STUDY PROGRAMME
FIRE SAFETY ENGINEERING

MASTER ACADEMIC STUDIES

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

STUDY PROGRAMME OBJECTIVES

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

The **aim** of the study programme is to enhance students' competences and academic knowledge in the field of fire safety engineering and to teach them to apply scientific and professional achievements to solve fire safety problems and to manage and develop modern fire protection systems.

Programme **objectives** include the acquisition of general and specific theoretical knowledge and practical skills for:

- Identification of occupational and environmental fire risk and hazards;
- Analysis of technological processes from the aspect of implementing fire and explosion protective measures;
- Engineering calculations of combustion processes pertaining to stoichiometric and thermodynamic issues;
- Identification and analysis of hazards and protection against electrically-induced fires and explosions;
- Design and maintenance of fire alarm and extinguishment systems;
- Organization and management of a fire protection system;
- Organization and management of interventions, rescue, evacuation, and disaster and fire effects mitigation;
- Fire and explosion expertise;
- Project management in fire safety;
- Development and use of methodologies, methods, tools, and procedures in fire/explosion protection system management;
- Use of IT in fire safety engineering;
- Human resource management and development in a fire protection system;
- Critical analysis of current fire safety problems and particularities of studying and solving them;
- Innovative activities and teamwork;
- Permanent education and development of a knowledge system in fire safety.

The defined aim and objectives indicate two fundamental goals of the study programme – first, training for direct transition from studying to performing fire protection jobs and second, and second, 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 Fire Safety Engineering provides students with the following **general competences**:

- Prediction of solutions and consequences;
- Proficiency in methods, procedures, and processes of risk identification;
- Development of critical thinking and approach to problem solving;
- Practical application of knowledge;
- Development of communication skills in the immediate and broader surrounding;
- Development of professional ethics.

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

- Assessing and preventing risks of fire and explosions;
- Supervising fire and explosion protection;
- Optimizing and managing available resources in a fire protection system;
- Creating reports on the state of fire and explosion protection;
- Devising plans and creating technical documentation for fire and explosion protection;
- Designing fire monitoring, alarm, and extinguishment systems;
- Organizing and managing interventions, rescue, evacuation, and disaster and fire effects mitigation;
- Devising strategic and tactical emergency response plans;
- Choosing, using, and handling emergency intervention and rescue equipment;
- Determining causes and providing fire and explosion expertise;
- Educating and managing knowledge in fire and explosion protection;
- Training and selecting professionals, and developing skills in fire and explosion protection;
- Creating regulatory acts for fire and explosion protection;
- Developing methodologies, methods, tools, and procedures for fire protection system management;
- Developing methods and metrics for effectiveness assessment of fire protection systems;
- Organizing and managing a fire protection system;
- Using IT in fire safety engineering;

- Establishing public relations in the field of emergency management;
- Developing engineering ethics;
- Pursuing doctoral studies in the same or related fields of study.

STUDY PROGRAMME PURPOSE

The purpose of the master academic studies study programme **Fire Safety Engineering** is to educate students to receive a master's degree in disaster and fire safety engineering. The acquired competences are socially justifiable and usable and fully in keeping with economic and social demands with the purpose of resolving complex occupational and environmental issues.

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

The study programme content helps students acquire knowledge in the fields of natural sciences, technical and technological sciences, social sciences and humanities, and medical sciences, and acquire skills and competences that will enable them to work on complex and multidisciplinary disaster and fire safety tasks. Scientific disciplines and professional courses on this level of studies allow students to master specific disaster and fire protection theoretical knowledge and applicative skills and to develop critical thinking and the ability to work as part of a team. The versatility of elective courses encourages not only individuality and creativity in tailoring one's own course of studies, but also innovative and multidisciplinary approaches to occupational and environmental fire safety. 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.

In times of rapid technological development and progress, but also new potential fire hazards and risks, a study programme designed in this way educates future professionals who possess the knowledge, competence, and skills that meet European and global criteria, master engineers who can identify potential fire hazards and risks and propose a proper response, thus improving the living and working conditions.

In view of the social, economic, and broad community importance of fire safety, professionals in this field possess socially justifiable and useful competences.

ADMISSION REQUIREMENTS

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

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

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

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

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

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

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

- they submit a written request no later than the deadline expiration for enrolment into the following academic year;
- the faculty possesses spatial and other resources;

- that the number of enrolled students has not reached the allowed maximum (32).

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

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

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

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

The study programme is implemented through:

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

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

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

- Theoretical-methodological 26.50 %;
- Scientific-professional 12.42 %;
- Professional-applicative 61.08 %.

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 20.10-20.77 (20.30 weekly average). The total number of lecture classes within the study programme is 16 (8.00 weekly average), the number of exercise classes is 13-16 (7.55 weekly average), other forms of active classes 0.67-3.20 (0.75 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. 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 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 – Fire Safety

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.MZOP01	Fire Detection System Design and Maintenance	1	2	2	0	0	0	6	R	PA
2	19.MZOP02	Design and Maintenance of Fire Extinguishing Systems	1	2	2	0	0	0	6	R	PA
3	19.MZOP03	Fire Modelling and Simulation	1	2	2	0.67	0	0	6	R	PA
4	19.MZOP04	Fire Protection in Technological Processes	1	2	2	0	0	0	6	R	TM
5	19.MZNR05	Human Reliability Analysis	1	2	2	0	0	0	6	E	PA
	19.MZOP05	Fire Toxicology	1	2	2	0	0	0	6	E	SP
	19.MZOP06	Fire Resilience of Buildings	1	2	2	0	0	0	6	E	TM
	19.MZOP07	Experimental Methods in Fire Research	1	2	0	2	0	0	6	E	PA
	19.MZOP08	Protection Against Electricity-induced Fires	1	2	2	0.87	0	0	6	E	TM
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.MZNR10	Human Resource Management and Development	2	2	2	0	0	0	5	E	TM
8	19.MZNR13	Information Systems in Safety	2	2	1	0.53	0	0	5	E	SP
	19.MZNR14	Systems Engineering	2	2	2	0	0	0	5	E	TM
	19.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.MZOP11	Internship	2	0	0	0	0	6	3	R	PA
10	19.IZP12A	Master's Thesis – Research	2	0	0	0	8	0	8	R	PA
11	19.IZP12B	Master's Thesis – Writing and Defence	2	0	0	0	0	4	4	R	PA
Total classes (lectures/exercises + other) and credits				16	13-16	8.67-11.20		10	60		
Total active classes per year				40.20-41.54				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 Detection System Design and Maintenance
2. Design and Maintenance of Fire Extinguishing Systems
3. Fire Modelling and Simulation
4. Fire Protection in Technological Processes
5. Intervention and Rescue Tactics
6. Internship
7. Master's Thesis – Research
8. Master's Thesis – Writing and Defence

Course name: Fire Detection System Design and Maintenance		
Course status: Elective	**Course code:**	19.MZOP01
ECTS credits: 6		
Requirements: -		

Course aim

Study of rules and procedures for designing fire detection systems through a comparative analysis of the rules from five leading standards in the field: national, German, British, American, and Russian. Acquisition of knowledge required for gaining a licence for designing fire detection systems.

Learning outcome

Students' ability to:

- assess risk and recognize the need for installing a fixed fire detection system;
- precisely define the necessary types, numbers, and locations of fire alarms and detectors inside a building;
- independently design a fire detection system project for fire detection in its earliest stage in buildings with different structural, architectural, and ambient properties, and for different technological and work processes occurring inside them.

Course outline

Theoretical lessons

Fire risk assessment: Euroalarm method. TRVB 100 method. Other fire risk assessment methods. **Structure of fire detection systems**: Types and organization of fire detection systems. **Central fire detection unit**: General requirements. States of the system (no alarm state, alarm state, states of failure, power off, and testing). **Design fundamentals**: (Non)protected areas. Fire detection zones. **Choice of fire detector**: Type and development of potential fire. Stratification effect. Ceiling height and shape. Influence of ventilation and air flows. **Siting and spacing of manual call points**: Installation principles. Siting rules. **Siting and spacing of point-type heat and smoke detectors**: Installation principles. Basic siting rules. Siting in narrow spaces and corridors. **Siting and spacing of flame detectors**: Installation principles. Siting rules. **Siting and spacing of carbon monoxide detectors**: Installation principles. Siting rules. **Aspirating smoke detection systems**: Installation principles. Siting rules. **Linear heat and smoke detectors**: Installation principles. Siting rules. Siting under special circumstances. **Siting and spacing of point-type heat and smoke detectors under special circumstances:** Slanted ceilings and roofs. Ceilings with beams and barriers. Suspended ceilings and raised floors. Ventilation and air flows. **Siting and spacing of detectors in spaces containing electrical equipment and devices**: Selection and siting of detectors. Siting of detectors in computer labs. **Audio and visual signalization**: Audio signalization. Visual signalization. **Fire detection system power supply**: Calculation of backup power supply. System installation. **System testing and maintenance**: Intervals for testing and maintenance procedures. **Project documentation**: Textual part of the project. Calculation part of the project. Graphical part of the project.

Practical lessons

During auditory exercises, the acquired theoretical knowledge is revised and then tested in two ways: through the analysis of fire detection system projects and through the individual design of specific portions of a project for given buildings.

Literature

[1] Blagojević Milan (2018). Projektovanje sistema za dojavu požara. Beograd: AGM Knjiga.
[2] Blagojević Milan (2015). Alarmni sistemi (drugo, ispravljeno i dopunjeno izdanje). Niš: Univerzitet u Nišu, Fakultet zaštite na radu u Nišu.
[3] Erić Milan (2017). Priručnik za kontrolisanje instalacija i uređaja za dojavu požara. Beograd/Zemun: AGM knjiga.

Number of active classes (weekly)

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

Teaching methods

Lectures, case studies, debates, seminars

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	25		
Colloquium 2	25		
Term paper 2	10		

Course name: Design and Maintenance of Fire Extinguishing Systems		
Course status: Elective	**Course code:**	19.MZOP02
ECTS credits: 6		
Requirements: -		

Course aim

Acquisition of knowledge about the selection of adequate fixed fire extinguishing systems and the principles of design, operation, and maintenance. Ability to independently design and maintain fixed fire extinguishing systems according to standards.

Learning outcome

Students' ability to:

- select the appropriate fire extinguishing system;
- properly maintain a fire extinguishing system;
- design fixed fire extinguishing systems.

Course outline

Theoretical lessons

Definitions of terms. Hydrant network. External hydrant network. Internal hydrant network. Pressurization devices. Dry hydrant network. Technical control of hydrant networks. **Vrste of fixed automatic fire extinguishment systems. Water-based fixed fire extinguishment systems. Sprinkler systems**: advantages, disadvantages, and use. Basic parts. Classification of sprinkler systems. Wet pipe sprinkler system. Dry pipe sprinkler system. Tandem – dry and wet pipe system. Nozzles. Water and power supply. Control of sprinkler system operability. Recommendations for water supply design. Calculations. Sprinkler system maintenance. **Drencher system**. Water supply to drencher systems. Water quantity required for extinguishment. Pipeline network. Drencher nozzles. Drencher system maintenance. **Foam-based fixed automatic fire extinguishment systems.** Fixed automatic fire extinguishment system based on low-expansion foam. Fixed automatic fire extinguishment system based on medium expansion foam. Fixed automatic fire extinguishment systems based on high expansion foam. System maintenance. **CO_2-based fixed automatic fire extinguishment systems.** Total protection. Partial protection. Basic parts of a CO_2 fixed extinguishing system. Base quantity of CO_2 to achieve extinguishment concentration. CO_2 reserve and additional quantity. CO_2 storage. Power supply. Protection of the fire extinguishment space against overpressure. Distribution valves. Pipeline. Pipeline sizing. Nozzles. Conception of the maintenance system for CO_2-based fixed extinguishment systems. Regular and periodical inspections of CO_2-based fixed extinguishment systems. Safety measures. Technical safety measures. **Dry-powder-based fixed automatic fire extinguishment systems.** Constituent parts of the system. Description of system operation. Dry powder quantity required for extinguishment. Powder discharge time. Calculation of pipeline pressure loss. Pipelines. Nozzles. Maintenance of dry-powder-based fire extinguishment systems. **Fixed automatic fire extinguishment systems using halon and new chemical agents.** Description of system operation. Basic parts of the system. **Water vapour-based fixed automatic fire extinguishment systems.** Description of system operation. Water vapour quantity required for extinguishment. Characteristics of water vapour. Designation of steam piping diameter. Size of water vapour outlets. Operation time of a fixed automatic system. Maintenance.

Practical lessons

Practical lessons are thought as part of exercises, which follow the theoretical lessons. They include analyses of practical examples of fixed fire extinguishing systems and the project assignment – calculation of sprinkler installation for fire extinguishment.

Literature

[1] Mihajlović Emina (2016). *Projektovanje i održavanje sistema za gašenje požara – interni materijal za pripremu ispita.* Niš: Univerzitet u Nišu, Fakultet zaštite na radu u Nišu.

[2] Mihajlović Emina, Mlađan Dragan, Janković Žarko (2017). *Procesi i sredstva za gašenje požara*. 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, 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: 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: Fire Protection in Technological Processes

Course status: Required	**Course code:**	19.MZOP04

ECTS credits: 6

Requirements: -

Course aim

Acquisition of knowledge necessary to analyze technological processes in order to reduce the risk of fires and explosions.

Learning outcome

Students' ability to:

- apply methods, methodology, and procedures for analysis, design, and functioning of technological processes pertaining to fire and explosion protection;
- control processes and operations for fire and explosion protection.

Course outline

Theoretical lessons

Technological processes, fires and explosions: Technology and technological processes. Selection of input and output elements with regard to fire protection. Categorization of technological systems according to fire vulnerability. Technological processes that involve the combustion of materials depending on their state of matter. **Fire protection in technological processes of coal production and processing:** Exploitation. Preparation. Refining. Drying. Briquetting. Coking. Liquefaction. Gasification. **Fire protection in metallurgic technological processes:** Ore mining. Ore storage. Ore fragmentation. Agglomeration. Flotation. Roasting. Refining. Casting. **Fire protection in metalworking technological processes:** Mechanical metal working. Thermal and thermochemical treatment. Degreasing. Corrosion. Galvanization. Application of coatings. **Fire protection in technological processes in chemical and petrochemical industry:** Technological processes in inorganic chemical industry. Technological processes in organic chemical industry. Technological processes in petrochemical industry. **Fire protection in technological processes of other industries:** Technological processes in textile industry. Technological processes in wood-processing industry. Technological processes in food industry. **Designation of hazardous zones in technological processes**.

Practical lessons

Auditory and calculation exercises, which successively follow the theoretical lessons; analysis of practical examples fire and explosion risk analysis and assessment in technological processes. Defence of term papers on topics from fire and explosion protection in technological processes. Research study within industry practice is encouraged.

Literature

[1.] Anđelković Branislav, Krstić Ivan (2019). *Zaštita od požara u tehnološkim procesima – interni materijal za pripremu ispita.* Niš: Univerzitet u Nišu, Fakultet zaštite na radu u Nišu
[2.] Vidaković Milovan (2002). *Požar i osiguranje u industriji*. Beograd: Fahrenheit
[3.] Kleut Nikola (2013). *Požari i njihova dejstva*. Beograd: AGM knjiga
[4.] Jovanov Radovan (2014). *Pristup projektovanju Ex uređaja*. Beograd: AGM knjiga
[5.] Jovanov Radovan (2015). *Eksplozija u industrijskim objektima*: Beograd: AGM knjiga

Number of active classes (weekly)

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

Teaching methods

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

Grading (maximum number of points: 100)			
Pre-exam requirements	Points	**Exam**	Points
Activity during lectures	5	Written exam (practical part of the exam)	10
Activity during exercises	5	Oral exam (theoretical part of the exam)	30
Colloquium 1	20		
Colloquium 2	20		
Term paper	10		

Course name: 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 (2007). *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 (2009). *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="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="4">Pre-exam requirements</td><td>Points</td><td colspan="3">Exam</td><td colspan="2">Points</td></tr>
<tr><td colspan="4">Activity during lectures</td><td>5</td><td colspan="3">Oral exam (theoretical part of the exam)</td><td colspan="2">40</td></tr>
<tr><td colspan="4">Activity during exercises</td><td>5</td><td colspan="3"></td><td colspan="2"></td></tr>
<tr><td colspan="4">Colloquium</td><td>30</td><td colspan="3"></td><td colspan="2"></td></tr>
<tr><td colspan="4">Term paper</td><td>20</td><td colspan="3"></td><td colspan="2"></td></tr>
</table>

Course name: Internship		
Course status: Required	**Course code:**	19.MZOP11
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.IZP12A
ECTS credits: 8		
Requirements: Enrolment in the second semester		

Course aim

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

Learning outcome

Students' ability to:

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

Course outline

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

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

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

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.IZP12B
ECTS credits: 4		
Requirements: Completion of exams for all courses in the study programme		

Course aim

Combination of the theoretical background and the research study to solve a specific problem, for the purpose of examining the structure and performing a systems analysis of the problem in order to draw conclusions about the possible ways of solving it. Gaining experience of presenting the results of the research study in written form and orally, during the master's thesis defence.

Learning outcome

Students' ability to:

- independently present the results of their research by writing their thesis and presenting it orally at the thesis defence;
- write the thesis according to a required form;
- clearly and satisfactorily elaborate on their proposed solutions to the given problem through an oral presentation of the thesis and response to the subsequent questions.

Course outline

By combining the research study and the theoretical background of the given problem, students write their master's thesis, which has to contain the following elements: abstract with key words in Serbian, table of contents, introduction, research text body (formulation of the research problem and subject matter, presentation of the current state of the given research field, theoretical or practical portion of the research, results and discussion), conclusion, list of cited literature (minimum of ten references, of which at least six have to be academic and professional publications and at least one has to be written in a foreign language), and appendices.

The committee for master's thesis evaluation and defence evaluates the written thesis and approves the public oral defence of the master's thesis, which is organized before a committee of three members, one of whom is the mentor. During the oral defence, the candidate presents the results of their research and then answers the questions by committee members, thus demonstrating the ability to orally present a project.

Literature

Number of active classes (weekly)

Lectures	-	Auditory exercises	-	Other forms of classes	-	RS	-	Other classes	4

Teaching methods

With the mentor's aid, students write their master's thesis and prepare for the oral defence. Students consult with the mentor and other members of the committee for master's thesis evaluation and defence.

Grading (maximum number of points: 100)

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

LIST OF ELECTIVE COURSES

1. Human Reliability Analysis
2. Fire Toxicology
3. Fire Resilience of Buildings
4. Experimental Methods in Fire Research
5. Protection Against Electricity-induced Fires
6. Information and Public Relations
7. Human Resource Management and Development
8. Information Systems in Safety
9. Systems Engineering
10. Project Management
11. Fire Cause Investigation

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

Course aim

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

Learning outcome

Students' ability to:

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

Course outline

Theoretical lessons

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

Practical lessons

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

Literature

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

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

[3] 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: Fire Toxicology		
Course status: Elective	**Course code:**	19.MZOP05
ECTS credits: 6		
Requirements: -		

Course aim

Acquisition of knowledge about fire parameters and products of uncontrolled combustion. Conclusions about toxic load in the work and natural environment.

Learning outcome

Students' ability to:

- understand the phenomena, principles, and laws in fire toxicology;
- assess risk from exposure to toxic substances;
- propose sustainable solutions for safe work with fire-toxic substances.

Course outline

Theoretical lessons

Introduction to fire toxicology: Subject matter and tasks of fire toxicology. Basic terms and principles in fire toxicology. **Types of toxic combustion products:** Irritants (inorganic acidic gases – hydrogen chloride, hydrogen fluoride, hydrogen bromide, sulphur oxides, nitrogen oxides. Organic irritants – acrolein, formaldehyde. Other inorganic irritants – ammonia, chlorine, phosgene). Asphyxiants (carbon monoxide, hydrogen cyanide). Complex molecules (polycyclic aromatic hydrocarbons, isocyanates, PM particles). **Toxicity of fire suppression agents and products of their decomposition. Toxic products of combustion depending on fuel type:** Polymers, oil, rubber, asbestos, etc. **Influence of combustion conditions on the formation of toxic effluents**: Temperature, oxygen content, etc. **Mechanisms of toxicity. Inhalation and the effects of fire effluent components on the respiratory tract:** Interaction of fire effluent components with respiratory structures, settling of inhaled fire effluent components in the respiratory tract. **Toxicological risk assessment for exposure to fire-toxic substances:** Identification of fire-toxic substances. Exposure assessment. Assessment of dose-response relationship. Risk characterization. **International standardized frameworks for predicting the toxicity of combustion products.**

Practical lessons

Learning about traditional and instrumental methods used for sampling and qualitative/quantitative analysis of fire-toxic substances in the air, water, and soil. Writing and defence of term papers on selected topics focused on specific groups of fire-toxic substances.

Literature

[1.] Popović Danilo (2014). Toksikologija – interni materijal za pripremu ispita. Niš: Univerzitet u Nišu, Fakultet zaštite na radu u Nišu.
[2.] Jokanović Milan (2010). Toksikologija. Niš: Univerzitet u Nišu, Medicinski fakultet.
[3.] Purser David, McAllister Jamie (2016). Assessment of hazards to occupants from smoke, toxic gases and heat, in The SFPE Handbook of Fire Protection Engineering, 5th Edition, ed. Morgan Hutley. New York: Springer-Verlag.
[4.] Stec Anna, Hull Richard (2010). Fire toxicity. Cambridge: Woodhead Publishing Limited.
[5.] Editors: David A. Purser, Robert L. Maynard, James C. Wakefield (2015). Toxicology, Survival and Health Hazards of Combustion Products. UK: Royal Society of Chemistry.

<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/calculation exercises, office hours</td></tr>
<tr><td colspan="10">Grading (maximum number of points: 100)</td></tr>
<tr><td colspan="4">Pre-exam requirements</td><td>Points</td><td colspan="3">Exam</td><td colspan="2">Points</td></tr>
<tr><td colspan="4">Activity during lectures</td><td>5</td><td colspan="3">Oral exam (theoretical part of the exam)</td><td colspan="2">40</td></tr>
<tr><td colspan="4">Activity during exercises</td><td>5</td><td colspan="3"></td><td colspan="2"></td></tr>
<tr><td colspan="4">Colloquium 1</td><td>20</td><td colspan="3"></td><td colspan="2"></td></tr>
<tr><td colspan="4">Colloquium 2</td><td>20</td><td colspan="3"></td><td colspan="2"></td></tr>
<tr><td colspan="4">Term paper</td><td>10</td><td colspan="3"></td><td colspan="2"></td></tr>
</table>

Course name: Fire Resilience of Buildings

Course status: Elective	**Course code:** 19.MZOP06

ECTS credits: 6

Requirements: -

Course aim

Acquisition of theoretical and practical knowledge necessary to identify changes in construction elements caused by fire, to calculate the fire resilience of construction elements and structures, and to implement safety measures before and after a fire outbreak.

Learning outcome

Students' ability to:

- independently design fire protection projects as a part of the technical design documentation for buildings;
- apply methods for determining the fire resilience of buildings;
- select adequate methods for fire protection of building structures.

Course outline

Theoretical lessons

The concept of fire resilience of buildings. Types of structures. Criteria for determining fire resilience. Fire models. Model of structural behaviour. Heat and fire temperature. Minimum required structural resilience. The concept of construction element fire protection. The concept of structural reliability in a fire. **Reinforced concrete structures**. Behaviour of reinforced concrete at high temperatures. Thermal, physical, and mechanical properties of concrete at high temperatures. Reinforced concrete surface girders exposed to fire from one side, linear girders exposed to fire from three. Bending stress in reinforced concrete elements. **Steel structures**. Behaviour of steel elements during a fire. Thermal, physical, and mechanical properties of steel at high temperatures. Compressive and bending stress of steel elements. **Prestressed reinforced concrete structures**. Types of structures and their behaviour at high temperatures. **Composite elements and structures.** Types and their behaviour during a fire. **Wooden structures**. Wooden structures and their behaviour at high temperatures. Thermal, physical, and mechanical properties of wood at high temperatures. Bending, compressive, and tensile stress of wooden elements. Fire resilience of joints and connections. **Fire resilience of other materials and structures** (stone, brick, mortars, glass, hydrocarbon binders and materials, polymers). **Fire protection of structural elements** (reinforced concrete, steel, wooden, composite, and others). **Stability assessment of fire-damaged building structures** (visual inspection, testing of materials, damage assessment and recovery of structures after a fire).

Practical lessons

Practical lessons comprise exercises, which follow the theoretical lessons, and include problems to calculate temperatures in structures and their fire resilience. Student research is guided towards a term paper on a topic concerning fire resilience of buildings, which they have to present and defend.

Literature

[1.] John A. Purkiss, (2007). *Fire Safety Engineering Design of Structures*, Second Edition. Elsevier.

[2.] Milutinović Slobodan, Mančić Radivoje (1997). *Zaštita zgrada od požara* (glava III: Otpornost na dejstvo požara). Niš: Univezitet u Nišu, Fakultet zaštite na radu u Nišu, str. 93-200.

[3.] Đorđević Spiridon (1995). *Građevinski materijali II - postojanost materijala*. Niš: Univerzitet u Nišu, Građevinski fakultet.

[4.] Buchanan Andrew & Abu Anthony (2017). *Structural Design for Fire Safety*, Second Edition. Wiley.

[5.] Laban Mirjana et al. (2020). *Fire Safety in Buildings: A Western Balkan Approach and Practice*. Novi Sad: Faculty of Technical Sciences.

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. Exercises include the defence of a term paper concerning fire resilience of buildings.

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	25		
Term paper	25		

Course name: Experimental Methods in Fire Research		
Course status: Elective	**Course code:**	19.MZOP07
ECTS credits: 6		
Requirements: -		

Course aim

Learning about experimental methods relevant for the field of fire safety. Learning about international fire safety standards and understanding measurement methods. Conducting experiments using the instruments and equipment available at the Laboratory for Fire Safety.

Learning outcome

- Knowledge and grasp of EN, ISO, and ASTM fire safety standards;
- Ability to prepare and conduct experiments in fire research;
- Practical experience with measurements of relevant fire quantities;
- Ability to present measurement results.

Course outline

Theoretical lessons

Basics of measures and measurements: Measurement methods. Measurement errors. **Interpretation of measurement results:** Measurement uncertainty. **Instruments for temperature measurement:** Thermocouples. Thermographic cameras. Measurement of temperature during fires. **Heat flux:** Instruments for heat flux measurement. Heat flux measurement during fires. **Basics of calorimetry:** Review of relevant standards. Oxygen bomb calorimeters. Operating principles and handling. **Basics of thermogravimetry:** Review of relevant standards. Use of devices for thermogravimetric analysis. Creation of temperature programs. Measurement procedure. Interpretation of results. **Effective thermal power and thermal strength of fires:** Theoretical background for determining thermal strength. **Ignition concentration limits – theoretical background:** Diffusion flame – theoretical background. **Kinetic flame – theoretical background**. **Theoretical background of liquid fuel ignition. Theoretical background of solid fuel ignition. Fire effluent sampling and analysis methods:** Use of FTIR spectroscopy for fire effluent analysis. Review of relevant standards regarding fire effluent sampling and analysis. **Modelling of material decomposition:** Kinetics of solid material decomposition. Review of relevant standards. **Review of methods for determining kinetic parameters based on results of thermogravimetric analysis.**

Practical lessons

Laboratory work. Measurement of flame temperature using thermocouples. Continuous measurement of temperature change of construction materials exposed to heat sources of different strength. Heat flux measurement in the combustion of solid and liquid fuels. Experimental determination of upper thermal power of materials using an oxygen bomb calorimeter. Technical analysis of fuels using a thermogravimetric analyser. Experimental determination of thermal power using a cone calorimeter with thermocouples. Experimental determination of ignition concentration limits. Determination of characteristics of diffusion flame. Experimental determination of kinetic flame propagation rate. Experimental determination of temperature and critical heat flux for self-ignition and pilot-light ignition of liquid fuels. Experimental determination of temperature and critical heat flux for self-ignition and pilot-light ignition of solid fuels. Experimental determination of fire effluent composition in real time. Thermogravimetric experiments in inert and oxidizing atmospheres to determine critical parameters. Data processing and calculation of kinetic parameters using multiple methods.

Literature

[1.] Hurley Morgan, Gottuk Daniel, Hall John, Harada Kazunori, Kuligowski Erica, Puchovsky Milosh, Wieczorek Christopher (Eds.). (2015). *SFPE handbook of fire protection engineering*. Springer.

[2.] Janssens Mathijs (2006). *Fundamental measurement techniques*. In *Flammability Testing of Materials Used in Construction, Transport and Mining.* Woodhead Publishing.
[3.] Drysdale Dougal (2011). *An introduction to fire dynamics*. USA, NJ: John Wiley & Sons.
[4.] Mathias Sarge Stefan, Höhne Günther, Hemminger Wolfgang (2014). *Calorimetry: fundamentals, instrumentation and applications*. USA, NJ: John Wiley & Sons.

Number of active classes (weekly)

Lectures	2	Auditory exercises	0	Other forms of classes	2	RS	-	Other classes	-

Teaching methods
Lectures, calculation exercises, and laboratory 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	30		
Project assignment	20		

Course name: Protection Against Electricity-induced Fires	
Course status: Elective	**Course code:** 19.MZOP08
ECTS credits: 6	
Requirements: -	

Course aim

Acquisition of specialized knowledge for identification and analysis of hazards and for protection of material property, cultural resources, and human lives against electricity-induced fire and explosions.

Learning outcome

Students' ability to:

- identify hazards, analyse protective measures, and assess risk from electricity-induced fire and explosions;
- test the safety of electrical installations, devices, equipment, and protection system against static electricity;
- test the safety of electrical installations, devices, equipment, and protection system against atmospheric electricity.

Course outline

Theoretical lessons

Electricity as a cause of fire and explosions: Statistical data. Hazards from short circuits, conductor overload, high transient resistance, electrothermal devices, use of spark-producing appliances and devices, electric arc welding, static electricity, and atmospheric electricity. **Technical regulations for the implementation of protective measures against electricity-induced fire and explosions:** Fire and explosion safety measures in electrical facilities, electrical installations, and electrical devices (protection against overcurrent, short circuit, fire, surges, voltage drop and onset). **Electrical equipment in spaces with explosive atmospheres:** Types of explosion protection (flameproof enclosure, increased safety, intrinsic safety, encapsulation, sand-filled enclosures, oil immersion, pressurized enclosures, special device types). **Electrical installations in spaces with explosive atmospheres:** General and specific requirements for the erection of electrical installations in *Ex*-zones. Types and methods of erecting installations. **Inspection and testing of elements of protection against harmful effects of electricity:** Inspection and testing of electrical equipment in spaces with explosive atmospheres. Inspection and testing of electrical installations in spaces with explosive atmospheres. **Protection against static electricity:** Electric charge. Discharge energy. Origins of static electricity (friction, separation and contact of two materials, induction, corona discharge). Ground. Maintenance of relative humidity. Air ionization. Antistatic preparation. Increased material conductivity. Influence (electrostatic induction). **Protection against atmospheric discharge:** Onset, discharge, and hazards of atmospheric electricity. Installations for the protection of buildings against atmospheric discharge.

Practical lessons

Auditory exercises: Calculation of short circuit currents and ground fault currents. Calculation of fault voltage and current. Calculation of uninsulated conductor and cable temperatures. Determination of electrical coupling and contact temperatures. Determination of efficiency of devices for protection against hazardous effects of electricity. Calculation of grounding resistance in the grounding device. **Laboratory work.**

Literature

[1.] Jovanov Radovan (2014). Pristup projektovanju Ex uređaja. Beograd/Zemun: AGM knjiga.
[2.] Nikola Kleut Nikola (2016). Tehnološke i mere bezbednosti od požara ne električnim instalacijama. Beograd/Zemun: AGM knjiga.
[3.] Janjić Aleksandar, Vučković Dragan (2020). Električne instalacije i osvetljenje. Niš: Univerzitet u Nišu, Elektronski fakultet.
[4.] Jovanov Radovan (2016). Požari izazvani električnim instalacijama sa primerima. Beograd/Zemun: AGM knjiga.
[5.] Glavonjić Milovan, Erić Milan (2011). Priručnik za ispitivanje električnih i gromobranskih instalacija – Inženjersko tehnički priručnik. Beograd/Zemun: AGM knjiga.

Number of active classes (weekly)

Lectures	2	Auditory exercises	2	Other forms of classes	0.87	RS	-	Other classes	-

Teaching methods

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

Grading (maximum number of points: 100)

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

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

[6.] Stojković Branimir, Radojković Miroljub (2009). *Informaciono komunikacioni sistemi*. Beograd: CLIO
[7.] Mandić Tijana (2003). *Komunikologija–psihologija komunikacije*. Beograd: CLIO
[8.] Blek Sem (2003). *Odnosi s javnošću*. Beograd: CLIO
[9.] Bartel Van de Walle, Turoff Murray & Hiltz Starr Roxanne (2009). *Information Systems for Emergency Management*. New York & London: M.E. Sharpe
[10.] 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 and Development		
Course status: Elective	**Course code:**	19.MZNR10
ECTS credits: 5		
Requirements: -		

Course aim

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

Learning outcome

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

Course outline

Theoretical lessons

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

Practical lessons

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

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

Literature

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

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

[8] 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.

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

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

Number of active classes (weekly)

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

Teaching methods

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

Grading (maximum number of points: 100)

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

Course name: Information Systems in Safety

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

ECTS credits: 5

Requirements: -

Course aim

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

Learning outcome

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

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

Course outline

Theoretical lessons

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

Practical lessons

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

Literature

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

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

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

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

Number of active classes (weekly)

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

Teaching methods

Lectures, auditory (calculation) exercises, and office hours

Grading (maximum number of points: 100)			
Pre-exam requirements	Points	**Exam**	Points
Activity during lectures	10	Oral exam (theoretical part of the exam)	40
Activity during exercises	10		
Colloquium 1	20		
Colloquium 2	20		

Course name: Systems Engineering

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

ECTS credits: 5

Requirements: -

Course aim

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

Learning outcome

Students' ability to:

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

Course outline

Theoretical lessons

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

Practical lessons

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

Literature

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

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

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

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

Number of active classes (weekly)

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

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

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

Course aim

Acquisition of 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' ability to:

- plan and monitor projects;
- organize project activities;
- use modern software tools for project management at a basic level;
- apply the project management concept in occupational and environmental safety.

Course outline

Theoretical lessons

Introduction to project management: Development and application of concepts, importance, certification bodies. **Basic characteristics of projects:** Definition, framework/scope, project goals, triple constraint. Planning, selection, and identification 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 structure 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 and evaluating a project's progress. Risk management within the project. Project implementation; monitoring and control. **Software tools for project management:** an overview of relevant software packages, introduction to *MS Project*.

Practical lessons

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

Literature

[1.] Jovanović Petar (2015). *Upravljanje projektom* (11. izdanje). Beograd: Fakultet za projektni i inovacioni menadžment.

[2.] Chatfield Carl, Johnson Timothy (2017). *Microsoft Project 2016 - korak po korak*. Beograd: CET.

[3.] Project Management Institute (2017). *A Guide to the Project Management Body of Knowledge*, Sixth Edition (PMBOK Guide). Newtown Square, PE: Project Management Institute.

[4.] Stanimirović Predrag, Jovanović Ivan (2018). *Mrežno planiranje i MS PROJECT*. Niš: Univerzitet u Nišu, Prirodno-matematički fakultet.

[5.] Kerzner Harold (2017). *Project Management - A Systems Approach to Planning, Scheduling, and Controlling*, 12th Edition. Wiley.

<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, defence of term papers</td></tr>
<tr><td colspan="10">Grading (maximum number of points: 100)</td></tr>
<tr><td colspan="4">Pre-exam requirements</td><td>Points</td><td colspan="3">Exam</td><td colspan="2">Points</td></tr>
<tr><td colspan="4">Activity during lectures</td><td>5</td><td colspan="3">Written exam (practical part of the exam)</td><td colspan="2">25</td></tr>
<tr><td colspan="4">Activity during exercises</td><td>5</td><td colspan="3">Oral exam (theoretical part of the exam)</td><td colspan="2">15</td></tr>
<tr><td colspan="4">Colloquium 1</td><td>15</td><td colspan="3"></td><td colspan="2"></td></tr>
<tr><td colspan="4">Colloquium 2</td><td>20</td><td colspan="3"></td><td colspan="2"></td></tr>
<tr><td colspan="4">Term paper</td><td>15</td><td colspan="3"></td><td colspan="2"></td></tr>
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Course name: Fire Cause Investigation		
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 fire cause 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 according to heat supply or heat 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 fire cause investigation**. Definition of trace, identification of traces, classification of traces. Operational stages during fire cause 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 cause investigation 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.

Number of active classes (weekly)

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

Teaching methods
Lectures, auditory exercises, presentation and analysis of examples of installed alarm systems, and office hours

Grading (maximum number of points: 100)

Pre-exam requirements	Points	**Exam**	Points
Activity during lectures	5	Oral exam (theoretical part of the exam)	40
Activity during exercises	5		
Colloquium 1	30		
Term paper 1	20		