.
[3] Đovčoš Martin (2015). *Veštačenje požara i eksplozija*. Beograd/Zemun: AGM knjiga.
[4] Almirall Jose, Furthon Kenneth (2004). *Analisys and Interpretation of Fire Scene Evidence*. CRC Press LLC.
[5] Daeid Niamh (2004). *Fire Investigation*. CRC Press LLC.

<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, auditory exercises, presentation and analysis of examples of installed alarm systems, and office hours</td></tr>
<tr><td colspan="10">Grading (maximum number of points: 100)</td></tr>
<tr><td colspan="5">Pre-exam requirements</td><td>Points</td><td colspan="2">Exam</td><td>Points</td></tr>
<tr><td colspan="5">Activity during lectures</td><td>5</td><td colspan="2" rowspan="3">Oral exam (theoretical part of the exam)</td><td rowspan="3">40</td></tr>
<tr><td colspan="5">Activity during exercises</td><td>5</td></tr>
<tr><td colspan="5">Colloquium 1</td><td>30</td></tr>
<tr><td colspan="5">Term paper 1</td><td>20</td><td colspan="2"></td><td></td></tr>
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