ВИСОКА ТЕХНИЧКА ШКОЛА
СТРУКОВНИХ СТУДИЈА
у Новом Саду

# COURSE CATALOGUE

# PROTECTION ENGINEERING

## Master applied studies

**NOVI SAD,**
**June – October 2023**

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

| No. | Course code | Course title | Field of Study | Semester | Lecture | Lab | Other Forms of Teaching | Other Hours | ECTS |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 2M01 | Risk management in protection | Environmental and Occupational Safety Engineering, Mechanical Engineering, Physical Sciences | 1 | 4 | 3 | | | 10 |
| 2 | 2M03 | Monitoring and control in protection | Environmental and Occupational Safety Engineering, Physical Sciences | 1 | 4 | 3 | | | 10 |
| 3 | Elective option 1 (select 1 of 2) | | | | | | | | |
| | 2M24 | Applied risk modelling methods | Mechanical Engineering, Electrical and Computer Engineering | 1 | 3 | 3 | | | 8 |
| | 2M33 | Methods of pollutant analysis | Environmental and Occupational Safety Engineering | 1 | 3 | 3 | | | 8 |
| 4 | 2M34 | Preventive fire protection | Environmental and Occupational Safety Engineering | 2 | 4 | 2 | | | 8 |
| 5 | 2M05 | Risk analysis in decision making for disaster protection | Environmental and Occupational Safety Engineering | 2 | 3 | 2 | | | 8 |
| 6 | 2M08 | Waste stream management and recycling technologies | Environmental and Occupational Safety Engineering, Technological Engineering | 2 | 4 | 2 | | | 8 |
| 7 | 2M13 | Professional master practice 1 | Environmental and Occupational Safety Engineering | 2 | | | | 6 / 0 | 4 |
| 8 | Elective option 2 (select 1 of 2) | | | | | | | | |
| | 2M35 | Business ethics | Cultural Studies and Communications, Industrial Engineering and Engineering Management | 2 | 2 | 1 | | | 4 |
| | 2M36 | Modern methods of education | Cultural Studies and Communications, Applied Arts and Design | 2 | 2 | 1 | | | 4 |
| 9 | 2M07 | Investigation of causes, phases and consequences of fire | Environmental and Occupational Safety Engineering, Chemical Sciences | 3 | 4 | 2 | | | 8 |
| 10 | 2M04 | Personal protective equipment | Environmental and Occupational Safety Engineering, Mechanical Engineering | 3 | 4 | 3 | | | 8 |
| 11 | Elective option 3 (select 1 of 2) | | | | | | | | |
| | 2M12 | Calculation and model of evacuation | Environmental and Occupational Safety Engineering | 3 | 4 | 3 | | | 8 |
| | 2M26 | Software methods of experimental modelling | Electrical and Computer Engineering, Mechanical Engineering | 3 | 4 | 3 | | | 8 |
| 12 | 2M14 | Professional master practice 2 | Environmental and Occupational Safety Engineering | 4 | | | | 6 / 0 | 4 |
| 13 | 2M15 | Preliminary master thesis | Environmental and Occupational Safety Engineering | 4 | | | | 0 / 20 | 16 |
| 14 | 2M16 | Master thesis | Environmental and Occupational Safety Engineering | 4 | | | | 4 / 0 | 16 |

## Table 5.2. – Course specification

**Study programme: Protection engineering**

**Course title: Risk management in protection**

**Teacher: Biljana Gemović, Vesna Petrović**

**Course status: Compulsory**

**Number of ECTS: 10**

**Prerequisite course: None**

**Course objective:**

Acquiring theoretical and practical knowledge in the field of safety engineering, legal regulations, standards and risk assessment itself, in order to learn about the protection system and the possibilities of applying all acquired knowledge in various technologies and production processes.

**Learning outcomes:**

Students know the methods and procedures of risk assessment in all areas of protection (occupational safety, fire protection and environmental protection). They know how to identify hazards and harms, apply protective measures as well as measures to reduce, eliminate and prevent risks. They acquire the knowledge necessary to organize all aspects of protection in various technological production processes, use and maintenance of equipment with special emphasis on preventive measures in all phases of work.

**Course contents**

*Theoretical teaching:*

Theoretical foundations of safety. Accidents and safety; accident problem, terminology. Characteristics of systems and accidents; elements of reliability theory, human error. Safety analysis; what is analysis, procedures, methodological review. Risk assessment in the field of Protection; objectives, types of assessment, practical aspects. Types of safety analysis: energy, job and deviation analysis, Hazard study, fault tree, safety function analysis and other methods. Safety analysis, planning and application. Theoretical aspects. Legal foundations for risk assessment; valid laws and selected by-laws in the field of protection (Safety and Health at Work, Fire Protection, Environmental Protection). Special focus on: Rulebook on Risk Assessment, development of a waste management plan, development of a fire protection plan. Practical risk assessment; definition of safety systems, standards and their application (ISO 14001, OHSAS 18001); Preventive measures, the importance of risk reduction, risk assessment procedure, hazard identification, hazard study methods, HAZOP study, risk matrix, risk ranking, practical risk assessment methods, assessment documentation, measures to reduce, eliminate and prevent risks.

*Practical teaching:*

Solving practical assignments in risk assessment and management, discussion of case study research papers in risk analysis and assessment from one of the areas of Protection (Occupational Safety and Health - OSH, Fire Protection, and Environmental Protection), followed by an independent risk assessment in the selected area.

**Literature:**

Gemović, B., Drobnjak, R., Drobnjak, P., Petrović, V.: Upravljanje rizikom i metode procene rizika, Naučna KMD, Beograd, 2013

***Materijal sa predavanja u elektronskom obliku.

*** Zakoni, Uredbe, Pravilnici, Standardi i Tehnički propisi iz oblasti Zaštite.

| **Active teaching classes: 105** | **Theoretical teaching: 60** | **Practical teaching: 45** |
|---|---|---|

**Teaching methods:** Monologic, interactive and demonstrative.

**Assessment (maximum number of points 100)**

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

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**Study programme: Protection engineering**

**Course title: Monitoring and control in protection**

**Teacher: Vesna Petrović**

**Course status: Compulsory**

**Number of ECTS: 10**

**Prerequisite course: None**

**Course objective:**

Acquiring the knowledge necessary for conducting monitoring, starting from developing a plan, and then sampling using appropriate methods, and preparing accompanying documentation. Acquiring skills and knowledge for working with laboratory and mobile equipment, as well as skills necessary for teamwork.

**Learning outcomes:**

Students are able to use the acquired knowledge to: measure some pollutants in the working and living environment and analyze the results obtained; organize a monitoring service and organize monitoring time depending on the pollutant; develop monitoring plans in accordance with laws and standards.

**Course contents:**

*Theoretical teaching*

Introductory definitions: The concept of monitoring in the field of protection. Principles, tools and basic methodology of monitoring systems in the field of protection. Place, role and importance of monitoring in the field of environmental protection, protection against disasters and fires. Monitoring regime. Air quality monitoring – Sulfur dioxide (SO2), Nitrogen oxides (NOx), Ground-level ozone (O3), Suspended particles. Air quality assessment with determination of the air quality index. Noise monitoring. Monitoring of electromagnetic radiation in the environment. Legal regulations and standards. Monitoring of phenomena and hazards that may have the characteristics of emergency situations: Hydrological monitoring (water level monitoring and flood forecasting). Meteorological monitoring. Seismological monitoring. Monitoring of radiation contamination. Types and characteristics of radioactive radiation. Types of nuclear processes. Use of nuclear energy. Controlled and uncontrolled nuclear reactions. Detectors. Harmful effects and standardization. Radiation monitoring in the Republic of Serbia.

*Practical teaching*

Elaboration of theoretical areas through concrete examples. Measurement of individual characteristic parameters of environmental pollution – air pollution (CO, CO2, dust) and measurement of municipal noise levels.

**Literature:**


*** Monitoring i kontrola u zaštiti – pripremljen materijal sa predavanja u elektronskoj formi.

Tolba, K. M., Radijacija, doze, posledice, rizici, UNEP, Nolit, Beograd, 1986

Čolović, V., Čurović, D.: Organizacija i rad centara za uzbunjivanje, Zavod za udžbenike, Beograd, 1998

Čolović, V., Čurović, D.: Organizacija i rad osmatračkih stanica, Zavod za udžbenike, Beograd, 1985

Vujić, A.: Zaštita životne sredine, PMF, Departman za biologiju, Novi Sad, 2005

Terzić, M., Šiljegović, M.: Fizika okoline, PMF, Departman za fiziku, Novi Sad, 2013

Hodolič, J. i dr. Mašinstvo i inženjerstvo zaštite životne sredine, FTN, Novi Sad, 2010


| **Active teaching classes: 105** | **Theoretical teaching: 60** | **Practical teaching: 45** |
|---|---|---|

**Teaching methods:** Monologic, dialogic, interactive and demonstrative.

**Assessment (maximum number of points 100)**

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

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**Study programme: Protection engineering**

**Course title: Applied risk modelling methods**

**Teacher: Božo Ilić, Nenad Janjić, Branko Savić**

**Course status: Elective**

**Number of ECTS: 8**

**Prerequisite course: None**

**Course objective**

Gaining knowledge about different types of risks, as well as methods for their modelling, with an emphasis on computer modelling.

**Learning outcomes**

Students will be able to recognize different types of risks and model them using various methods, especially computer modelling.

**Course contents**

*Theoretical teaching*

Research: Stages of research work. Research methods. Empirical method. Observation method. Experimental research. Research using the modelling method. Mathematical modelling: Empirical, deterministic, population and stochastic models. Application of the Monte Carlo method in modelling stochastic processes. Statistical Research: Application of Computers in Statistical Analysis. Statistical Population, Variable, and Sample. Simple correlation and regression analysis. Probability theory: Classical definition of probability. Statistical definition of probability. computer modeling and process simulation: Application of the MATLAB software package in computer modelling and process simulation. Ecological modelling: Phases of ecological model development. Mathematical model formulation. Computer model development. Computer model verification (program testing). Model validation and application. Risk: Concept of risk. Risk assessment. System modelling for quantitative risk assessment. Environmental risk assessment methods. Examples of risk modelling: Environmental impact of a product or manufacturing process. Life Cycle Assessment (LCA) of a Product. Environmental risk assessment. Model for assessing environmental risks caused by the NATO bombing of the Republic of Serbia in 1999. Forest fire risk management. Computer modelling and simulation of forest fire spread. Application of GIS model in hazard and flood risk mapping. Financial risk modelling of a wind farm project.

*Practical teaching*

Assignments related to the topics covered in the lectures are performed.

**Literature**

Ilić, B., Primenjene metode modelovanja rizika 1 i 2, skripta u elektronskom obliku, Visoka tehnička škola strukovnih studija u Novom Sadu, 2018

Petrić, M., Statistika, Visoka tehnička škola strukovnih studija u Novom Sadu, 2015

Ž. Adamović, V. Veljković, D. Malešević, Metodologija istraživanja u industriji i obrazovanju, Društvo za energetsku efikasnost, Banja Luka, 2010

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

A. Veljović, M. Zahorjanski, Modeliranje informacionih sistema, CET, Beograd, 2016

| **Active teaching classes: 90** | **Theoretical teaching: 45** | **Practical teaching: 45** |
|---|---|---|

**Teaching methods:** Monologic, dialogic, interactive

**Assessment (maximum number of points 100)**

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

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**Study programme: Protection engineering**

**Course title: Methods of pollutant analysis**

**Teacher: Anita Petrović Gegić**

**Course status: Compulsory**

**Number of ECTS: 8**

**Prerequisite course: None**

**Course objective:**

To introduce students to and provide an understanding of instrumental analytics, its significance and concrete application in environmental analysis aimed at the accurate determination of representative pollutants.

**Learning outcomes:**

Students are familiar with the types of instrumental chemical analysis methods and their application in analyzing environmental pollutants. They are acquainted with the operating principles and practical handling of instruments used in pollution detection. Students work independently on measuring instruments such as the polarimeter, spectrophotometer, and refractometer, and are able to determine pollutant concentrations using various analytical methods. They possess knowledge of operating GC and AAS, although assistance from a laboratory technician/associate is required for their operation.

**Course contents**

*Theoretical teaching*

Electrochemistry: General concepts in electrochemistry (voltage series of elements, galvanic and concentration coupling, measurement of electrode potential, types of electrodes). Electrogravimetry. Potentiometry (direct and potentiometric titration). Conductometry (direct and conductometric titration). Polarography. Amperometry. Biamperometry. Coulometry (at constant current and constant potential). Chromatography: Introduction to chromatography, principle of chromatographic analysis, classification of chromatographic methods. Adsorption chromatography. Partition chromatography. Ion exchange chromatography. Column chromatography. Thin layer chromatography. Paper chromatography. Gas chromatography (GSC and GLC/MS). Liquid chromatography. Optical methods. Classification and principle of optical methods. Polarimetry. Refractometry. Fundamentals of spectral methods. Excitation of atoms. Optical absorption laws. Colorimetric methods of analysis (standard series method, colorimetric titration, dilution method, balancing method). Photometric methods of analysis. Spectrophotometric methods. Emission spectroscopy. Flame photometry. Atomic absorption spectroscopy. ICP spectroscopy. Infrared spectroscopy. UV spectroscopy.

*Practical teaching*

They conceptually follow the content of the course in order to acquire practical knowledge and skills in the domain of instrumental analytics in the detection of pollutants: Introduction to measurements in the environment. Volumetric determination of sulfuric acid content. Gravimetric determination of total iron. Analytical - qualitative separation and detection of heavy metal cations. Electrogravimetric determination of copper. Potentiometric titration of neutralization systems. Influence of temperature, concentration and type of electrolyte on electrical conductivity. Conductometric titration of acid-base systems. Column and paper chromatography. Polarimetric determinations. Refractometric determination of heavy metal salt concentration. Colorimetric determination of heavy metal salt concentration. Photometric determinations in the environment. Spectrophotometric determinations in the environment. Application of AAS in the environment.

**Literature**

Petrović-Gegić, A.: Instrumentalne metode analize sa praktikumom, Visoka tehnička škola strukovnih studija u Novom Sadu, Novi Sad, 2015
Marjanović, N.: Instrumentalne metode analize, Tehnološki fakultet, Novi Sad, 1987
Ast, T.: Instrumentalne metode analize, Tehnološko metalurški fakultet, Beograd, 1994

| **Active teaching classes: 90** | **Theoretical teaching: 45** | **Practical teaching: 45** |
|---|---|---|

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

**Assessment (maximum number of points 100)**

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

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**Study programme: Protection engineering**

**Course title: Preventive fire protection**

**Teacher: Branko Babić**

**Course status: Compulsory**

**Number of ECTS: 8**

**Prerequisite course: None**

**Course objective:**

To introduce students to basic theoretical knowledge about technical-technological, electrical and construction preventive fire protection measures, characteristic fire hazards, as well as the current legal regulations in the field of preventive fire protection.

**Learning outcomes:**

Students are qualified for the professional performance of engineering duties and tasks in practice that are functionally and substantively related to preventive fire protection measures necessary to prevent fire occurrence or mitigate fire consequences. They are professionally qualified to perform preventive fire protection tasks, monitor fire protection status, and improve the fire protection system.

**Course contents**

*Theoretical teaching*

The importance of preventive fire protection. Legislation, regulations on technical norms, standards, ordinances and other norms regulating preventive fire protection measures. Danger zones, definition, determination.

Technical and technological prevention of fire-prone industries (oil and petrochemical industry, paint and varnish industry, textile industry, food industry, silos). Heating, purpose of heating, heat transfer. Fire hazards and preventive protection measures during heating. Fire hazards when using fuels – solid, liquid, gaseous. Ventilation system – role in fire protection, ventilation implementation. Protection of ventilation ducts from fire. Smoke extraction systems. Dust – fire hazards, dust extraction systems.

Electrical prevention. Emergency lighting. Panic lighting. Ingress protection rating (IP code) of electrical equipment in plants with dust presence and where flammable liquids and flammable gases are handled. Safety installations and consumers. Types of device protection, protection of devices and objects from the effects of atmospheric stress. Static electricity.

Construction prevention. Urban planning in fire protection. Safety separation distances between buildings. Access roads for fire-fighting vehicles. Fire resistance rating of structures, fire resistance of building constructions. Behavior of building materials and structures in fire. Fire compartments. Fire sectors. Fire barriers. Explosion vents. Smoke vents. Evacuation. Determination of evacuation time. Evacuation stairwells. Evacuation elevators.

*Practical teaching*

Development and analysis of specific fire load of a residential unit. Seminar paper.

**Literature**

Zakon o zaštiti od požara, "Službeni glasnik RS", br.111/2009, 20/2015, 87/2018 i 87/2018. Zakon o zapaljivim i gorivim tečnostima i zapaljivim gasovima („Sl. glasnik RS”, br. 54/15)

Zakon o eksplozivnim materijama, zapaljivim tečnostima i gasovima („Sl. glasnik SRS”, br. 44/77, 45/85, 18/89, „Sl. glasnik RS”, br. 53/93 - dr. zakon, 67/93 - dr. zakon, 48/94 - dr. zakon, 101/05, 54/15) - u delu eksplozivnih materija Zakon o prometu eksplozivnih materija („Sl. list SFRJ“, broj 30/85, 6/89, 53/91, „Sl. list SRJ“, broj 24/94, 28/96, 68/2002, „Sl. glasnik RS“, 101/2005 - dr.zakon)

Zakon o transportu opasne robe („Sl. glasnik RS“, br. 104/2016, 83/2018, 95/2018 – dr. zakon 10/2019 – dr. zakon) Zakon o inspekcijskom nadzoru („Sl. glasnik RS", br. 36/15, 44/18 - dr. zakon i 95/18)

Zakon o smanjenju rizika od katastrofa i upravljanju vanrednim situacijama ("Sl. glasnik RS ", broj 87/18)

Milanko, V., Božović, T.: Preventivna zaštita od požara, praktikum, Visoka tehnička škola strukovnih studija, Novi Sad, 2015

Kleut, N.: Planiranje i projektovanje javnih objekata bezbednih od požara i drugih akcidenata, Zaštita sistem, Beograd, 2008

Vidaković, M.: Požar i arhitektonski inženjering, Farenhajt, Beograd, 1995. Sekulović, Z.: Bogner, M., Pejović, S: Preventivna zaštita od požara, ETA, 2012

| **Active teaching classes: 90** | **Theoretical teaching: 60** | **Practical teaching: 30** |
|---|---|---|

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

**Assessment (maximum number of points 100)**

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

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**Study programme: Protection engineering**

**Course title: Risk analysis in decision making for disaster protection**

**Teacher: Branko Babić**

**Course status: Compulsory**

**Number of ECTS: 8**

**Prerequisite course: None**

**Course objective:**
To introduce students to the concept, phases, principles, and objectives of risk management. To acquire the knowledge essential for decision-making in the management of disaster risks within the field of emergency situations for defense entities. By examining the causes, factors, experiences, and concepts of disaster risk management, students will become familiar with risk elements and the obligations of entities in risk management.

**Learning outcomes:**
Students are able to identify and classify risks within the system of defense entities; they can analyze risks at all stages of the disaster cycle and assess circumstances and their impact on decision-making in both prevention and disaster occurrence scenarios.

**Course contents**

*Theoretical teaching*

Risk theory; Concept, objectives, principles, framework and process of risk management; Stages and rules of risk management; Risk management in the field of crisis management; Risk and risk-taking; Integrated disaster risk management; Systemic approach to disaster risk management; Decision-making and integrated risk management (concept, methods, approaches, decision-making models, types of decisions, decision-making process, decision support systems); Individual decision-making and risk assessment in companies, in state administration bodies, autonomous provinces and local self-government units; Implementation of systems analysis for disaster management; Human behavior during disasters; National security strategies, national security system management; The protection and rescue system of the Republic of Serbia and neighboring countries; Regulatory and legal framework for protection against disasters; Application of IT systems in disaster management; Logistics organization in disasters; Psychological aspects of disasters – stress and prevention; International cooperation and disaster relief.

*Practical teaching*

Disaster simulation, selection of methods for event resolution and mitigation of consequences – practicing decision-making through group work for action under specific threat conditions at the level of civil defense entities (floods; chemical accidents; accidents involving hazardous substances; catastrophic fires, gale-force winds, snow, hail); enabling students to independently identify research problems, utilize literature, and apply research methods and techniques in order to find adequate directions for their resolution. In this way, students expand their knowledge and develop abilities that allow them to identify the research problem, conduct appropriate methodological procedures, perform proper analyses, and draw correct conclusions regarding the issues under research within the assigned topic. Perform a Disaster Risk Analysis of defense entities (local self-government units, business companies, and other legal entities).

**Literature**


Babić B.: Analiza rizika u procesu odlučivanja u zaštiti od katastrofalnih događaja, VTŠ SS, Novi Sad, 2022
Babić B.: Zaštita i spasavanje u vanrednim situacijama-1 i 2 VTŠ SS, Novi Sad, 201.
Babić B.: Sistem zaštite i spasavanja, VTŠ SS, Novi Sad, Novi Sad, 2014
Babić B.: Propisi u vanrednim situacijama-civilnoj zaštiti, VVTŠ SS, Novi Sad, 2012
Babić B.: Propisi u sistemu zaštite i spasavanja, VTŠ SS NS, 2012
Babić B.: Procena rizika u vanrednim situacijama, Zbirka propisa broj 3, VTŠ SS, Novi Sad, 2013
Standard SRPS ISO 31000:2015 - Upravljanje rizikom, principi i smernice
Standard SRPS A.L.2.003 - Procena rizika u zaštiti imovine, lica i poslovanja
Standard ISO-IEC 31010 Tehnike za upravljanje rizikom (identifikacija rizika)
Uputstvo o Metodologiji izrade i sadržaju Procene rizika od katastrofa i Plana ZiS, „Službeni glasnik RS”, broj 80/19
Zakon o smanjenju rizika od katastrofa i upravljanja vanrednim situacijama, „Službeni glasnik RS”, broj 80/19


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

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

**Assessment (maximum number of points 100)**

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

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**Study programme: Protection engineering**

**Course title: Waste stream management and recycling technologies**

**Teacher: Anita Petrović-Gegić, Marina Stamenović**

**Course status: Compulsory**

**Number of ECTS: 8**

**Prerequisite course: None**

**Course objective**

Acquiring knowledge about all methods of waste management from generation, through collection, selection, transport to final disposal of waste. Training students to carry out activities in accordance with legal regulations in the field of waste management, maintaining documentation and preparing reports on waste movements. Mastering the principles of sustainable development while minimizing the generation of waste materials. Acquiring knowledge in the field of recycling technologies for various materials.

**Learning outcomes**

The course outcome is acquired knowledge in the field of waste management. Students know the legislation in the field of waste management. They perceive and understand the roles of waste management entities. They are familiar with the procedures for issuing waste management permits. They possess knowledge of waste categorization depending on the company's business activities, and they are capable of preparing waste transfer notes and waste management plans. They understand the basic principles and technologies of recycling, as well as the regulatory framework applied in this field.

**Course contents**

*Theoretical teaching*

Sustainable development, hierarchy and waste management strategy. Waste categorization according to the EU waste catalogue. Waste disposal. Municipal solid waste as valuable secondary raw materials. EU legislation in the field of waste management. Waste management plan. Waste management plant plan. Waste management principles. Permits and types of permits for waste management. Inert and non-hazardous waste. Hazardous waste and place of origin. Defining the properties of hazardous waste and getting to know the physico-chemical and other properties of hazardous waste. Hazardous waste management. Transport system and vehicles for transporting hazardous waste. Selection of vessels for storing hazardous waste. Design of temporary storage facilities and precautions when handling hazardous waste. Mechanical and chemical recyclable processes. Sources and characteristics of recyclable materials. Organization, collection and selection of waste as a prerequisite for recycling. Recycling techniques for polymeric materials. Paper recycling techniques. Glass recycling techniques. Metal recycling techniques. Construction waste recycling techniques. Recycling of old vehicles. Recycling of batteries and accumulators, Recycling of electrical and electronic waste. Handling of agricultural waste. Effects of recycling. Importance of recycling for the benefit of natural resources.

*Practical teaching*

The exercises are audit and demonstrative type in nature, aiming to provide practical knowledge in the field of waste management and recycling. Development of individual and regional waste management plans and writing waste movement reports. Preparation of documents for environmental waste impact assessment. Calculation of industrial waste quantities and the handling of specific waste types. The concept of circular economy and its application. Introduction to the marking and identification of recyclable materials in accordance with the USEPA list and the European Waste Catalogue. Introduction to sampling and characterization of non-hazardous waste composition. Field visits to non-hazardous waste recycling facilities. Presentation of assigned tasks from specific areas and guidance in the development of group seminar papers.

**Literature**


Petković, G., Šerović, R., Stevanović-Čarapina, H.: Priručnik za upravljanje otpadom, Forum media, Beograd,

Vujić, Ubavin, Stanisavljević, Batinić: Upravljanje otpadom u zemljama u razvoju, Fakultet tehničkih nauka, Novi Sad, 2012

Bošković. G., Jovičić, N.: Sakupljanje i transport čvrstog otpada, Fakultet inženjerskih nauka Univerziteta u Kragujevcu, Kragujevac, 2020

Zavargo, Z.: Održive tehnologije, Tehnološki fakultet, Novi Sad, 2012

Bredberg, K., Christiansson, M., Stenberg, B., Holst, O.: Biotechnological Processes for Recycling of Rubber Products, Biopolimer online, 2005

Ubavin, D.: Upravljanje opasnim otpadom, skripta, Fakultet tehničkih nauka, 2015

Hodolič, J.: Reciklaža i reciklažne tehnologije, FTN, Novi Sad, 2013


| **Active teaching classes: 90** | **Theoretical teaching: 60** | **Practical teaching: 30** |
|---|---|---|

**Teaching methods:** Interactive, laboratory, monologic, dialogic.

**Assessment (maximum number of points 100)**

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

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**Study programme: Protection engineering**

**Course title: Professional master practice 1**

**Teacher: Head of the study programme**

**Course status: Compulsory**

**Number of ECTS: 4**

**Prerequisite course: None**

**Course objective**

Acquisition, application and improvement of current practical knowledge and skills related to the study programme from the subject area dealt with in the first year of the master study, which is carried out in the selected host company, as well as introduction to the work process of the company.

**Learning outcomes**

Practical experience gained in the application of current knowledge and skills acquired during the first year of master studies, on specific work processes in the selected host company.

**Course contents**

*Practical teaching*

Professional master practice 1 is carried out in the 1st year of professional master studies, lasting 90 hours. It is performed in companies dealing with production, service and other activities, according to general and individual programme contents, agreed between the co-mentor from the host company, the mentor in charge of practice from the School and the student. The student can also perform Professional master practice 1 at the Higher Education Technical School of Professional Studies in Novi Sad, according to a predetermined and approved plan.

Forms related to Professional master practice 1 are available to students registered to take the course.

The student in Professional master practice 1 performs general and special tasks. General tasks imply that the student learns about: the history of the company, the organisational structure and the production programme, that is, the work processes in the company.

Student's professional tasks that should be performed during Professional master practice 1 are defined by the co-mentor from the company and the mentor. They refer to thematic units the student has attended and passed in the courses during the first year of master studies, so now that knowledge is applied in practice in the selected company.

The assignments provide adequate opportunities for the student to demonstrate abilities in several categories: application of professional knowledge; practical skills; analytical skills, the ability to solve concrete problems; innovation and originality; development skills; time management; written and oral expression, all with the aim of training for the future profession. The co-mentor in the company regularly cooperates with the student, instructs him and monitors their work. During the practice, the student keeps the internship diary.

After completing the Professional master practice 1, the student submits a report that, in terms of content and form, corresponds to the instructions defined at the beginning of the internship.

**Literature**

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

**Active teaching classes: 90**

**Teaching methods**:

Practical, laboratory, individual work.

**Assessment (maximum number of points 100)**

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

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**Study programme: Protection engineering**

**Course title: Business ethics**

**Teacher: Petra Balaban, Jovana Kopanja**

**Course status: Elective**

**Number of ECTS: 4**

**Prerequisite course: None**

**Course objective**

Introducing students to the concepts of ethics and morality in the business environment. The course covers the fundamentals of philosophical ethical theories and their application in business. Through numerous examples, students will become familiar with the practical application of ethics in various problematic situations that have become prominent in recent years: business ethics, whistleblowing, data privacy, conflict of interest, bribery and corruption, and discrimination. Additionally, students are introduced to the principles of corporate social responsibility.

**Learning outcomes**

The student is equipped to analyse the impact of economic challenges on ethics. They possess the skills to recognize and resolve ethical problems in business. The student is encouraged to analyse their own value system, recognizing the importance of individual values in the business environment and the workplace. The student acts in a socially responsible manner.

**Course contents**

*Theoretical teaching*

Corporate culture – concept, features. The importance of symbols for cultural development. The relationship between economy and culture. The concept and principles of personal ethics. General and business ethics. Fundamental principles of business ethics. Development stages of business ethics. Ethics as a segment of corporate culture and ethical principles. Entrepreneurial business culture as a prerequisite for business ethics. Codes of ethics. Business morality. Obligations and rights of employees as a framework for moral challenges. Business ethics and moral pluralism. Conflict of interest and business ethics. Moral dilemmas of employees. Bribery and corruption. The emergence of whistleblowers. Data privacy. Discrimination. Establishing and applying moral standards in business. Ethics in a global world. The subject of business ethics as an academic discipline. Stakeholders and stockholders of ethical reasoning. The concept of social responsibility. Types, concepts, and models of social responsibility. Levels of social responsibility. Social responsibility in marketing and public relations. Social responsibility and environmental protection.

*Practical teaching*

Analysis of practical examples from the material presented in the lectures. Active participation of students in discussions.

**Literature**

Vuković M., Voza D., Vuković A., Poslovna etika, Visoka škola strukovnih studija za mendžment u saobraćaju, 2010

Elaković, S., Poslovna etika i komuniciranje, Univerzitet Singidunum, Beograd, 2011

Miljević M., Poslovna etika i komuniciranje, Univerzitet Singidunum, 2010

Cvijanović D., Mihajlović B., Pejanović R., Poslovna etika i komuniciranje, Institut za ekonomiku poljoprivrede, 2012

Pavić Ž., Etika i psolovne komunikacije, Univerzitet Singidunum, 2011

Jalešnjak B., Krkač K., Poslovna etika, Korporacijaksa društvena odgovornost i održivost, Mate, 2016

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

**Teaching methods**:

Monologic, dialogic, interactive, demonstrative.

**Assessment (maximum number of points 100)**

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

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**Study programme: Protection engineering**

**Course title: Modern methods of education**

**Teacher: Jovana Kopanja, Karolina Mudrinski-Palanački**

**Course status: Elective**

**Number of ECTS: 4**

**Prerequisite course: None**

**Course objective**

Introducing students to modern educational technologies and standards. Enabling students to apply modern technologies and methods in order to present their own engineering results.

**Learning outcomes**

Students understand the applications of information and communication technologies, and adopt methods for their selection as well as the relevant standards applied in the process of presenting and evaluating results. The student recognizes the importance of applying modern educational technology and is familiar with the pedagogical and psychological effects caused by its implementation.

**Course contents**

*Theoretical teaching*

History of educational technologies and the concept of e-learning. Modern technologies and tools in education. Types of modern education. Information and communication technologies (ICT) and modern education. Hardware and software infrastructure. E-learning platforms (LMS – Learning Management System) used for the creation, administration, and tracking of training and education. Intelligent tutoring systems. E-learning standards. Standards for the presentation of electronic materials. Standards for the presentation of the instructional process. Open education. Pedagogical-psychological effects of applying modern technologies in education. Problems in the application of modern educational technology and mechanisms for overcoming them. Modern educational technologies and media literacy.

*Practical teaching*

Development of a project assignment from a selected area of modern education. Analysis and evaluation of knowledge within the adopted and enhanced education system.

**Literature**

Đorđević J., Individualizacija i inoviranje nastave i učenja u školi 21. veka, Pedagoška stvarnost, Novi Sad, 2009
Ivić I., Pešikan A., Antić S., Aktivno učenje 2, Institut za psihologiju, Beograd, 2001
Aggarwal J. C., Kaur M., Jaswal S.S., Bajwa Ch., Chabra S., Contemporary issues in education, Tripura University, 2017
Illeris K., Contemporary theories of learning, Routledge Taylor & Franscis group, 2009
Tirri K., Contemorary teacher education, MDPI, 2021

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

**Teaching methods**

Monologic, dialogic, interactive.

**Assessment (maximum number of points 100)**

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

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**Study programme: Protection engineering**

**Course title: Investigation of causes, phases and consequences of fire**

**Teacher: Saša Spaić**

**Course status: Compulsory**

**Number of ECTS: 8**

**Prerequisite course: None**

## Course objective

Students should learn types of fires, causes of their occurrence, phases, manifestations during their duration, types of resulting evidence, and the "reading" of traces and manifestations, all for the purpose of mental reconstruction of the course of events, supported by exact evidence.

## Learning outcomes

Based on statistical data, students observe the significant prevalence of certain types of fires, identify potential causes and propose solutions for the observed problem. On completion of their education, within the scope of their capabilities, they persistently work on improving the state of the field for the general benefit of society. They know the behavior of materials in a fire and understand how traces point to the origin of the fire. In case of suspected arson, they produce evidence and point to motives. They logically correlate the results of physical and chemical analyses with the reconstruction of the course of events.

## Course contents

*Theoretical teaching*

Ignition. Combustion. Fire. Explosion. Oxygen-enriched atmospheres. Databases in the field of disasters and fires: National Fire Incident Reporting System and DesInventar. National Forensic-Technical Center. Causes of fires (direct contact with flame or incandescent material; electric current – thermal effect, spark, arc; static electricity; natural – atmospheric discharge of electricity, thermal effect of the Sun, earthquake; mechanical – friction, pressure, impact; spontaneous combustion – oils, plant materials, coal). Electric current as a cause of fire. Primary and secondary short circuit. X-ray structural analysis of short circuits. Static electricity as a cause of fire. External manifestations of fire (smoke, flame, soot, odours, sounds, corrosion of surrounding materials). Fires according to the place of occurrence: open space (forest fire, harvest work, etc.), closed space (kitchen fires, chimney fires, silo fires, etc.), means of transport. Stages of fire development. Behavior of materials (wood, glass, paper, metals, brick, stone, concrete, mortar, plastics) and structures in a fire. The origin of the fire and methods for its location (static, dynamic, elimination methods). Reconstruction of the event. Traces on and around the fire site. Arson. Motives. Traces on the suspect. Forensic classification of the causes of fires. Fire and explosion in the Criminal Code of the Republic of Serbia. Arsonists (intentional, mental illness, state of intoxication, pyromania). Physico-chemical methods in fire detection (atomic emission spectrometry – with laser microspectral analysis, atomic absorption spectrometry, infrared spectrometry, X-ray fluorescence analysis, neutron activation analysis, gas chromatography, mass spectrometry).

*Practical teaching*

Seminar paper related to a specific type of fire. Application of a thermal imaging camera for monitoring local overheating. Combustion and thermal decomposition (aerobic pyrolysis) of selected solid samples. Determination of thermal decomposition indicators for sunflower oil (liquid sample example).

## Literature


Spaić, S., Petrović, V.: Istraživanje uzroka, faza i posledica požara, materijal u elektronskoj formi dostupan studentima, Visoka tehnička škola strukovnih studija u Novom Sadu, Novi Sad, 2022

Pečalat, R., Zorić, Z.: Istraživanje uzroka požara, Zavod za istraživanje i razvoj sigurnosti d.d., Zagreb, 2003

Aleksić, Ž.L., Kostić, R.A.: Požari i eksplozije - Priručnik za otkrivanje uzroka i utvrđivanje odgovornosti, Privredna štampa, Beograd, 1982

NFPA®921 Guide for Fire and Explosion Investigations, 2017 Edition, NFPE®, Quincy, Massachusetts, 2017

Jelčić Rukavina, M., Carević, M., Veršić, Z.: Sigurna uporaba toplinsko-izolacijskih materijala u građevinama s aspekta zaštite od požara, Sveučilište u Zagrebu, Građevinski fakultet, Zagreb, 2020

Krivični zakonik („Sl. glasnik RS“, br. 85/05, 88/05 – ispr., 107/05 – ispr., 72/09, 111/09, 121/12, 104/13, 108/14, 94/16 i 35/19). Kiurski, J.: Priručnik za uviđaj, Misija OEBS-a u Srbiji, Beograd, 2018

Čimburović, Lj., Ivanović, R.A.: Primena fizičko-hemijskih metoda u kriminalističkoj tehnici, Pravni izazovi na početku XXI vijeka, Novi Pazar, 2011, Zbornik radova, str. 125-146

Artamonov, V.S., Belobratova, V.P., Belьšina, Ю.N., Vakulenko, S.V., Voronova, V.B., Gališev, M.A., Kondratьev, S.A., Motorьgin, Ю.D., Polяnskaя, N.A., Sirotinkin, N.V., Tolstьh, V.I., Utkin, N.I., Češko, I.D., Šarapov, S.V.: Rassledovanie požarov: Učebnik. Sankt-Peterburg: Sankt-Peterburgskiй universitet Gosudarstvennoй protivopožarnoй službы MČS Rossii, 2007


| **Active teaching classes: 90** | **Theoretical teaching: 60** | **Practical teaching: 30** |
|---|---|---|

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

**Assessment (maximum number of points 100)**

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

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**Study programme: Protection engineering**

**Course title: Personal protective equipment**

**Teacher: Dušan Gavanski**

**Course status: Compulsory**

**Number of ECTS: 8**

**Prerequisite course: None**

**Course objective**

Introducing students to the characteristics, application, labeling, proper selection and maintenance of personal protective equipment.

**Learning outcomes**

The student has acquired knowledge regarding the significant characteristics of individual personal protective equipment, as well as its marking according to standards used as a basis for proper selection. Furthermore, the student knows how to correctly use and maintain personal protective equipment.

**Course contents**

*Theoretical teaching*

Valid regulations governing the use of personal protective equipment. Rulebook on preventive measures for safe and healthy work in the use of personal protective equipment. Rulebook on personal protective equipment. Importance and classification of personal protective equipment (PPE). Personal protective equipment for head protection. Head hazards within the work process. Classification, characteristics, application, testing, and marking of personal protective equipment for head protection. Personal protective equipment for face and eye protection. Eye and face hazards within the work process. Classification, characteristics, application, and marking of personal protective equipment for eye and face protection. Personal protective equipment for hearing protection. Noise-related hazards. Classification, characteristics, application, and marking of personal protective equipment for hearing protection. Personal protective equipment for respiratory protection. Respiratory hazards within the work process. Classification, characteristics, application, and marking of personal protective equipment for respiratory protection. Personal protective equipment for hand protection. Hazards from hand injuries and occupational diseases. Classification, characteristics, application, and marking of personal protective equipment for hand protection. Skin protection. Personal protective equipment for leg and foot protection. Hazards from foot and leg injuries within work processes. Classification, characteristics, application, and marking of personal protective equipment for foot and leg protection. Personal protective equipment for torso and abdomen protection. Protective clothing. Hazards from bodily injuries within the work process. Classification, characteristics, application, and marking of personal protective clothing. Personal protective equipment for firefighters-rescuers. Classification, characteristics, application, and marking of personal protective equipment for firefighters-rescuers. Personal protective equipment for ionizing radiation. Personal protective equipment against falls from heights. Personal protective equipment against drowning. Personal protective equipment for humanitarian demining. Maintenance and disposal of personal protective equipment. Record-keeping of personal protective equipment.

*Practical teaching*

Preparation and defense of a seminar paper. Procurement procedures for personal protective equipment. Creation and completion of personal protective equipment issuance records.

**Literature**

Gavanski, D.: Lična zaštitna oprema, skripta, Visoka tehnička škola strukovnih studija, Novi Sad, 2021

*** Pravilnik o preventivnim merama za bezbedan i zdrav rad pri korišćenju sredstava i opreme za ličnu zaštitu na radu („Službeni glasnik RS”, br. 92/2008 i 101/2018)

*** Pravilnik o ličnoj zaštitnoj opremi („Službeni glasnik RS”, broj 23/2020)

Horvat, J., Regent, A.: Osobna zaštitna oprema, Veleučilište u Rijeci, 2009

Vučinić, J., Vučinić, Z.: Osobna zaštitna sredstva i oprema, Veleučilište u Karlovcu, 2011

Knežiček, Ž., Adilović, A., Regent, A.: Lična i kolektivna zaštitna oprema, Univerzitet u Tuzli, 2015

| **Active teaching classes: 90** | **Theoretical teaching: 60** | **Practical teaching: 30** |
|---|---|---|

**Teaching methods:** Monologic, dialogic, interactive and demonstrative.

**Assessment (maximum number of points 100)**

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

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**Study programme: Protection engineering**

**Course title: Calculation and model of evacuation**

**Teacher: Branko Babić**

**Course status: Elective**

**Number of ECTS: 8**

**Prerequisite course: None**

**Course objective**

To introduce students to the elements of evacuation – phases, routs, movement speed, evacuation time calculation, as well as the essential elements for planning and designing evacuation and rescue operations for people in fire conditions from buildings; to familiarize them with the organization of evacuation and rescue in emergency situations, along with the place and role of stakeholders involved in the evacuation process.

**Learning outcomes**

Students are capable of planning and designing optimal evacuation routes, as well as formulating and defining measures that will ensure the preparedness of threatened persons for timely response and the evacuation process. They know how to use and apply evacuation modelling software – Pathfinder – and how to determine building evacuation time in accordance with official rulebooks.

**Course contents**

*Theoretical teaching*

Evacuation – basic concepts and definitions. Decision-making on evacuation and human behavior in conditions of fire and natural disasters. Exit planning strategies. Evacuation phases. Evacuation routs. Evacuation movement speeds. Evacuation time calculation. Computer modelling of evacuation. Procedures for activating authorities and organizations (human and material resources), bringing them into a state of readiness to execute tasks for the preparation and implementation of evacuation and rescue: legal entities, regular services, and material-technical resources. Organization, methods of receiving and announcing accident notifications. Organization and methods of summoning authorities and organizations for disaster mitigation. Organization of material and medical support during evacuation and rescue. Safety measures during evacuation and rescue. Organizational structure of authorities and organizations integrated into the evacuation and rescue system in the event of an accident (healthcare and utility services, traffic police, civil protection, etc.). Provision of first medical aid and healthcare. Sheltering and care of the affected population. Evacuation of the population.

*Practical teaching*

Evacuation drills. Calculation of evacuation time, periodic repetition of drills. Evacuation plans. Calculation of the maximum number of people present who need to be evacuated. Application of the evacuation software model – Pathfinder.

**Literature**


Babić, B.: Proračun i model evakuacije, VTŠ SS Novi Sad, 2022.

Zakon o zaštiti od požara "Sl. glasnik RS", br. 111/09, 132/14, 20/15 i 87/2018

Zakon o planiranju i izgradnji, ("Sl. glasnik RS", br. 72/2009, 81/2009 - ispr., 64/2010 - odluka US, 24/2011, 121/2012, 42/2013 - odluka US, 50/2013 - odluka US, 98/2013 - odluka US, 132/2014, 145/2014, 83/2018, 31/2019, 37/2019 - dr. zakon, 9/2020 i 52/2021) Pravilnik o tehničkim normativima za zaštitu od požara stambenih i poslovnih objekata i objekata javne namene, "Sl. glasnik RS", br. 22/2019

SRPS UJ.1. 051. Ponašanje građevinskih materijala u požaru, pregled klasifikacija građevinskih materijala

Uredba o razvrstavanju, objekta, delatnosti i zemljišta u kategorije ugroženosti od požara, „Sl. glasnik RS br. 76/2010.

SRPS U.J1.240:1994. Zaštita od požara u građevinarstvu – Stepen otpornosti zgrade prema požaru

Pravilnik o tehničkim normativima za zaštitu visokih objekata od požara, „Sl. glasnik RS br. 80/2015, 67/2017, 103/2018

Pravilnik o tehničkim normativima za zaštitu ugostiteljskih objekata od požara, „Sl. glasnik RS br. 20/2019.

Pathfinder - uputstvo za korišćenje


| **Active teaching classes: 105** | **Theoretical teaching: 60** | **Practical teaching: 45** |
|---|---|---|

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

**Assessment (maximum number of points 100)**

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

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**Study programme: Protection engineering**

**Course title: Software methods of experimental modelling**

**Teacher: Božo Ilić, Nenad Janjić, Branko Savić**

**Course status: Elective**

**Number of ECTS: 8**

**Prerequisite course: None**

**Course objective**

Gaining knowledge about different types of experiments, as well as methods for their modelling, with an emphasis on softwer-based modelling.

**Learning outcomes**

Students will be able to recognize different types of experiments and model them using various methods, with a particular focus on computational modelling.

**Course contents**

*Theoretical teaching*

Modelling: Computer-based modelling and process simulation. Application of the MATLAB software package in computational modelling and process simulation. Application of computational modelling in ecology. Programming languages that can be used for modelling. Evaluation of results obtained by computer simulation. Application of the Monte Carlo method in modelling stochastic processes. Problem solving methodology: Problem definition. Description of input and output operations. Manual problem-solving (or using a calculator) for a sample dataset. MATLAB solution development. Solution testing with various data. MATLAB environment: MATLAB windows, problem solving in MATLAB, working with matrices, operator precedence, MATLAB modules (Simulink Toolbox, Control System Toolbox, Simscape, Neural Network Blockset, Optimization Toolbox, Spline Toolbox, etc.). Simulink Modelling: Simulink libraries (Commonly Used Blocks, Continuous, Discontinuous, Discrete, Logic and Bit Operations, Look-Up Tables, Math Operations, Model Verification, Model-Wide Utilities, Ports & Subsystems, Signal Attributes, Signal Routing, Sinks, Simscapes, etc.). Creating a new model in Simulink. Basic element classes in Simulink. Examples of modelling and simulation in Simulink. Simscape Modelling: Basic libraries for modelling in Simscape. System modelling and simulation in Simscape. Structural modelling of systems in Simscape.

*Practical teaching*

Assignments related to the topics covered in the lectures are performed.

**Literature**

D. Etter, D. Kuncicky, Uvod u Matlab 7, CET, Beograd, 2005

A. Veljović, M. Zahorjanski, Modeliranje informacionih sistema, CET, Beograd, 2016

M. Zahorjanski, Zbirka zadataka iz informacionog modeliranja, CET, Beograd, 2016

G. Nestorović, Ž. Adamović, Modeliranje sklopova u Pro/Engineer-u Wildfire 5.0, TŠ Nikola Tesla, Kostolac, 2011

Ž. Adamović, Lj. Josimović, Metodologija i tehnologija naučnog istraživanja, Društvo za tehničku dijagnostiku Srbije, Beograd, 2007

| **Active teaching classes: 105** | **Theoretical teaching: 60** | **Practical teaching: 45** |
|---|---|---|

**Teaching methods**:

Monologic, dialogic, interactive.

**Assessment (maximum number of points 100)**

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

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**Study programme: Protection engineering**

**Course title: Professional master practice 2**

**Teacher: Head of the study programme**

**Course status: Compulsory**

**Number of ECTS: 4**

**Prerequisite course: None**

**Course objective**

Gaining new and applying acquired advanced knowledge and skills related to the study programme while in the selected host company, focused on the preparation of the Preliminary master thesis and the Master thesis.

**Learning outcomes**

Practical experience in the application and use of knowledge and skills acquired during the master professional studies. The student is able to identify, analyse and solve a specific problem in the field of the study programme. Data/results that have been collected can serve as a basis for preparing the practical part of the Preliminary master thesis and the Master thesis.

**Course contents**

Professional master practice 2 is carried out in the 2nd year of master studies, lasting 90 hours. It is performed in companies dealing with production, service and other activities, according to general and individual programme contents, agreed between the co-mentor from the host company, the mentor in charge of practice from the School and the student, with the purpose of collecting data/results and acquiring skills that can serve as a basis for preparing the practical part of the Preliminary master thesis and the Master thesis. The student can also perform Professional master practice 2 at the Higher Education Technical School of Professional Studies in Novi Sad, according to a predetermined and approved plan.

Forms related to Professional master practice 2 are available to students registered for the course.

The student in Professional master practice 2 solves special tasks, which are defined by the co-mentor from the company and the mentor.

The mentor and co-mentor guide the student and precisely define the work tasks and obligations in order to enable the student to gain appropriate data/results/skills necessary for the preparation of the practical part of the Preliminary master thesis and the Master thesis. These are, for example: planning and conducting a survey and/or preliminary experiments, considering possible solutions to a specific problem, selecting a methodology and detailed planning for performing the main analyses, selecting technologies when developing a practical project. The selected assignments provide adequate opportunities for the student to demonstrate abilities in several categories: application of professional knowledge; practical skills; analytical skills, the ability to solve concrete problems; innovation and originality; development skills; time management; written and oral expression, all with the aim of training for the future profession. Then the student performs planned activities – data analysis and/or surveys, experiments, numerical simulations, statistical data processing, development of algorithms and programs, applies selected technologies during the development of the planned practical work. A co-mentor from the company regularly cooperates with the student, instructs them and monitors their work. During the practice, the student keeps the internship diary.

After completing the Professional master practice 2, the student submits a report that corresponds in content and form to the instructions defined at the beginning of the internship.

**Literature**

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

**Active teaching classes: 90**

**Teaching methods:** Practical, laboratory, individual work.

**Assessment (maximum number of points 100)**

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

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**Study programme: Protection engineering**

**Course title: Preliminary master thesis**

**Teacher: Head of the study programme/Mentor**

**Course status: Compulsory**

**Number of ECTS: 16**

**Prerequisite course: None**

**Course objective**

Developing the ability to independently plan a project that will solve a specific practical problem from the selected field of the study programme. Developing the ability to identify and define problems and communicate with the mentor. Introduction to practical methodologies that can be used in the selected field. Integrating, upgrading, and practically applying the knowledge acquired throughout the studies. Preparation for writing one's master thesis.

**Learning outcomes**

Through independent and mentored work, the student has defined the outline topic of the master thesis and elaborated it, up to the written proposal and oral defence (viva) of the detailed plan for the master thesis. Thus, the student has developed the ability to conduct analyses and identify problems within the given topic, and is ready to write the master thesis.

**Course contents**

The course is taught through independent applied research and mentoring, during which the student defines the outline topic of the master thesis, then elaborates it in detail, up to the written proposal and oral defence of the detailed plan for the development of the master thesis.
After receiving the topic and assignment, along with regular consultation and reporting, the student studies the appropriate professional literature, previous master theses and other works in a similar field and performs preliminary analyses in order to better define the assigned problem.
In the second phase, the student studies the nature, structure and complexity of the problem in more detail. He actively searches for published knowledge from the broader topic of the assigned work, plans and conducts preliminary research or programme/idea solutions, in order to better quantify the task and topic. In this way, the student draws conclusions about possible solutions, selects a methodology/technology and plans in detail the organization and execution of the main analyses or applications of the selected technology when developing a practical project, with the aim of producing the master thesis. During this process, the student regularly consults with the mentor, and if necessary, with other teachers of the School. The goal of the student's activities during this phase of research is to gain the necessary experience to solve more complex problems and to identify opportunities for applying previously acquired knowledge in practice. At the end of the research work, the student writes the Preliminary master thesis.
The quality of the written Preliminary master thesis is assessed by the mentor/head of the study programme. The Preliminary master thesis is defended orally.

**Literature**

Textbooks in the selected field, papers from professional journals, technical documentation from the company, software tutorials, previous master theses, etc.

**Active teaching classes: 300**

**Teaching methods**

Practical, research, mentoring.

**Assessment (maximum number of points 100)**

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

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**Study programme: Protection engineering**

**Course title: Master thesis**

**Teacher: Mentor**

**Course status: Compulsory**

**Number of ECTS: 16**

**Prerequisite course: Passed all courses from the study programme**

**Course objective**

Application of theoretical and practical knowledge and skills acquired in the study programme with the aim of enabling students to adopt advanced methods for engineering decision-making and complex problem-solving. Documenting the completed work in written form and public defence (viva) of the project results.

**Learning outcomes**

Capability to comprehend and solve complex practical problems and apply advanced methods in engineering decision-making. Skills in both written and verbal presentation of work results.

**Course contents**

Upon passing all exams, the student proceeds to the preparation of the master thesis. The master thesis is a research, methodological, and practical work of the student, aimed at familiarizing them with solving complex practical problems and the methodology of developmental and practical research within one of the fields of the master study programme. Procedures and forms related to the master thesis are available on the School's website.

During the preparation of the master thesis, the student actively consults with their mentor and may also consult other teachers from the School as needed (subject area professor, mentor from Professional master practice 2, etc.). In addition to a detailed review of relevant contemporary literature and/or legal and technical regulations in the chosen field, the master thesis should include at least one of the following elements: analytical, computational, design, developmental, software programming, or experimental aspects.

The master thesis is conducted independently, and it is preferable for it to be linked with the specific knowledge and skills acquired during the professional master practice.

The student writes the master thesis based on the detailed execution plan previously presented in the Preliminary master thesis. In doing so, the student finalizes the preliminary experiments, analyses, or software solutions obtained during the research for the preliminary paper to achieve final results or programs. Then, the student prepares the master thesis in the prescribed format, which includes the following chapters: introduction, objective of the work, subject elaboration, conclusion, and references.

After completing the master thesis, the student submits the written version of the work. Following the verification of compliance with the conditions according to the procedure specified by the Rules on Topic Selection, Preparation, and Defence of Final Work for Bachelor, Specialist, and Master Studies of the Higher Education Technical School of Professional Studies in Novi Sad, the student proceeds to the oral presentation and defence (viva) of the master thesis. The defence is public and takes place before a committee.

**Literature**

Textbooks in the chosen field, papers from professional journals, technical documentation from the company, software tutorials, previous master theses, etc.

**Number of classes: 60**

**Teaching methods**

Mentoring, practical, laboratory, individual work.

**Assessment (maximum number of points 100)**

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

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