

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet: ANALIZE TVEGANJA
Course Title: RISK ANALYSIS

Študijski program in stopnja Study Programme and Level	Študijska smer Study Field	Letnik Academic Year	Semester Semester
UŠP Tehniška varnost, 1. stopnja	/	3.	5.
USP Technical Safety, 1 st Cycle	/	3 rd	5 th

Vrsta predmeta / Course Type

obvezni / Mandatory

Univerzitetna koda predmeta / University Course Code:

TV118

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje Work	Druge oblike študija	Samost. delo Individ. Work	ECTS
45	/	30 LV	/	/	75	5

**Nosilec predmeta /
Lecturer:**

doc. dr. Mitja Robert Kožuh /
Dr. Mitja Robert Kožuh, Assistant Professor

Jeziki / Languages:

Predavanja / Lectures: Slovenski / Slovenian
Vaje / Tutorial: Slovenski / Slovenian

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:

Študent oz. kandidat mora imeti predmet opredeljen kot študijsko obveznost.

Prerequisites:

The course has to be assigned to the student.

Vsebina:

Kako sprejeti odločitev ali uporabiti kvantitativno varnostno analizo
 Pravilna ocena argumentov za izvedbo varnostne analize
 Izbor in uporaba kvantitativne varnostne analize, ter seznanitev z vsemi kvalitativnimi in kvantitativnimi elementi varnostne analize.
 Uporaba modelov za komponente sistemov in ugotavljanje podatkov za te modele. (Baze podatkov o posameznih pomembnih komponentah ter kvantitativne metode določanja parametrov zanesljivosti komponent)
 Induktivne metode

- Failure Mode and Effect Analysis

Content (Syllabus outline):

How to take decision to use qualitative risk analysis
 Argument based decision to use risk analysis
 Selection and use of risk assessment,
 Acquaintance with all qualitative and quantitative elements of risk assessment.
 Use of models for system components and data base collection for these models. (Quantitative methods for reliability model parameter determination)

- Failure Mode and Effect Analysis (FMEA), Failure Mode Effect and Criticality Analysis (FMECA)
- Hazard and Operability Study (HAZOP)

Deductive methods

<p>(FMEA), Failure Mode Effect and Criticality Analysis (FMECA) (sistematične metode analize odpovedi sistemov)</p> <ul style="list-style-type: none"> • Hazard and Operability Study (HAZOP) (sistematične metode analize nevarnosti med obratovanjem) <p>Deduktivne metode</p> <ul style="list-style-type: none"> • Drevo dogodkov (analiza nezgodnih scenarijev in njihovo logično modeliranje) • Drevo odpovedi (analiza odpovedi posameznih sistemov in njih logično modeliranje) <p>Analiza napak s skupnim vzrokom Analiza človeške zanesljivosti Analiza zunanjih dogodkov Vrednotenje modelov s pomočjo računalniških programov ter interpretacija rezultatov. Definiranje meril pomembnosti in njihova vloga pri vrednotenju. Merila, izračun in predstavitev ocen tveganja</p> <ul style="list-style-type: none"> • Mere tveganja • Predstavitev tveganja • Izračun tveganja • Negotovosti občutljivosti in pomembnost pri tveganju <p>Uporaba rezultatov kvantitativne analize za upravljanje s tveganjem Interpretacija kvantitativnih rezultatov v varnostni analizi in pomembnost predpostavk pri tem Metode za oceno organizacijskih faktorjev</p> <ul style="list-style-type: none"> • Management Oversight and Risk Tree (MORT) • Work Process Analysis Model (WPAM) 	<ul style="list-style-type: none"> • Event tree (accident scenario analysis and their logical modeling) • Fault tree analysis (System logical modeling) <p>Common Cause Failures Human reliability analysis External event analysis Quantitative evaluation of models using computer codes and interpretation of the results Importance measures definition and their role within evaluation of risk Risk measures and representation of risk assessment</p> <ul style="list-style-type: none"> • Risk measures • Risk representation • Risk calculation • Uncertainties, sensitivity and importances within risk <p>Use of the results of quantitative analysis for risk management Interpretation of qualitative results in risk assessment and importance of assumptions Methods for organizational factors assessment</p> <ul style="list-style-type: none"> • Management Oversight and Risk Tree (MORT) • Work Process Analysis Model (WPAM)
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Temeljni literatura in viri / Readings:

Glavna literatura:

- Fault tree handbook, NUREG -0492, Nuclear Regulatory Commission, 1986 209 str. (70%)
- Ian Sutton: Process Reliability and Risk Management, Van Nostrand Reinhold, New York, 1992, 277 str. (30%)
- AIChE. Guidelines for Chemical Process Quantitative Risk Analysis, New York 1989, 382 str. (20%)

Dopolnilna literatura:

- E.E.Lewis, Introduction to Reliability Engineering, Wiley 1987 400 str.
- Gertman I.D., Blackman H.S.: Human Reliability and Safety Analysis Data Handbook, John

Willey & Sons Inc. 1994, 448 str.

- Kletz T.A.:HAZOP and HAZAN, The institution of Chemical Engineers, Rugby 1986, 256 str.

Cilji in kompetence:

Namen predmeta je seznaniti študente z uporabo metod za analize tveganj. Teoretično bodo študenti spoznali metode na predavanjih praktično pa na vajah pri katerih bodo spoznali tudi računalniške programe za izvajanje takih analiz. S pomočjo seminarske naloge bodo znanje utrdili in s pomočjo ene od metod rešili praktični realni problem.

Objectives and Competences:

Aim of the course is to teach students with the use of risk assessment methods. Theoretically they will learn methods and practically during exercises. Students will learn how to use computer codes for risk analyses. During seminar work they will solve realistic problem.

Predvideni študijski rezultati:

Znanje in razumevanje

Študent bo pridobil osnovna teoretska in praktična znanja, ki so potrebna za razumevanje različnih analiznih postopkov, ki jih inženir nujno potrebuje pri vsakodnevni odločitvah in je temeljni pogoj za izvedbo praktičnih analiz. Prav tako bodo sposobni kritično presoditi zmogljivosti nekaterih analiznih metod, primerjati kvalitativne in kvantitativne metode. Razen teoretskih temeljev bodo pridobili tudi praktična znanja.

Uporaba

Analiza tveganj je usmerjena v reševanje praktičnih problemov, ki so nujni tako pri snovanju varnejših sistemov. Pri predmetu bodo študentje pridobili znanja, ki jim omogočajo izvedbo preprostih in zahtevnejših analiz. Poleg matematičnih osnov, ki so osnova razumevanje analiz bodo pridobili tudi praktična znanja, ki so potrebna pri zasnovi in izvedbi logičnih modelov ter interpretaciji podatkov in dobljenih rezultatov. Pomemben vidik predmeta je predstaviti študentu kritičen pogled na podajanje rezultatov in zmogljivosti različnih analiz.

Refleksija

Kritična presoja uporabnosti posameznih metod za oceno tveganja.

Prenosljive spretnosti

Pri predmetu bo študent pridobil intelektualne spretnosti, znal bo uporabljati podatke iz literature, izvajati izračune za pridobitev uporabnih podatkov, eksperimentalne podatke

Intended Learning Outcomes:

Knowledge and Comprehension

Student will obtain basic theoretical and practical skills, needed for understanding analytical practices that engineer needs in everyday decisions and is fundamental condition for performing analysis. Besides theoretical fundamentals students will obtain also practical skills.

Application

Risk analysis is oriented towards solving of practical problem, which are needed for design of safer systems. The course will enable students to perform more basic and also more advanced analyses. Besides mathematical basics that are fundamental for analysis understanding students will obtain also practical knowledge needed for making logical models and for interpretation of input data and the results. Important aspect of the course is to present to student critical view on results and on possibilities of different analyses.

Reflection

Critical judgement for use of different risk assessment methods.

Skill-transference Ability

During the course will student obtain intellectual skills, he will be able to use data from literature, he will be able to calculate data needed for analysis based on experimental data and to

bo znal ustrezno obdelati ter primerno interpretirati.

process them and interpret them soundly.

Metode poučevanja in učenja:

Predavanja
Vaje

Learning and Teaching Methods:

Lectures
Exercises

Načini ocenjevanja:

Delež (v %) /

Weight (in %)

Assessment:

Način (pisni izpit, ustno izpraševanje, naloge, projekt)

70%

Izpit pisni in ustni. Ocene: 6-10 pozitivno

Vaje: Opravljen kolokvij Pri vajah predstavlja delež ocene tudi uspešno delo na vajah (1/3).

30%

Reference nosilca / Lecturer's References:

1. **KOŽUH, Mitja**, PEKLENIK, Janez. A method for identification and quantification of latent weaknesses in complex systems. *Cognition, technology & work*, 1999, vol. 1, no. 4, str. 211-221. [COBISS.SI-ID 15086119]
2. AL-MANSOUR, Fouad, **KOŽUH, Mitja**. Risk analysis for CHP decision making within the conditions of an open electricity market. *Energy (Oxford)*. [Print ed.], 2007, vol. 32, no. 10, str. 1905-1916. [COBISS.SI-ID 20987431]
3. **KOŽUH, Mitja**, PETELIN, Stojan, PERKOVIČ, Marko. Can classification societies with their rules on redundancy propulsion improve statistics on oil spills and cleaning costs?. *Mar. eng. (Tokyo)*, 2007, vol. 42, no. 3, str. 113-118, graf. prikazi. [COBISS.SI-ID 28861445]

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet: DELOVNE PRIPRAVE IN NAPRAVE
Course Title: WORK APPLIANCES AND DEVICES

Študijski program in stopnja Study Programme and Level	Študijska smer Study Field	Letnik Academic Year	Semester Semester
UŠP Tehniška varnost, 1. stopnja	/	3.	6.
USP Technical Safety, 1 st Cycle	/	3 rd	6 th

Vrsta predmeta / Course Type

izbirni / Elective

Univerzitetna koda predmeta / University Course Code:

TV163

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje work	Druge oblike študija	Samost. delo Individ. work	ECTS
45	/	30 SV	/	/	75	5

Nosilec predmeta / Lecturer:

Doc. dr. Boris Jerman / Dr. Boris Jerman, Assistant Professor

Jeziki / Languages:

Predavanja / Lectures: Slovenski / Slovenian

Vaje / Tutorial: Slovenski / Slovenian

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:

Študent oz. kandidat mora imeti predmet opredeljen kot študijsko obveznost.

Prerequisites:

The course has to be assigned to the student.

Vsebina:

Snov zajema predstavitev osnovnih zakonskih zahtev ter zahtev standardov, na osnovi katerih se vrednoti varnost ter določi ustrezna raven zaščite in ustrezna zaščitna oprema pri določenem delovnem procesu. Vključene so tudi teoretične osnove, na katerih posamezne zahteve temeljijo. Vključene so naslednje teme:

- osnovna terminologija s področja varnosti strojev;
- teorija zaščite (načela ter načrtovanje zaščite delovnih sredstev, dejavniki, ki vplivajo na izbor in učinkovitost zaščitne opreme, tipične nevarnosti pri strojih);
- ocena tveganja (zakonske zahteve, teorija, praktična izvedba);

Content (Syllabus Outline):

The contents of the course include a presentation of the basic requirements of laws and standards on basis of which the corresponding safety integrity level is estimated and appropriate protective equipment for specific work process is determined. Also included are the theoretical foundations on which each of the requirements is based. It includes the following topics:

- Basic terminology in the field of safety engineering;
- theory of protection (protection principles and the planning of protection of occupational devices and appliances, the factors that influence the choice and effectiveness of protective equipment, the typical hazards of

- določanje potrebnega nivoja zaščite;
- tehnike varovanja (varovala, varnostna stikala, dvoročni vklop, varnostne krmilne naprave, naprave, občutljive na približanje, laserji, ...);
- ergonomski vidiki varnosti pri delu;
- sistemi varovanja (mehanski, električni, hidravlični, pnevmatski)
- pregled drugih varnostnih ureditev (dvižne in transportne naprave, sistemi pod tlakom, delovno okolje, ...);
- pridobitev in uporaba znaka CE.

VSEBINA VAJ: Namen vaj je utrditev ter poglobitev razumevanja pridobljenih teoretskih osnov. Prvi del vaj poteka v predavalnici, kjer slušatelji, razdeljeni v manjše skupine (5-6 oseb, do 5 skupin na enkrat) ocenjujejo tveganje in iščejo ustrezne zaščitne ureditve za konkretne primere strojev, s katerimi se seznanijo preko tekstovnega in slikovnega gradiva. Vključena je tudi predstavitev rezultatov ter njihov komentar. Drugi del vaj je praksa, ki poteka v laboratoriju, kjer se slušatelji v majhnih skupinah (5-7 oseb, vsaka skupina posebej) podrobneje spoznajo s posameznimi tehnikami varovanja (npr. sestavljanje pnevmatskega dvoročnega vklopa, določevanje varnostnih razdalj in primerjava dobljenih rezultatov s standardnimi, ...).

- machines) ;
- risk assessment (legal requirements , theory, practice);
 - determination of the necessary safety integrity level;
 - techniques of protection (guards , safety switches, two-hand control, safety control devices, presence sensing devices, lasers , ...) ;
 - ergonomic aspects of safety at work;
 - protection systems (mechanical, electric, hydraulic, pneumatic);
 - overview of other security arrangements (lifting and handling equipment, pressurized systems, working environment , ...) ;
 - gaining and use of the CE marking.

CONTENTS OF THE EXERCISES: The purpose of the exercises is to strengthen and deepen the comprehension of theoretical foundations. The first part of the work takes place in the classroom where students are divided into small groups (5-6 people up to 5 groups at once). They are assessing the risk and looking for appropriate protective arrangements of actual examples of machines. A presentation of the results and their comment is also included. The second part of the exercise is a practice that takes place in a laboratory , where students in small groups (5-7 people, each group separately) get familiar with techniques of protection (e.g. assembly of pneumatic two-hand control, determination of safety distances and comparison of the results obtained with the standard distances, ...).

Temeljni literatura in viri / Readings:

- J. Ridley, D. Pearce. Safety With Machinery. Butterworth-Heinemann. Oxford, druga izdaja, 2006. (60%)

Dopolnilna literatura / Additional literature:

- Zakon o splošni varnosti proizvodov. Ur. l. RS, 101/2003.
- Zakon o tehničnih zahtevah za proizvode in o ugotavljanju skladnosti (ZTZPUS-1). Ur. l. RS, 17/2011.
- Pravilnik o varnosti strojev. Ur. l. RS, 75/2008.
- Seznam standardov, katerih uporaba ustvari domnevo o skladnosti strojev z zahtevami Pravilnika o varnosti strojev (Uradni list RS, št. 56/2009, 74/2011).
- ISO 12100:2011. Varnost strojev –Splošna načela načrtovanja –Ocena tveganja in zmanjšanje tveganja (ekvivalenten ISO 12100:2010).

- V. Drusany. Varnostnotehniški priročnik. Ljubljana, 1999, 718 str.

Cilji in kompetence:

Cilj predmeta je usposobiti slušatelje odkrivati nevarnosti in škodljivosti v delovnem okolju, povezane z uporabo delovnih priprav in naprav, ter predvideti ukrepe za odstranitev teh nevarnosti in škodljivosti oz. za zmanjševanje z njimi povezanih tveganj. Slušatelji pridobijo znanje o osnovnih principih varnostne tehnike. Seznanijo se z delovanjem zaščitne opreme in se usposobijo za analizo take opreme. Seznanijo se z metodami za ocenjevanje tveganja in določanja potrebnega nivoja zaščite delovnih priprav in naprav ter se usposobijo za uporabo takih metod. Seznanijo se z najpomembnejšo slovensko zakonodajo ter najpomembnejšimi slovenskimi in mednarodnimi standardi z obravnavanega področja in jih znajo uporabljati. Seznanijo se s postopki pridobivanja in uporabe znaka CE.

Objectives and Competences:

The aim of this course is to enable students to determine the hazards and risks in the working environment related to the use of occupational devices and appliances, and provide for measures to remove these hazards and threats or to reduce the associated risks. Students will gain knowledge of the basic principles of safety techniques. They get acquainted with the operation of protective equipment and are trained to analyse such equipment. They get acquainted with the methods of risk assessment and determining the adequate safety integrity level, and the ability to apply such methods. They get acquainted with the most important Slovenian legislation and the most important Slovenian and international standards in the subject and know how to use them. They become familiar with the procedures for gaining and use of the CE marking.

Predvideni študijski rezultati:

Znanje in razumevanje

Pri predmetu bo slušatelj pridobil osnovna teoretska in praktična znanja za reševanje praktičnih varnostnih problemov. Slušatelj bo po opravljenem izpitu:

- seznanjen z osnovnimi principi varnostne tehnike in z metodami uporabe varnostne opreme. Predstavljene mu bodo vsebine od osnov tehnike varovanja pred preprosto nevarnostjo do obsežnih nalog varovanja, povezanih z zapletenimi sodobnimi stroji;
- seznanjen z osnovnimi metodami za oceno tveganja in določevanje potrebnega nivoja zaščite strojev ter drugih delovnih priprav in naprav;
- seznanjen z delovanjem osnovnih vrst zaščitne opreme;
- seznanjen z metodami za presojo ustreznosti obstoječe zaščitne opreme in zaščitnih sistemov;

Intended Learning Outcomes:

Knowledge and Comprehension

In this course students will acquire basic theoretical and practical knowledge to solve practical safety problems. After the final exam the student will be:

- familiar with the basic principles of safety techniques and methods of use of safety equipment. The contents from the basic techniques of protection against the simple hazards to comprehensive protection tasks associated with complex modern machines will be presented to him;
- familiar with the basic methods for risk assessment and determination of the required safety integrity level of machinery and other occupational devices and appliances;
- familiar with the operation of the basic types of protective equipment;
- familiar with the methods for assessment of adequacy of the existing safety equipment and protective systems;

<ul style="list-style-type: none"> • seznanjen z vsebino najpomembnejše slovenske zakonodaje ter najpomembnejših slovenskih in mednarodnih standardov z obravnavanega področja. 	<ul style="list-style-type: none"> • familiar with the contents of the most important Slovenian legislation as well as the most important Slovenian and international standards in the subject.
<p><u>Uporaba</u> Predmet je usmerjen k reševanju varnostnih problemov, s katerimi se varnostni inženir srečuje vsakodnevno, bodisi v praksi (v vlogi razvijalca zaščitne opreme, ali v vlogi nadzornika, ki ugotavlja ustreznost uporabljene zaščitne opreme, njeno trenutno stanje ter uporabo te opreme s strani upravljavcev) ali v sklopu raziskav.</p> <p>Slušatelj bo po opravljenem izpitu:</p> <ol style="list-style-type: none"> usposobljen za uporabo in tolmačenje osnovnih metod za oceno tveganja; usposobljen za uporabo metod za presojo ustreznosti obstoječe zaščitne opreme in zaščitnih sistemov, določevanje potrebnega nivoja zaščite strojev ter drugih delovnih priprav in naprav ter za podajanje predlogov o potrebnih izboljšavah; usposobljen samostojno izbrati najprimernejše in najučinkovitejše načine za zagotovitev ustreznega nivoja zaščite strojev ter drugih delovnih priprav in naprav ter izbirati med različno na trgu ponujeno opremo; usposobljen samostojno uporabljati najpomembnejšo slovensko zakonodajo ter najpomembnejše slovenske in mednarodne standarde z obravnavanega področja. 	<p><u>Application</u> The course is oriented toward solving safety problems, with which a safety engineer faces on a daily basis, either in practice (as a developer of protective equipment, or in the role of supervisor, who assesses the adequacy of protective equipment, its current status and use of this equipment by operators) or in the context of research.</p> <p>After the final exam the student will be:</p> <ol style="list-style-type: none"> Trained for the use and interpretation of the basic methods of risk assessment; Trained in usage of the methods for assessing the adequacy of existing safety equipment and protective systems, determining the necessary machinery safety integrity level and other occupationally devices and appliances as well as for advancing proposals about necessary improvements; Trained to independently choose the most appropriate and most effective ways to ensure the appropriate level of protection of machinery and other working devices and appliances, and choose between different offers on the market; Trained to independently apply the most important Slovenian legislation as well as the most important Slovenian and international standards in the subject.
<p><u>Refleksija</u> Povezovanje delovanja sistemov z varnostjo dela v teh sistemih.</p>	<p><u>Reflection</u> Integrating of the systems operation with the safety at work in these systems.</p>
<p><u>Prenosljive spretnosti</u> V okviru predmeta si bo slušatelj pridobil oz. utrdil sledeča znanja oz. spretnosti: iskanje literature, razumevanje zahtevnejših strokovnih tekstov, kot so tehniška zakonodaja in standardi, uporaba standardov v tujih jezikih, metode ocenjevanja tveganja, načela izdelave tehniških poročil.</p>	<p><u>Skill-transference Ability</u> During the course students will acquire and deepen the following skills or knowledge respectively: searching for the literature, understanding of complex texts such as technical legislation and standards, the use of standards written in foreign languages, risk assessment methods, the principles of making technical reports.</p>

Metode poučevanja in učenja:

Predavanja, teoretske vaje, laboratorijske vaje, domače delo – izdelava seminarske naloge, ekskurzija.

Learning and Teaching Methods:

Lectures, exercises, lab work, domestic work - seminars, excursion.

Načini ocenjevanja:

Delež (v %) /

Weight (in %)

Assessment:

Izpit (pisno in/ali ustno) iz teorije in vaj. Možnost opravljanja pisnega dela izpita s kolokviji. Del ocene iz vaj predstavlja ocena seminarske naloge in uspešnost sodelovanja pri vajah (1/3). Lestvica ocen od 1 do 10. Ocene 1 do 5 so negativne, ocene 6 do 10 pa pozitivne in sicer: 6-zadostno, 7-dobro, 8 in 9- prav dobro, 10-odlično.

70%**30%**

Examination (written and/or oral) of theory and exercises. Optionally the written examination can be replaced by colloquiums. Seminar work and effectiveness of cooperation during exercises presents a part (1/3) of the exercise grade. The grades rate from 1 to 10. Grades from 1 to 5 are negative, grades from 6 to 10 are positive as follows: 6-sufficient, 7-good, 8 and 9-very good, 10-excellent.

Reference nosilca / Lecturer's References:

1. HLADNIK, Jurij, RESMAN, Franc, **JERMAN, Boris**. Torsion stiffness of a racing cross-country ski boot. *Proc. Inst. Mech. Eng., Part P, sports eng. technol. (Print)*, 2013, doi: [10.1177/1754337113485349](https://doi.org/10.1177/1754337113485349). [COBISS.SI-ID [12936475](#)]

2. VUJIČIĆ, Andrija, ZRNIĆ, Nenad Đ., **JERMAN, Boris**. Ports sustainability : a life cycle assessment of zero emission cargo handling equipment. *Stroj. vestn.*, Sep. 2013, vol. 59, no. 9, str. 547-555, ilustr., doi: [10.5545/sv-jme.2012.933](https://doi.org/10.5545/sv-jme.2012.933). [COBISS.SI-ID [13112859](#)]

3. **JERMAN, Boris**, HRIBAR, Anton. Dynamics of the mathematical pendulum suspended from a moving mass. *Teh. vjesn. - Stroj. fak.*, 2013, vol. 20, no. 1, str. 59-64, ilustr.

http://hrcak.srce.hr/index.php?show=clanak&id_clanak_jezik=143490. [COBISS.SI-ID [12724251](#)]

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet:	DELOVNO OKOLJE
Course Title:	WORKING ENVIRONMENT

Študijski program in stopnja Study Programme and Level	Študijska smer Study Field	Letnik Academic Year	Semester Semester
UŠP Tehniška varnost, 1. stopnja	/	2.	3. in 4.
USP Technical Safety, 1 st Cycle	/	2 nd	3 rd and 4 th

Vrsta predmeta / Course Type obvezni / Mandatory

Univerzitetna koda predmeta / University Course Code: TV120

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje Work	Druge oblike študija	Samost. delo Individ. Work	ECTS
90	60	/	/	/	150	10

Nosilec predmeta / Lecturer: prof. dr. Marija Bešter Rogač / Dr. Marija Bešter Rogač, Full Professor
prof. dr. Matija Tomšič / Dr. Matija Tomšič, Full Professor

Jeziki / Languages: **Predavanja / Lectures:** Slovenski / Slovenian
Vaje / Tutorial: /

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti: **Prerequisites:**
The course has to be assigned to the student.

Študent oz. kandidat mora imeti predmet opredeljen kot študijsko obveznost.

Vsebina:

Prezračevanje: Merjenje dejavnikov okolja, temperature toplotnega sevanja, vlažnosti, hitrosti gibanja zraka. Merila in kriteriji za vrednotenje toplotnih razmer v okolju. Delo na vročem, na hladnem, dejavniki ugodja. Prezračevanje in Odsesavanje zraka.

Aerosoli: Uvod in definicije. Človek in okoljedelovno okolje. Definicija disperznega sistema. Pregled pogostih disperznih sistemov. Prah nastanek, vpliv na okolje in človeka. Mikroskopske lastnosti fluidov. Kinetična teorija plinov. Povprečna hitrost in srednja prosta pot molekul. Viskoznost. Difuzija. Brownovo gibanje. Transport delcev. Laminarno, turbulentno gibanje (upor). Delec v

Content (Syllabus Outline):

Ventilating: Measurements of the environmental parameters, radiant temperature, humidity, air velocity. Measures and criteria for the heat comfort assessment. Heat and cold stress parameters of heat comfort. Ventilating and air-conditioning.

Aerosols: Introduction and definitions: units, dispersion systems-definitions and overview, dust-formation and influence on the man and environment. Fluids properties: kinetic theory, gas behaviour, molecular speeds, mean free path, gas viscosity, diffusion, Brownian motion. Particle kinetics: laminar, turbulent motion (resistance), settling velocity, centrifugation of particles, electrostatic controlled aerosol

gravitacijskem poljusedimentacijska hitrost. Delec v polju centrifugalne sile-rotacijski vzgon, hitrost odmikanja v krožečem zraku. Delec v električnem polju-hitrost gibanja. Delec v okolju s temperaturnim gradientom. Podobnost v gibanju delcev. Stokesovo število. Impakcija, prestrezanje. Koagulacija. Morfologija delcev. Oblika, velikost. Geometrijske karakteristike: ekvivalentni premeri, aerodinamični premer. Optične lastnosti aerosolov. Absorpcija svetlobe. Beer-Lambertov zakon. Sipanje svetlobe. Mikroskopija. Inhalabilnost aerosolov. Eksperimentalne metode. Epidemiološke študije. Klasifikacija prahu-inhalabilna, alveolarna, torakalna frakcija. Inhalacija aerosolov: dihala, dihanje, spirometrija. Krvni obtok. Limfni obtok. Vpliv inhaliranih delcev na človeka. Samočistilni mehanizem dihalnega sistema. Fagocitoza. Škodljivost aerosolov. Klasifikacija po škodljivosti. Azbest. Kancerogene snovi. Poklicne bolezni. Tveganje za obolenje: MDK in drugi standardi. Določanje koncentracije. Metode merjenja. Merilniki: osebni dozimetri, prenosni in stacionarni merilniki. Merjenje alveolarne, inhalabilne frakcije. Predpisovanje meritev. Varovalni ukrepi. Odsesovalne šobe, nape, digestoriji. Odpraševanje: usedalne komore, mehanski zbiralniki, elektrofiltri, mokri odpraševalniki, tkaninski filtri. Stopnja odpraševanja. Izbira odpraševalnika. Eksplozivnost prahu. Spodnja in zgornja eksplozijska koncentracija. Eksplozijska konstanta. Vžigna entalpija. Vžigna temperatura. Temperatura tlenja. Razred gorljivosti prahu. Preprečevanje eksplozij. Zmanjšanje učinka eksplozije.

Hrup: Uvod, Nihanje in valovanje, Akustika Kriteriji za raven hrupa v različnih okoljih, Oktavna in terčna analiza hrupa, hitra Fourierjeva transformacija, akustični polmer prostora, merjenje zvočne ravni, Varstvo pred hrupom, Izolacija, akustična obdelava prostorov, resonančni absorberji. Vibracije: Merjenje vibracij, vibracijski spekter. Vpliv vibracij na človeka. Resonanca delov človeškega telesa. Varstvo pred vibracijami.

kinetics, thermophoresis, stokes number, impaction, interception of particles, coagulation. Morphological properties of aerosols: shape, size, equivalent diameters, aerodynamic diameter, particle size distributions. Optical properties: extinction, Beer-Lambert's law, angular scattering, microscopic studies. Inhalability of aerosols: experimental methods, epidemiological studies, classification of aerosols: inhalable, thoracic, inspirable fraction. Inhalation: human respiratory system, breathing mechanics, spirometry, human blood circulatory and lymphatic system. Respiratory defence system: mucociliary clearance, phagocytosis. Toxicity and risks induced by occupational exposure to aerosols, classification of toxicology, asbestos, carcinogens, occupational diseases caused by aerosol inhalation, threshold limit values. Aerosol measuring technology: methods, exposure monitoring, personal, portable and stationary sampler, sampling of inhalable and inspirable fraction, regulation of aerosol particle concentrations measurements. Precautions: exhaust hoods, dust collectors-inertial separators, fabric collectors, wet scrubbers, electrostatic precipitators, evaluation of local ventilation system, efficiency measurements. Explosive aerosols, severity of explosions, types of explosive dusts, ignition sources.

Noise: Introduction, vibration and undulation, Acoustics Criteria for Noise level in different environments, Octave and one third octave band analysis, Fast Fourier Transform, acoustical radii of the room, noise level measurement, noise control, Acoustical insulation, acoustic treatment of rooms, resonance absorbers. Vibrations: Measurements of vibrations, vibrations spectra. Impact of vibrations on human body. Resonance of human body parts to vibration. Isolation, Isolation of vibration source, vibration absorption.

Personal protective equipment (PPE) is equipment used by workers at work, which cannot be avoided risks to health and safety. Protects against dangers in the workplace and

Izolacija, izolacija vira vibracij, dušenje vibracij.

Osebna varovalna oprema (OVO) je oprema, ki jo uporabljajo delavci pri delih, pri katerih se ni mogoče izogniti tveganjem za varnost in zdravje. Varuje pred nevarnostmi na delovnem mestu in v delovnem okolju. Delavci naj bi jo uporabljali le, kjer delodajalec ne more dovolj omejiti tveganj s tehničnimi ukrepi, kjer ni mogoče drugače preprečiti škodljivega vpliva obstoječih delovnih razmer ali drugače organizirati dela. Vsekakor naj imajo tehnični varstveni posegi prednost pred uporabo osebne varovalne opreme. Študent spozna materiale ki se uporabljajo za izdelavo ter lastnosti ki jih mora vsebovati posamezna OVO. Spozna načine in postopke za ocenjevanje posamezne OVO, ki mora biti izdelana v skladu z zahtevami nacionalnih standardov. Spozna slovenske standarde SIST EN, ki so prevzeti evropski standardi, ter usklajeni z direktivami novega pristopa in evropskimi standardi. V uredbi (EU) 2016/425 so podane bistvene zahteve, ki jih mora izpolnjevati proizvod, preden je dan na trg Evropske unije, da bi se zagotovil prost pretok ter varnost in zdravje uporabnikov. Pri predmetu spozna opremo za:

- varovanje glave,
- varovanje oči in obraza,
- varovanje sluha,
- varovanje dihalnih organov,
- varovanje rok,
- varovanje nog,
- varovanje trebušnih organov,
- varovanje telesa,
- varovanje pred ionizirajočimi ter neionizirajočimi sevanji,
- varovanje pred neugodnimi atmosferskimi učinki,
- varovanje pred padcem z višine in za delo v globini,
- varovanje pred utapljanjem v vodi.

Spozna tudi specifična sredstva in opremo v gasilstvu: za varovanje pred vročino in ognjem, obleko za posege v ognju, obleke za varovanje pred agresivnimi, jedkimi tekočinami, plini in parami.

in the workplace. Workers should be used only where the employer cannot limit the risks through technical measures, which cannot be otherwise prevented the adverse impact of existing working conditions or otherwise organized labour. In any event, a technical protection interventions advantage over the use of personal protective equipment. Students learn about the materials used for the manufacture and properties to be included in each PPE. Learn about the methods and procedures for evaluating individual PPE and about accordance with the requirements of national standards. Meets Slovenian standards BS EN transposing European standards, and comply with the New Approach Directives and European standards. **Regulation (EU) 2016/425 defines** the essential requirements that must be fulfilled by a product before it is placed on the EU market , in order to ensure freedom of movement and the safety and health of users. In this course, learn about equipment :

- The protection of the head,
- Eye and face protection ,
- Hearing protection ,
- Respiratory protection ,
- Hand protection ,
- To protect the legs
- Protection of the abdominal organs ,
- The protection of the body ,
- Protection against ionizing and non-ionizing radiation,
- Protection against adverse atmospheric effects,
- Protection against falls from a height and to work in depth,
- Protection against drowning in the water.

His also specific resources and equipment in the fire service: protection against heat and flame, suit for interventions in fire suits for protection against aggressive, corrosive liquids, gases and vapours.

Temeljna literatura in viri / Readings:

- P. Gspan, B. Hrašavec: Prah v proizvodnji, ZVD, Ljubljana, 1993, 160 str. (20%)
- P. Gspan: Ekologija dela, ZVD in Iskra Telematika, 1984, 186 str.(20%)
- P.F.Holt: Inhaled Dust and Disease, John Willey & Sons, 1987, 325 str.(50%)
- J.H. Vincent: Aerosol Science for Industrial Hygienists, Elsevier Science Limited, 1995, 411 str.(30%)
- R.J.Heinsohn: Industrial Ventilation Engineering Principles, John Willey & Sons, 1991, 720 str.(20%)
- Horvat J., Osebna varovalna oprema, UL – VŠZ, Ljubljana 2001, 254 str.(80%)

Dopolnilna literatura:

- W.A.Burgess: Recognition of Health hazards in industry, A review of Materials and Processes, John Willey & Sons, 1995, 560 str.
- M.Čudina: Tehnična akustika, Fakulteta za strojništvo, 2000, 265 str.
- H.Goodfellow: Industrial ventilation, Design Guidebook, Academic Press, 2001, 1519 str.
- Safety and Health, National Safety Council, W.O.C., USA
- Standardi SIST EN.

Cilji in kompetence:

Namen predmeta je študentu dati pregled čez parametre delovnega okolja, merila za vrednotenje delovnega okolja ter tudi predpise ter meritve, ki na tem področju veljajo.

- poglobijo in obnovijo poznavanje delovnega okolja, spoznavajo delovne razmere in se naučijo in ocenijo ekološke razmere v delovnem okolju,
- znajo identificirati konkretne pereče probleme in poiskati ustrezne rešitve,
- razvijejo sodelovanje za teamsko delo.

Objectives and Competences:

The objective of the course is to give the students the review over the parameters of the working environment, the measure for its assessment, rules and standards valid in this field.

- deepen and resume the knowledge about working environment, recognition of working circumstances, to learn and assess the ecological conditions in the working environment.
- identifying the actual urgent problems and finding of solutions
- developing the skills for team work.

Predvideni študijski rezultati:

Znanje in razumevanje

Študent bo pridobil osnovna teoretska in praktična znanja, ki so potrebna za razumevanje različnih fizikalnih procesov v okolju. Spoznali bodo nevarnosti za delavca v delovnem okolju ter načine za zmanjšanje tveganja zaradi okolijskih dejavnikov v delovnem okolju.

Uporaba

Študent se bo naučil identificirati probleme v delovnem okolju ter se usposobil za njihovo reševanje.

Intended Learning Outcomes:

Knowledge and Comprehension

The students will get basic theoretical and practical knowledge, needed for understanding different physical process in the environment. They will be able to recognize the possible hazards for workers in his working environment and the methods for risk assessment and reduction.

Application

Ability for identifying of the problems in the working environment and qualification for solve them.

<u>Refleksija</u> Študent bo lahko kritično presojal pomen predpisov za varno delovno okolje.	<u>Reflection</u> The student will be able for critical assessment of the rules for working place safety.
<u>Prenosljive spretnosti</u> Pri predmetu bo študent pridobil praktične in teoretske spretnosti, znal bo uporabljati podatke iz literature, izvajati enostavne izračune in nekatere fizikalne meritve, eksperimentalne podatke bo znal ustrezno obdelati ter primerno interpretirati.	<u>Skill-transference Ability</u> The student will get the practical and theoretical skills, ability for literature data usage, carrying our simple calculation and some physical measurements, analysis and corresponding interpretation of experimental data.

Metode poučevanja in učenja:

Predavanja
Seminarske vaje

Learning and Teaching Methods:

Lecures
Seminars.

Načini ocenjevanja:	Delež (v %) / Weight (in %)	Assessment:
Študent opravlja izpit za vsak del posebej (Prezračevanje, Hrup, Aerosoli, OVO). Izpit je pisni in/ali ustni. Ocene: 6-10 pozitivno Ocena predmeta predstavlja povprečna vrednost ocen, ki jih študent dobi pri posameznem delu (Prezračevanje, Hrup, Aerosoli, OVO).	25 % Prezračevanje 25 % Hrup 25 % Aerosoli 25 % OVO	Type (examination, oral, coursework, project): The exam for each part (Ventilating, Noise, Aerosols, Personal protecting equipment) is carried out separately. Written and/or oral exam Marks: 6-10 positive The final mark is the average value of marks obtained at each part (Ventilating, Noise, Aerosols, Personal protecting equipment).

Reference nosilca / Lecturer's References:

Prof. dr. Marija Bešter-Rogač

BEŠTER-ROGAČ, Marija. Prah v delovnem okolju. V: *Varstvo pri delu, varstvo pred požari in medicina dela : posvet z mednarodno udeležbo, Portorož, 14. - 15. maj 2002.* Ljubljana: Fakulteta za kemijo in kemijsko tehnologijo, 2002, str. 113. [COBISS.SI-ID [24241413](#)]

GRGIĆ, Irena, **BEŠTER-ROGAČ, Marija.** Kako (ne)varni so prvomajski kresovi? : onesnaževanje zraka : največ nanodelcev v kubičnem centimetru zraka so v Ljubljani izmerili od 18. ure 30. aprila do poldneva 1. maja. *Delo (Ljubl.)*, 18. aprila 2013, letn. 55, str. 14, ilustr. [COBISS.SI-ID [36666117](#)]

HAUPTMAN, Nina, KLANJŠEK GUNDE, Marta, KUNAVER, Matjaž, **BEŠTER-ROGAČ, Marija.** Influence of dispersing additives on the conductivity of carbon black pigment dispersion. *JCT research*, 2011, vol. 8, no. 5, str. 553-561, ilustr. [COBISS.SI-ID [4640538](#)]

Izr. prof. dr. Matija Tomšič

TOMŠIČ, Matija. Požar in nevarne snovi : tečaj za vodje enote. Ljubljana: [M. Tomšič], 2012 [i. e. 2013]. 40 str., <http://www.gasilec.net/modules/simplemod/datoteke/3-VEE/3-VEE-literatura-POZAR-IN-NEVARNE-SNOVI.docx> .

DOGŠA, Iztok, CERAR, Jure, JAMNIK, Andrej, **TOMŠIČ, Matija.** Supramolecular structure of methyl cellulose and lambda- and kappa-carrageenan in water : SAXS study using the string-of-beads

model. Carbohydrate polymers, 2017, vol. 172, str. 184-196.

TOMŠIČ, Matija, JAMNIK, Andrej, FRITZ, Gerhard, GLATTER, Otto, VLČEK, Lukáš. Structural properties of pure simple alcohols from ethanol, propanol, butanol, pentanol, to hexanol : comparing Monte Carlo simulations with experimental SAXS data. The journal of physical chemistry. B, Condensed matter, materials, surfaces, interfaces & biophysical, 2007, vol. 111, no. 7, str. 1738-1751.

TOMŠIČ, Matija, BEŠTER-ROGAČ, Marija, JAMNIK, Andrej, KUNZ, Werner, TOURAUD, Didier, BERGMANN, Alexander, GLATTER, Otto. Nonionic surfactant Brij 35 in water and in various simple alcohols : structural investigations by small-angle x-ray scattering and dynamic light scattering. The journal of physical chemistry. B, Condensed matter, materials, surfaces, interfaces & biophysical, 2004, vol. 108, no. 22, str. 7021-7032.

UL
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UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet:	DIPLOMSKO DELO
Course Title:	DIPLOMA WORK

Študijski program in stopnja Study Programme and Level	Študijska smer Study Field	Letnik Academic Year	Semester Semester
UŠP Tehniška varnost, 1. stopnja	/	3.	6.
USP Technical Safety, 1 st Cycle	/	3 rd	6 th

Vrsta predmeta / Course Type obvezni / Mandatory

Univerzitetna koda predmeta / University Course Code:

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje work	Druge oblike študija	Samost. delo Individ. work	ECTS
/	/	/	/	225	225	15

Nosilec predmeta / Lecturer: /

Jeziki / Languages:

Predavanja / Lectures:	Slovenski / Slovenian
Vaje / Tutorial:	Slovenski / Slovenian

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:

Odobrena tema diplomskega dela.	Prerequisites: Approved topic.
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Vsebina:

Diplomsko delo se opravlja iz področja tehniške varnosti, požarne varnosti ali okoljske varnosti. Vsebina in naslov se določata v soglasju z izbranim mentorjem – nosilcem ene izmed vsebin v programu. Diplomant rešuje praktični problem zato je velik del njegove raziskave vezan na delo podjetju. To pomeni, da je velik del izdelave diplomskega dela praksa v podjetju, kjer raziskuje in rešuje problem.

Content (Syllabus Outline):

Technical safety, fire safety or environmental safety is the field of working thesis. The content and title are set out in the agreement with the mentor - one of the carrier content in the program. Graduate solves a practical problem, therefore, is a big part of his research work linked to the company. This means that a large part of diploma practice in a business where a graduate researches and solves the problem.

Temeljni literatura in viri / Readings:

<ul style="list-style-type: none"> • knjige in članki, ki so povezani z vsebino diplomskega dela./ Books and articles that are related to the content of the thesis.

Cilji in kompetence: **Objectives and Competences:**

Dokončno oblikovanje pričakovanega lika diplomanta. Študent bodo ob izdelavi diplomske naloge pokazal sposobnosti iskanja in zaznavanja problemov Tehniške varnosti in znal poiskati rešitev za tak problem. Pri delu bodo pokazal, da je pridobil večino kompetenc navedenih v programu študija.

The completion of the expected characters graduate. Once the student will be finalizing thesis will show the ability to search and detection of safety problems Engineering and unable to find a solution to such a problem. At work will show that he has acquired the majority of competencies listed in the program of study.

Predvideni študijski rezultati:

Znanje in razumevanje

Pri izdelavi diplomskega dela bo slušatelj pridobil:

- sposobnosti formuliranja problema,
- sposobnosti samostojnega iskanja ustrezne literature,
- sposobnosti obravnavanja problema v praksi,
- sposobnosti iskanja rešitev in utemeljevanja ustreznosti rešitev,
- sposobnosti predstavitve rezultatov svojega dela.

Intended Learning Outcomes:

Knowledge and Comprehension

When making the thesis a student will be obtained:

- The ability to formulate problems,
- Ability to act independently of the relevant literature,
- Ability to deal with the problem in practice,
- Ability to find solutions and justification of the solution,
- Ability to present the results of their work.

Uporaba

Znanje in pridobljene veščine bo diplomant lahko uporabil pri poklicnem delu.

Application

A graduate Will use knowledge and skills acquired in occupation.

Refleksija

Povezovanje vseh pridobljenih teoretskih znanj z reševanjem problemov varstva pri delu in pred požari ter kritični pogled na uporabnost teh znanj.

Reflection

Integration of acquired theoretical knowledge to solving problems of safety at work and fire safety and a critical view of the usefulness of these skills.

Prenosljive spretnosti

Pri delu bo diplomant pridobil znanja o metodah reševanja problemov, o načinu prezentacije teh znanj v pisani in govornjeni obliki povezani z ostalimi metodami posredovanja raziskav ugotovitev itd.

Skill-transference Ability

The Graduate will gain knowledge of the methods of solving problems at work, the method of presentation of these skills in written and spoken form associated with other methods of intervention research findings, etc..

Metode poučevanja in učenja:

Individualno delo mentorja in samostojno študijsko in raziskovalno delo.

Learning and Teaching Methods:

Individual work with a mentor and an independent study and research.

Delež (v %) /

Načini ocenjevanja:

Weight (in %) **Assessment:**

Ocenjuje se diplomsko delo in zagovor diplomskega dela pred komisijo, ki jo sestavljajo predsednik, mentor in en

It is estimated thesis and oral defense of the thesis before a panel consisting of the president, mentor and one member.

član. Lestvica ocen vsakega dela je od 1 do 10. Ocene 1 do 5 so negativne, ocene 6 do 10 pa pozitivne in sicer: 6-zadostno, 7-dobro, 8 in 9-prav dobro, 10-odlično.		Table assessments of each work is from 1 to 10 Ratings 1 to 5 are negative, rating 6 to 10 is positive as follows: 6-sufficient, 7-well, 8 and 9- very well, 10-excellent.
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Reference nosilca / Lecturer's References:

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UL EFKT

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet: ELEKTROTEHNIKA IN VARNOST
Course Title: ELECTRICAL ENGINEERING AND SAFETY

Študijski program in stopnja Study Programme and Level	Študijska smer Study Field	Letnik Academic Year	Semester Semester
UŠP Tehniška varnost, 1. stopnja	/	3.	5.
USP Technical Safety, 1 st Cycle	/	3 rd	5 th

Vrsta predmeta / Course Type

obvezni / Mandatory

Univerzitetna koda predmeta / University Course Code:

TV119

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje Work	Druge oblike študija	Samost. delo Individ. Work	ECTS
45	/	30 LV	/	/	75	5

Nosilec predmeta / Lecturer:

Izr. prof. dr. Grega Bizjak / Dr. Grega Bizjak, Associate Professor

Jeziki / Languages:

Predavanja / Lectures: Slovenski / Slovenian

Vaje / Tutorial: Slovenski / Slovenian

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:

Študent oz. kandidat mora imeti predmet opredeljen kot študijsko obveznost.

Prerequisites:

The course has to be assigned to the student.

Vsebina:

Snov predmeta zajema naslednje sklope:
 Osnove elektrotehnike: nauk o elektrotehnik, sodobna elektrotehnika, njen obseg in pomen, mednarodni sistemi enot (SI), električno polje, električno polje, vir napetosti, osnovni tokokrog, moč in delo, enosmerni tok in magnetno polje enosmernega toka, inducirana napetost, izolirane snovi, izmenični tok, izmenična napetost, linearna električna vezja pri izmeničnem toku, upornost, induktivnost in kapacitivnost pri izmeničnem toku, delovna, jalova in navidezna moč, magnetna polja izmeničnih tokov, trifazni tok: napetosti in toki, vloga nevtralnega vodnika, moč in delo pri trifaznem toku.
 Električne meritve: merilni inštrumenti in

Content (Syllabus Outline):

Subject is divided into following sections:
 Basics of electrical engineering: doctrine of electrical engineering, scope and importance of modern el. engineering, International System of Units (SI), electric field, voltage sources, basic el. circuits, power and energy, DC magnetic field, DC current, induced voltage, AC current and voltage linear el. circuits, resistance, inductance and capacitance in AC circuits, active, reactive and apparent power, three-phase systems, the role of the neutral conductor, power and energy in three phase systems.
 Electrical measurements: instruments and transducers, measurement of current, voltage, resistance and power.

pretvorniki, meritve toka, napetosti, upornosti in moči.

Električni stroji in naprave: delovanje in preizkušanje električnih naprav in strojev, proizvodnja, prenos in poraba el. energije, električne inštalacije.

Nevarnost električnega udara: napetost dotika, vpliv električnega toka na človeško telo, izolacijske okvare v električnih napravah, tokokrog okvare in napetost dotika v različnih vrstah omrežij.

Zaščita pred električnim udarom: pomen in naloge zaščitnih ukrepov, pregled različnih zaščitnih ukrepov, zaščita v različnih vrstah omrežja.

Nevarnost požara in eksplozije: tokovne in napetostne preobremenitve, segrevanje in zaščita električnih naprav in inštalacije, pogoji za nastanek eksplozije, nevarnost eksplozije zaradi električnih naprav, vrste eksplozijske zaščite električnih naprav, obratovanje in vzdrževanje eksplozijsko zaščitnih električnih naprav.

Elektrotehniška zakonodaja: pomen in vloga elektrotehniških predpisov.

Razsvetljava: svetloba in človek, fizikalne osnove svetlobe, svetloba in barve, fotometrija, svetlobni viri, svetilke, razsvetljava delovnega mesta, varnostna razsvetljava, svetila in okolje.

Vsebina vaj:

Prvi del vaj obsega meritve elektrotehniških veličin ter meritve varnosti v električnih inštalacijah. Drugi del vaj pa je namenjen meritvam v razsvetljavi s poudarkom na meritvah svetlobno-tehničnih parametrov delovnega mesta.

Electrical machines and apparatus: the operation and testing of electrical equipment and machinery, production, transmission and consumption of el. power, electrical installations.

Risk of electric shock: touch voltage, influence of electric current on the human body, insulation faults in electrical equipment, circuit failure and the touch voltage in different types of networks.

Protection against electric shock: importance and functions of protective measures, overview of various protective measures, protection in different types of networks.

Risk of fire and explosion: current and voltage overloads, protection of electrical equipment and installations, the risk of explosion due to electric devices, types of explosion protection of electrical equipment, operation and maintenance of explosion-protected electrical equipment.

Electrotechnical legislation: the importance and role of el. regulations.

Lighting: light and humans, physical nature of light, light and color, photometry, light sources, luminaires, lighting of working places, security lighting, lighting and environment.

Contents of tutorials:

The first part comprises measurements of electrical quantities and measurements of safety in electrical installations. The second part includes measurement of lighting installations with an emphasis on work places.

Temeljni literatura in viri / Readings:

- Nikolić, Petrović: Opasnost i zaštita od električne struje, Naučna knjiga, Beograd 1987, 621 str. (20%)
- Ose: Elektrotechnik für Ingenieure, Fachbuchverlag Leipzig, 2001, 439 str. (20%)
- Geddes: Handbook of Electrical Hazards and Accidents, CRC Press, 1995, 204 str. (30%)
- Ogrinc: Delovno okolje – Razsvetljava, učbenik, FKKT, Ljubljana 2001, 114 str. (30%)

Dopolnilna literatura:

- Cooper: Electrical Safety Engineering, Butterworth-Heinemann Ltd, Elsevier group, 1993,

571 str.

- Cadick, Capelli-Schellpfeffer, Neitzel: Electrical Safety Handbook, Mc Graw Hill, 2005, 560 str.
- Ogrinc: Elektrotehnika in varnost, Univerza v Ljubljani, FKKT, 2001, 211 str.
- Več avtorjev: Priročnik za varno in zdravo delo, Tehniška založba Slovenije 2002, 504 str.
- Več avtorjev: IESNA Lighting Handbook, Illumination Engineering Society, USA 2000, 1000 str.

Cilji in kompetence:

Pri predmetu Elektrotehnika in varnost se študent seznanja z elektrotehničnimi vsebinami, ki so potrebne za razumevanje delovanja električnih strojev, naprav in inštalacij. V sklopu predmeta spozna tudi nevarnosti električnega toka ter varovalne ukrepe in njihovo preverjanje. V drugem delu predmeta se študent seznanja tudi z razsvetljavo, ki predstavlja del električne inštalacije pa tudi del delovnega okolja. V tem delu je poudarek predvsem na ustrezni osvetlitvi delovnega mesta in izboru za to ustrezne tehnike. Študent pa se seznanja tudi s preverjanjem ustreznosti osvetlitve delovnega mesta.

Objectives and Competences:

Course is designed to introduce basic knowledge of electrical engineering (electrical machinery, apparatus and installations) to the students. They also learn about danger of electrical current, protective measures and how to check them. Second part is dedicated to the lighting, which is part of the electrical installation but also of the working environment. In this part, the focus is mainly on the appropriate lighting of workplaces and selecting the appropriate technique for this. The students are also acquainted with the measurement of illuminance on workplaces.

Predvideni študijski rezultati:

Znanje in razumevanje

Študent si v sklopu predmeta pridobi osnovna teoretska in praktična znanja o delovanju električnih naprav in inštalacije, na podlagi katerih zna oceniti nevarnosti, ki izhajajo iz uporabe le-teh. Študent zna tudi praktično, z meritvami, preveriti varnost električne inštalacije in električnih naprav.

V drugem delu predmeta si študent pridobi tudi ustrezna znanja in praktične izkušnje s področja razsvetljave delovnega mesta. Na podlagi tega znanja lahko preveri ustreznost razsvetljave ter predlaga ustrezne ukrepe, s katerimi je možno razsvetlavo delovnega mesta izboljšati.

Uporaba

Znanja, ki si jih študent pridobi v okviru predmeta bo lahko uporabil pri ocenjevanju ustreznosti in varnosti delovnega mesta s stališča uporabe električnih naprav in razsvetljave. Pri tem bo s pridom uporabil praktično znanje o meritvah varnosti

Intended Learning Outcomes:

Knowledge and Comprehension

Student acquires basic theoretical and practical knowledge of the operation of electrical devices and installations and can so assess the risks arising from the use of them. The student can also practically (with measurements) verify the safety of electrical installations and devices. In the second part of the course the student acquires the knowledge and practical experience in the field of lighting of work places. He/She also learns how to verify the adequacy of lighting and to propose appropriate measures for improvement.

Application

Acquired knowledge can be used in assessing the safety and suitability of the workplace from the perspective of the use of electrical devices and lighting. Student will be able to apply practical knowledge of safety measurements of electrical devices and lighting at the workplace.

električnih strojev, naprav in inštalacije ter osvetlitve delovnega mesta. Študent je sposoben tudi predlagati ustrezne ukrepe za izboljšanje razmer na delovnem mestu.

Refleksija

Na podlagi teoretska in praktična znanja bo lahko študent presojal o vplivu električne energije na varnost v delovnem procesu.

Prenosljive spretnosti

Pri predmetu bo študent pridobil znanja in spretnosti o uporabi različne (električne) merilne opreme, izvedbi meritev, varnosti pri izvedbi meritev ter izdelavi ustreznih poročil o opravljenih meritvah.

The student is also able to propose appropriate measures to improve the safety and suitability of the workplace.

Reflection

On the basis of theoretical knowledge and practical skills student will be able to made assessments on the impact of el. power on safety in the work process.

Skill-transference Ability

In this course the student will acquire knowledge and skills on the use of different (electric) measuring equipment, on carrying out measurements, on safety during measurements and on the creation of appropriate measurement reports.

Metode poučevanja in učenja:

Predavanja
Laboratorijske vaje

Learning and Teaching Methods:

Lectures
Tutorials

Načini ocenjevanja:

Delež (v %) /
Weight (in %)

Assessment:

Način (pisni izpit, ustno izpraševanje, naloge, projekt)	Delež (v %) / Weight (in %)	Type (examination, oral, coursework, project):
Pisni izpit	33 %	Written exam
Ustni izpit	33 %	Oral exam
Poročilo o izvedenih meritvah v sklopu vaj	33 %	Measurement reports from tutorials

Reference nosilca / Lecturer's References:

1. KOBAY, Matej Bernard, **BIZJAK, Grega**, KLANJŠEK GUNDE, Marta, MALOVRH REBEC, Katja. LED spectra and its photobiological effects. *Light eng. (N.Y.N.Y.)*, 2013, vol. 21, no. 1, str. 22-27, ilustr. [COBISS.SI-ID [9806676](#)]
2. KOBAY, Matej Bernard, **BIZJAK, Grega**, DUMORTIER, Dominique. Characterization of sky scanner measurements based on CIE and ISO standard CIE S 011/2003. *Light. res. technol. (2001, Print)*. [Print ed.], Aug. 2013, vol. 45, no. 4, str. 504-512, ilustr. <http://lrt.sagepub.com/content/45/4/504.full.pdf+html>, doi: [10.1177/1477153512458916](https://doi.org/10.1177/1477153512458916). [COBISS.SI-ID [9897300](#)]
3. **BIZJAK, Grega**, KLANJŠEK GUNDE, Marta, KOBAY, Matej Bernard, MALOVRH REBEC, Katja. Spektry izlučenja i fotobiološki dejstvie svetodiodov. *Svetotehnika*, 2013, 2, str. 20-24, ilustr. [COBISS.SI-ID [9971284](#)]

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet: ERGONOMIJA IN ERGONOMSKE MERITVE
Course Title: ERGONOMICS AND ERGONOMIC MEASUREMENTS

Študijski program in stopnja Study Programme and Level	Študijska smer Study Field	Letnik Academic Year	Semester Semester
UŠP Tehniška varnost, 1. stopnja	/	3.	5.
USP Technical Safety, 1 st Cycle	/	3 rd	5 th

Vrsta predmeta / Course Type obvezni / Mandatory

Univerzitetna koda predmeta / University Course Code: TV123

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje Work	Druge oblike študija	Samost. delo Individ. Work	ECTS
45	/	30 SV	/	/	75	5

Nosilec predmeta / Lecturer: prof. dr. Metoda Dodič Fikfak / Dr. Metoda Dodič Fikfak, Full Professor

Jeziki / Languages: **Predavanja / Lectures:** Slovenski / Slovenian
Vaje / Tutorial: Slovenski / Slovenian

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:

Študent oz. kandidat mora imeti predmet opredeljen kot študijsko obveznost.

Prerequisites:

The course has to be assigned to the student.

Vsebina:

ERGONOMIJA, Pomen ergonomije pri analizi delovnega mesta
 OBREMENITVE IN OBREMENJENOSTI V DELOVNEM OKOLJU
 OBREMENITVE NA DELOVNEM MESTU
 Fizične (statične) in dinamične obremenitve
 Obravnavanje delovnega mesta s vidika antropometrije, Obremenitve človeka zaradi delovne naloge, Obremenitve človeka zaradi delovnega okolja, Obremenitve zaradi organizacije dela
 Metabolizem in čas
 Določevanje višin delovnih površin in stola
 Toplotne obremenitve
 Obremenitve vida (Inklinacija pogleda, ostrina

Content (Syllabus Outline):

ERGONOMICS, The importance of ergonomics in the analysis of workplace STRAINS AND STRESSES IN THE WORKING ENVIRONMENT STRAINS AT THE WORKPLACE Physical (static) and dynamic strains Dealing with the workplace from the anthropometry view, Strains of the human being due to work assignments, Strains of the human being due to environmental impacts, Strains of the human being due to the organization of work.
 Metabolism and time
 Height determination of the working surface and chairs.
 Thermal strains.

vida ,merjenje svetlobe),
 Obremenitve zaradi hrupa
 Obremenitve zaradi stika z aerosoli
 Obremenitve zaradi stika s plini in parami
 Obremenitve zaradi monotonije
 METODE ZA PROUČEVANJE TELESNIH DRŽ
 (Metoda OWAS, Metoda REBA, Metoda RULA)
 Vrste, oblikovanje dela in delovnih mest:
 Tehnološko oblikovanje delovnih mest,
 Tehnično oblikovanje delovnih mest,
 Ergonomsko oblikovanje delovnih mest.
 VRSTE, METODE IN TEHNIKE OBLIKOVANJA
 DELA IN DELOVNEGA OKOLJA
 Ocenjevalna analiza delovnega okolja OADM
 (OADO), Merska analiza delovnega okolja
 MADM (MADO)
 DODATNI ČAS ZA IZVEDBO DELA, Metoda
 izračuna Polajnar-Verhovnikovega
 ergonomskega koeficienta.
Vaje:
 - Praktična izvedba metod za izvajanje
 ergonomskih meritev (OAMD, MADM;
 OWAS).

Visual strains (Inclination of view, visual
 acuity, light measuring).
 Strains due to noise
 Strains due to contact with aerosols.
 Strains due to contact with gases and
 vapors Strains due to monotony.
 METHODS FOR STUDYING THE BODY POSTURES
 (OWAS method, Reba method, Method RULA)
 Types of work design and workplaces
 Technological design of workplaces
 Technical design of work places
 Ergonomic design of work places.
 KINDS, METHODS AND TECHNIQUES OF WORK
 AND WORKING ENVIRONMENT
 The assessment analysis of the working
 environment OADM (OADO), Measurement
 analysis of the working
 environment MADM (MADO),
 ADDITIONAL TIME TO COMPLETE THE
 WORK, Method of calculation of the Polajnar-
 Verhovnik ergonomic coefficient.
 Exercises:
 - Practical execution of methods for
 implementation of the ergonomic
 measurements (OAMD, MDAM; OWAS).

Temeljni literatura in viri / Readings:

- POLAJNAR, Andrej, VERHOVNIK, Vekoslav, SABADIN, Argio, HRAŠOVEC, Bogomil. *Ergonomija*. Maribor: Fakulteta za strojništvo, 2003. X, 383 str., ilustr. (60%)
- Bilban M. *Medicina dela ZVD 1999*, 605 str (10%).
- POLAJNAR, Andrej, VERHOVNIK, Vekoslav. *Oblikovanje dela in delovnih mest*. 2. izd. Maribor: Fakulteta za strojništvo, 2007. III, 200 str., ilustr., graf. prikazi. (50%)
- POLAJNAR, Andrej, VERHOVNIK, Vekoslav. *Oblikovanje dela in delovnih mest za delo v praksi*. 2. izd. Maribor: Fakulteta za strojništvo, 2007. IV, 212 str., ilustr., tabele. (40%)

Cilji in kompetence:

Predmet podaja osnove ergonomskih meritev potrebnih za opravljanje ergonomske analize delovnih mest, za bodoče varnostne inženirje.

- Seznaniti študente s pomenom vloge ergonomsko oblikovanega delovnega mesta.
- Spoznati metode in tehnike za oblikovanja dela in delovnih mest.
- Študentje bodo dobili potrebna znanja za praktično izvedbo oblikovanja delovnih mest

Objectives and Competences:

The course presents the basics of ergonomic measurements needed to perform ergonomic analysis of workplaces for future security engineers.

- Students will learn about the importance of the role of ergonomic workplaces.
- Students will understand the methods and techniques for work and workplaces design.
- Students will get practical skills for the

z upoštevanjem ergonomskih meritev.

implementation of ergonomic measurements by workplace designing.

Predvideni študijski rezultati:

Znanje in razumevanje

- Razviti sposobnost izvesti analizo obremenitev zaradi dela in delovnega mesta.
- Praktično izvesti analizo delovnih mest z metodami OWAS, OADM, MADM.
- Praktična izvedba oblikovanja delovno mesto
- Uporabiti računalniške tehnologije pri oblikovanju delovnih mest.
- Spoznati se z zakonodajo in standardi na področju ergonomije.
- Razume pomen humanizacije delovnih in življenjskih procesov, vplive okolja in drugih relacij na človeka in njegove odzive v delovnih okoljih.

Uporaba

Varovanje in izboljšanje zdravja zaposlenih;
Preprečevanje in obvladovanje poklicnih bolezni, poškodb pri delu...
Boljše delovne razmere – prilagojene posameznem delavcu;
Odpravljanje poklicnih tveganj in pogojev dela, ki ogrožajo varnost in zdravje pri delu;
Izboljšanje poklicnega in socialnega statusa zaposlenih, fizičnega in materialnega statusa zaposlenih;
Ohranjanje in razvoj delazmožnosti zaposlenih;
Omogočanje socialno in ekonomsko produktivnega življenja.

Refleksija

- Uporaba računalniških programov za analiziranje obremenitev pri delu in načrtovanju delovnega mesta po ergonomskih zahtevah.
- Študent je sposoben usklajevanja med zahtevami dela in zmogljivostjo človeka.
- Ocenjevanje prilagoditve delovnega okolja človeku in rizik za nastanek težav.
- Zna izbrati, in evalvirati ustrezno metodo za analiziranje delovnega prostora.
- Zna uporabiti pripomočke za analiziranje

Intended Learning Outcomes:

Knowledge and Comprehension

- To develop the ability to perform an analysis of strains due to work and the workplace.
- To perform the practical analysis of working methods OWAS, OADM, MDAM.
- Practical implementation of workplace design,
- To use computer technology for designing workplaces.
- To learn the legislation and standards in the field of ergonomics.
- To recognize the importance of humanization of working and living processes environmental influences and relations to other people and their responses into the workplace.

Application

Protection and improving the health of employees;
Prevention and control of occupational diseases injuries at work ...
Better working conditions according to the individual worker;
Elimination of occupational hazards and working conditions that endanger the safety and health at work;
Enhancing the professional and social status of employees, physical and material status of employees;
Preservation and development of work ability of employees;
Enable a socially and economically productive life.

Reflection

- The use of computer programs to analyze the strains at work and planning the ergonomic requirements of work places.
- The student is able to reconcile the demands of work and human performance.
- Evaluation of adapting the work environment to humans and the risks of developing problems.
- To know how to select and evaluate the appropriate method for analyzing

obremenitev delavcev v delovnem okolju.
 - Študent je sposoben podati ergonomске rešitve na podlagi ergonomskih meritev in predpisane zakonodaje.

Prenosljive spretnosti

Študentje razvijejo sposobnost iskanja literature po svetovnem medmrežju in študijskih ter splošnih knjižnicah. Nadalje se naučijo pravil pisanja seminarских nalog in javnega predstavljanja in prikazovanja obravnavanega problema. Prav tako se naučijo komuniciranja v delovnem okolju pri reševanju zastavljenih nalog.

the workspace.

- To know how to use the tools to analyze the strains of workers in the workplace.

- The student is able to provide ergonomic solutions based on ergonomic measurements and statutory legislation.

Skill-transference Ability

The students will develop the ability to search literature in the global Internet and libraries. Furthermore, they will learn the rules for writing seminar papers and public presentation as well as displaying of problems. They also learn to communicate in the work environment at solving the tasks set.

Metode poučevanja in učenja:

Predavanja
 Vaje – obvezna prisotnost in sodelovanje, ter izdelava poročila
 Seminarська naloga

Learning and Teaching Methods:

Lectures
 Exercises - Compulsory attendance and participation, and making reports
 Coursework

Načini ocenjevanja:

Pisni izpit
 Seminarська naloga (1/2)

Delež (v %) /
 Weight (in %)

Assessment:

	50%	
	50%	

Reference nosilca / Lecturer's References:

- KERMAVNAR, Tjaša (avtor, ilustrator), **DODIČ-FIKFAK, Metoda**. Oblikovanje po meri človeka, Ilustrirani učbenik iz ergonomije. 1. izd. Ljubljana: Univerzitetni klinični center Ljubljana, Klinični inštitut za medicino dela, prometa in športa: Akademija za likovno umetnost in oblikovanje, 2013-. Zv. <1->, ilustr. ISBN 978-961-6921-02-2. [COBISS.SI-ID 269762304]

- LIPIČNIK, Kristjan, **DODIČ-FIKFAK, Metoda**. Primerjava štirih vhodnih kazalnih računalniških naprav med nalogo upravljanja s kurzorjem - primerjava položaja v zapestju v smeri fleksije/ekstenzije, hitrosti izvedbe naloge in neudobja pri delu = Comparison of four computer pointing devices during the mouse task - comparison of wrist flexion/extension, task performance and discomfort. V: DODIČ-FIKFAK, Metoda (ur.), MOLAN, Marija (ur.). Znanje, izkušnje, sodelovanje : 40 let KIMDPŠ, (Sanitas et labor, ISSN 1580-5972, letn. 9, št. 1; letn. 10, št. 1). Ljubljana: Univerzitetni klinični center, Klinični inštitut za medicino dela, prometa in športa: = University Medical Centre, Institute of Occupational, Traffic and Sports Medicine, 2012-2013, letn. 10, št. 1, str. 59-80. [COBISS.SI-ID 901548]

- **DODIČ-FIKFAK, Metoda**, FRANKO, Alenka. Vloga specialista medicine dela pri oceni tveganja = The role of occupational doctor in risk assessment. Sanitas et labor, ISSN 1580-5972, november 2008, letn. 7, št. 1, str. 9-16. [COBISS.SI-ID 25152473]

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet:	FIZIKA I
Course Title:	PHYSICS I

Študijski program in stopnja Study Programme and Level	Študijska smer Study Field	Letnik Academic Year	Semester Semester
UŠP Tehniška varnost, 1. stopnja	/	1.	1.
USP Technical Safety, 1 st Cycle	/	1 st	1 st

Vrsta predmeta / Course Type obvezni / Mandatory

Univerzitetna koda predmeta / University Course Code: IN102

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje work	Druge oblike študija	Samost. delo Individ. work	ECTS
45	/	30 SV	/	/	75	5

Nosilec predmeta / Lecturer: prof. dr. Svjetlana Fajfer / Dr. Svjetlana Fajfer, Full Professor

Jeziki / Languages: Predavanja / Lectures: Slovenski / Slovenian
Vaje / Tutorial: Slovenski / Slovenian

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti: **Prerequisites:**

Študent oz. kandidat mora imeti predmet opredeljen kot študijsko obveznost.	The course has to be assigned to the student.
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Vsebina:

Kinematika: premo enakomerno in pospešeno gibanje točkastega telesa, gibanje v prostoru.
Dinamika: sila in masa. Newtonovi zakoni, izrek o gibanju težišča, izrek o gibalni količini, sila curka, izrek o kinetični energiji, delo, potencialna energija, prožnost, prožnostna energija, vrtenje togega telesa okoli nepremične osi, navor, Newtonov zakon pri vrtenju, izrek o vrtilni količini.
Mehanika tekočin: hidrostatika, hidrostatični tlak, vzgon, delo tlaka, hidrodinamika, opis toka tekočin, Bernoullijeva enačba.
Nihanje in valovanje: amplituda, frekvenca in nihajni čas, sinusno nihanje, vsiljeno nihanje, sklopljeno nihanje, spekter nihanja, longitudinalno in transverzalno valovanje, valovna dolžina, hitrost valovanja,

Content (Syllabus Outline):

Kinematics: uniform and accelerated motion of a particle, motion in space
Dynamics: Force and mass; Chord force; Newton's laws; the theorem on the system of particles and velocity of the centre of mass; kinetic energy theorem; work; potential energy; elasticity; rotation of a rigid body around a fixed axis; torque; Newton's law on rotation; theorem on conservation of angular momentum.
Fluid mechanics: hydrostatics, hydrostatic pressure; buoyancy; hydrodynamics; description of fluid flow; Bernoulli's equation.
Oscillation and wave motions: amplitude, frequency and oscillation intervals; harmonic oscillation; oscillation of molecules, forced oscillation; oscillation of coupled oscillators;

interferenca, stoječe valovanje, lastna nihanja, osnove akustike.

Toplota: definicija temperature, temperaturno raztezanje teles, idealni plin, enačba stanja, fazne spremembe, notranja energija, toplota, energijski zakon, kalorimetrija, notranja energija idealnega plina, različne spremembe idealnega plina, prevajanje toplote.

oscillation spectrum; longitudinal and transversal waves, radiant flux, radiant flux density, wave length; the speed of a travelling wave, interference, standing waves; motion spectrum; fundamentals of acoustics.

Heat: Definition of temperature, thermal expansion of bodies, ideal gas, enab status, phase changes, internal energy, heat, energy law, calorimetry, internal energy of an ideal gas, various modifications of the ideal gas heat conduction

Temeljni literatura in viri / Readings:

- J. Strnad, Fizika: I. del, DZS 1997, 1998, 281 str., (60%),
- R. Kladnik: Visokošolska fizika I, DZS, Ljubljana, 1989. 285 str., (60%)

Cilji in kompetence:

Pri predmetu Fizika I študenti pridobijo razumevanje osnovnih fizikalnih pojmov in fizikalnih količin, spoznajo osnovne zakone narave, ter se ob reševanju problemov navadijo osnov analitičnega mišljenja.

Objectives and Competences:

During the physics course students obtain the understanding of basic physical concepts and quantities, they obtain the understanding of the basic laws of nature and through problem solving acquire the basics principles of analytical thinking.

Predvideni študijski rezultati:

Znanje in razumevanje

Ob reševanju problemov se navadijo osnov analitičnega mišljenja.

Uporaba

Pridobljeno znanje fizikalnih osnov bo študentu omogočilo kritično ovrednotiti različne posege za zagotavljanje tehnične in požarne varnosti.

Refleksija

Razmislek o urejenosti sistemov v naravi.

Prenosljive spretnosti

Sposobnost samostojnega spremljanja novih spoznanj in literature na področju tehnične in požarne varnosti. Razumevanje fizikalnih meritev in sposobnost njihovega ovrednotenja. Kritičen odnos do standardov kakovosti in varnosti na področju varstva pri delu.

Intended Learning Outcomes:

Knowledge and Comprehension

Students obtain the understanding of the basic laws of nature and through problem solving acquire the basics principles of analytical thinking.

Application

The acquired knowledge of physics will enable the student to critically evaluate the different approaches to establish technical and fire safety.

Analysis

In-depth analysis of system behaviour in nature.

Skill-transference Ability

The ability to autonomously follow the latest advances and literature in the field of technical and fire safety. Understanding of physical measurements and the ability of their critical evaluation.

Metode poučevanja in učenja:

Learning and Teaching Methods:

Predavanja Vaje	Lectures Problem solving
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Delež (v %) /

Načini ocenjevanja:

Weight (in %)

Assessment:

Izpit pisni in ustni. Ocene: 6-10 pozitivno. Vaje: Opravljen kolokvij.		Written and oral exam. Grades: 6-10 Problem solving: written tests
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Reference nosilca / Lecturer's References:

1. **FAJFER, Svjetlana**, GRELJO, Admir, KAMENIK, Jernej, MUSTAĆ, Ivana. Light Higgs and vector-like quarks without prejudice. *J. high energy phys.*, 2013, vol. 2013, no. 7, str. 155-1-155-37, doi: [10.1007/JHEP07\(2013\)155](https://doi.org/10.1007/JHEP07(2013)155). [COBISS.SI-ID [26913831](https://www.cobiss.si/id/26913831)]
2. **FAJFER, Svjetlana**, KOŠNIK, Nejc. Resonance catalyzed CP asymmetries in $D[\text{to}]P[\text{sup}]+I[\text{sup}]$ -. *Phys. rev., D Part. fields gravit. cosmol.*, 2013, vol. 87, no. 5, str. 054026-1-054026-8, doi: [10.1103/PhysRevD.87.054026](https://doi.org/10.1103/PhysRevD.87.054026). [COBISS.SI-ID [26631719](https://www.cobiss.si/id/26631719)]
3. DORŠNER, Ilja, **FAJFER, Svjetlana**, GRELJO, Admir, KAMENIK, Jernej. Higgs uncovering light scalar remnants of high scale matter unification. *J. high energy phys.*, 2012, issue 11, vol. 2012, str. 130-1-130-17, doi: [0.1007/JHEP11\(2012\)130](https://doi.org/10.1007/JHEP11(2012)130). [COBISS.SI-ID [26335783](https://www.cobiss.si/id/26335783)]

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet:	FIZIKA II
Course Title:	PHYSICS II

Študijski program in stopnja Study Programme and Level	Študijska smer Study Field	Letnik Academic Year	Semester Semester
UŠP Tehniška varnost, 1. stopnja	/	1.	2.
USP Technical Safety, 1 st Cycle	/	1 st	2 nd

Vrsta predmeta / Course Type obvezni / Mandatory

Univerzitetna koda predmeta / University Course Code: IN107

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje work	Druge oblike študija	Samost. delo Individ. work	ECTS
45	/	30 SV	/	/	75	5

Nosilec predmeta / Lecturer: prof. dr. Svjetlana Fajfer / Dr. Svjetlana Fajfer, Full Professor

Jeziki / Languages: Predavanja / Lectures: Slovenski / Slovenian
Vaje / Tutorial: Slovenski / Slovenian

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti: **Prerequisites:**

Študent oz. kandidat mora imeti predmet opredeljen kot študijsko obveznost.	The course has to be assigned to the student.
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Vsebina:

Električno in magnetno polje: statično električno polje, jakost električnega polja, električno polje točkastega naboja, Coulombov zakon, kondenzator, kapaciteta kondenzatorja, dielektrik v električnem polju, izmenični tok skozi kondenzator izoliran prevodnik v električnem polju, influenza, specifični upor, Ohmov zakon, enosmerni in izmenični tok, merjenje električnega toka in napetosti, statično magnetno polje, gostota magnetnega polja, sila na vodnik v magnetnem polju, magnetni navor na tokovno zanko, magnetni moment, induktivnost tuljave, izmenični tok skozi tuljavo, indukcija, generator in elektromotor, transformator.

Svetloba: elektromagnetno nihanje in valovanje, hitrost svetlobe, odboj, lom in

Content (Syllabus Outline):

Electric field and electric current: Coulomb's law, static electric field; electric field of a point charge, electric field of an electric dipole, electric potential, voltage, Gauss's law, Poisson's equation, capacitor, capacitance, dielectric in electric field, insulated conductor in electric field, influence, Ohm's law, direct and alternating current, alternating current through Ohm's resistor and capacitor, measuring electric current and voltage, electrical work and power.

Magnetic field: static magnetic field, density of magnetic field, magnetic force on a current-carrying conductor, magnetic torque on a current loop, magnetic moment, bio-magnetic orientation (via magnetite crystals), Amper's law, magnetic field in the vicinity of a long

interferenca svetlobe, svetlobni energijski tok, fotometrija, spekter svetlobe, elektromagnetno sevanje segrelih teles (Wiennov in Stefanov zakon)

Geometrijska optika: zrcala in leče enačba zrcal in leč, optične naprave: oko, povečevalno steklo in mikroskop.

Osnove atomske fizike: fotoefekt, unklonska slika curka elektronov, de Broglijeva valovna dolžina, zakoni sevanja črnega telesa, Bohorov model atoma, jedrski razpadi.

straight wire, in the coil, inductivity of a coil, alternating current through a coil, induction, alternating current in an undamped and damped electric circuit.

Light: formation of electromagnetic radiation, speed of electromagnetic radiation, reflection, refraction and interference, radiant energy, absorption of light, photometry, light spectrum, electromagnetic radiation of black bodies (Wienn's and Stefan's law).

Geometrical optics: reflectors and lenses, equation of mirrors and lenses, eye, vision corrections, optical devices, magnifying glass and microscope.

Selected topics in modern physics: photo effect, electron beam diffraction, de Broglie's wave length, Bohr's model of atom.

Temeljni literatura in viri / Readings:

- J. Strnad: Fizika II, DZS, Ljubljana, 1977. 288 str. (50%)
- J. Strnad: Fizika II, DZS, Ljubljana, 1998. 293 str. (10%), ali
- R. Kladnik: Visokošolska fizika II, DZS, Ljubljana, 1989. 335 str. (60%)

Cilji in kompetence:

Pri predmetu Fizika II študenti nadaljujejo s pridobivanjem razumevanja osnovnih fizikalnih pojmov in fizikalnih količin, spoznajo osnovne zakone narave, ter se ob reševanju problemov navadijo osnov analitičnega mišljenja.

Objectives and Competences:

During the physics course students obtain the understanding of basic physical concepts and quantities, they obtain the understanding of the basic laws of nature and through problem solving acquire the basics principles of analytical thinking.

Predvideni študijski rezultati:

Znanje in razumevanje:

Pri predmetu Fizika II študenti nadaljujejo s pridobivanjem razumevanja osnovnih fizikalnih pojmov in fizikalnih količin, spoznajo osnovne zakone narave.

Uporaba

Ob reševanju problemov se navadijo osnov analitičnega mišljenja.

Refleksija

Pridobljeno znanje fizikalnih osnov bo študentu omogočilo kritično ovrednotiti različne posege za zagotavljanje tehnične in požarne varnosti.

Intended Learning Outcomes:

Knowledge and Comprehension

Students continue to obtain the understanding of the basic laws of nature and through problem solving acquire the basics principles of analytical thinking.

Application

The acquired knowledge of physics will enable the student to critically evaluate the different approaches to establish technical and fire safety.

Analysis

In-depth analysis of system behaviour in nature.

Prenosljive spretnosti

Spoznajo računske pristope, potrebne za reševanje različnih tipov fizikalnih problemov in ob tem utrdijo analitični način razmišljanja.

Skill-transference Ability

The ability to autonomously follow the latest advances and literature in the field of technical and fire safety. Understanding of physical measurements and the ability of their critical evaluation.

Metode poučevanja in učenja:

Predavanja
Vaje

Learning and Teaching Methods:

Lectures
Problem solving

Načini ocenjevanja:

Izpit pisni in ustni.
Ocene: 6-10 pozitivno.
Vaje: Opravljen kolokvij.

Delež (v %) /

Weight (in %) /

Assessment:

Written and oral exam.
Grades: 6-10
Problem solving: written tests.

Reference nosilca / Lecturer's References:

1. **FAJFER, Svjetlana**, GRELJO, Admir, KAMENIK, Jernej, MUSTAČ, Ivana. Light Higgs and vector-like quarks without prejudice. *J. high energy phys.*, 2013, vol. 2013, no. 7, str. 155-1-155-37, doi: [10.1007/JHEP07\(2013\)155](https://doi.org/10.1007/JHEP07(2013)155). [COBISS.SI-ID [26913831](https://www.cobiss.si/id/26913831)]
2. **FAJFER, Svjetlana**, KOŠNIK, Nejc. Resonance catalyzed CP asymmetries in $D[\text{to}]P[\text{sup}]+I[\text{sup}]$ -. *Phys. rev., D Part. fields gravit. cosmol.*, 2013, vol. 87, no. 5, str. 054026-1-054026-8, doi: [10.1103/PhysRevD.87.054026](https://doi.org/10.1103/PhysRevD.87.054026). [COBISS.SI-ID [26631719](https://www.cobiss.si/id/26631719)]
3. DORŠNER, Ilja, **FAJFER, Svjetlana**, GRELJO, Admir, KAMENIK, Jernej. Higgs uncovering light scalar remnants of high scale matter unification. *J. high energy phys.*, 2012, issue 11, vol. 2012, str. 130-1-130-17, doi: [0.1007/JHEP11\(2012\)130](https://doi.org/10.1007/JHEP11(2012)130). [COBISS.SI-ID [26335783](https://www.cobiss.si/id/26335783)]

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet: GORENJE IN DINAMIKA POŽAROV
Course Title: FIRE AND FIRE DYNAMICS

Študijski program in stopnja Study Programme and Level	Študijska smer Study Field	Letnik Academic Year	Semester Semester
UŠP Tehniška varnost, 1. stopnja	/	2.	4.
USP Technical Safety, 1 st Cycle	/	2 nd	4 th

Vrsta predmeta / Course Type

obvezni / Mandatory

Univerzitetna koda predmeta / University Course Code:

TV114

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje Work	Druge oblike študija	Samost. delo Individ. Work	ECTS
45	30	/	/	/	75	5

Nosilec predmeta / Lecturer:

Izr. prof. dr. Simon Schnabl / Dr. Simon Schnabl, Associate Professor

Jeziki / Languages:

Predavanja / Lectures: Slovenski / Slovenian
Vaje / Tutorial: /

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:

Študent oz. kandidat mora imeti predmet opredeljen kot študijsko obveznost.

Prerequisites:

The course has to be assigned to the student.

Vsebina:

1. Gorenje
- definicija gorenja in trikotnik gorenja,
- teorija in mehanizmi gorenja (stehiometrična razmerja (gorivo - oksidant), energijske spremembe pri kemijski reakciji, kemijsko ravnotežje v plamenu,
- mehanizem gorenja plinov (vrste plamena, vžig plinske zmesi, meje vnetljivosti in adiabatna temperatura plamena),
- mehanizem gorenja tekočin (tok tekočin, širjenje plamena po površini tekočine, hitrost površinskega zgorevanja tekočin (ob razlitju), razpršene tekočine ("spray"), tekočina v zaprti posodi),
- mehanizem gorenja trdnih snovi, njihov

Content (Syllabus Outline):

1. Combustion
- the combustion process and fire triangle (fuel, source of ignition and oxidant; flaming and nonflaming), energy release; fuel/ oxygen ratio, chemical equilibrium in flame
- the mechanism of gas phase combustion (types of flame, flammability limits (fuel, inert gas concentration and temperature dependence); premixed and diffusion flames (flame temperature, flame height)
- burning rate, heat release rate and spread of flame of liquids (pool fire, burning of droplets, boilover, BLEVE, UVCE) and
- solids (thermal decomposition)
- smouldering, charring,

termični razpad,
 - tlenje in žarjenje, samodejni razkroj, samovžig trdnih in tekočih snovi,
 - produkti gorenja (dim, plini).

2. Gorenje s plamenom
 - hitrost gorenja in hitrost sproščanja toplote,
 - vrste plamena (predhodno premešani plamen, difuzijski plamen),
 - lastnosti plamena (temperatura plamena, masni vzgonski tok, hitrost),
 - širjenje požara (višina plamena),
 - mehanizmi širjenja požara in dima po objektu.

3. Potek požara v objektih
 - razvoj požara - faze;
 - značilne krivulje poteka požara (standardna požarna krivulja; enakomeren polno razviti požar; časovno odvisen požar)
 - temperatura v prostoru nastanka požara (pred požarnim preskokom, po požarnem preskoku, v fazi pojemajočega požara).

4. Eksplozivno gorenje
 - vzroki za eksplozije in mehanizmi,
 - vrste eksplozij (prah, plini),
 - kemijska, fizikalna eksplozija,
 - energijske spremembe pri eksploziji, deflagracija, detonacija,
 - izračun tlaka, (maksimalni tlak, maksimalna hitrost naraščanja tlaka)

5. Požari v posebnih okoljih
 - višja koncentracija kisika; sistemi z nad- ali podtlakom.

6. Klasifikacija požarov

- spontaneous ignition
 - fire products (gases, smoke)

2. Homogeneous burning (flaming mode)
 - burning rate, heat release rate
 - premixed flame, diffusion flame
 - flame properties (shape, height, velocity, mass flow), flame under ceiling (temperature),
 - spread of flame
 - spread of fire and smoke

3. Compartment fire
 - course of compartment fire (growth period, flashover)
 - standard fire curves, t-squared fire, fully developed fire
 - temperatures in the compartment before and during flashover

4. Explosions
 - causes; mechanisms,
 - dust and gas-explosions;
 - chemical and physical explosions
 - energy change (deflagration, detonation)
 - pressure calculation (maximum pressure, rate of pressure rise)

5. Fires in special environments
 (high and low pressure systems, high oxygen concentration)

6. Fire classes

Temeljni literatura in viri / Readings:

- Principles of Fire Protection Chemistry and Physics, R. Friedman, NFPA, 3. izdaja (1998), 296 str., (60%)
- An Introduction to Fire Dynamics, D. Drysdale, Wiley, 2. izdaja (1998), 451 str., (25%)
- Enclosure Fire Dynamics, B. Karlsson, J. Quintere, 2000, 315 str., (20%)

Dopolnilna literatura:

- Kemija v gasilstvu, B. Grm, B. Stevanovič, GZS, 1. izdaja (2001), 339 str.,
 - Zaštita od požara i eksplozija, D. Stojanović, IZPE Sarajevo, 2. izdaja (1988) 331 str.,
- The SFPE Handbook of Fire Protection Engineering, NFPA, 2. izdaja (1995) 1 zv. (loč. pag.).

Cilji in kompetence:

Objectives and Competences:

Študent spozna teoretične osnove gorenja različnih vrst gorljivih snovi, razvoja požara in širjenja požara po zgradbi. Seznanijo se s pogoji in učinki eksplozivnega gorenja. Pri seminarjih se naučijo z izračuni oceniti, ali so izpolnjeni pogoji za gorenje. V posameznih primerih izračunajo temperaturo in višino plamena med gorenjem ter nekatere druge pomembne parametre. To so osnovna znanja, ki so nujno potrebna, da lahko razumejo različne principe in načine gašenja ter izbor in izvedbo potrebnih požarnovarnostnih ukrepov, s katerimi se seznanijo pri predmetih v višjih letnikih.

Students adopt basic concepts of burning, fire dynamics, compartment fires and explosions. They learn some methods to evaluate burning conditions, flame temperature and height, and some other important parameters. The obtained background is necessary to understand principles and methods of fire extinguishment and selection of proper fire protection which is a subject of following courses.

Predvideni študijski rezultati:

Znanje in razumevanje

Študent bo pridobil osnovna teoretska in praktična znanja, ki so potrebna za razumevanje gorenja in obnašanja različnih snovi, zajetih v proces oksidacije. Razen teoretskih temeljev bodo pridobili tudi praktična znanja.

Uporaba

Študent bo spoznal osnove gorenja, gašenja in dinamike požarov, osnovne pojme torej, ki obravnavajo pogoje za nastanek in razvoj požara.

Refleksija

Ukrepe požarne varnosti kritično presojujejo z uporabo znanja o dinamiki požara.

Prenosljive spretnosti

Pri predmetu bo študent pridobil osnovna znanja, uporabna tudi na drugih področjih in pri drugih predmetih: Osnove tehniške in požarne varnosti, Matematične metode v varnosti, Osnove procesne tehnike, Nevarne snovi, Odkrivanje in gašenje požarov, Požarna varnost v objektih, Intervencije in reševanje, Požarni praktikum in Inženirske metode v požarni varnosti.

Intended Learning Outcomes:

Knowledge and Comprehension

Students adopt basic theoretical knowledge and some practical skills in calculating to master fire and fire dynamic.

Application

Student master core concepts of fire, its origin and development.

Reflection

Sharpen student skills in problem solving and critical thinking regarding fire protection.

Skill-transference Ability

Fundamental concepts will be further developed in other courses: Fundamentals of technical and fire safety, Safety statistics, Fundamentals of processing techniques, Hazardous materials, Fire detection and suppression, Fire safety of buildings, Practical course, Engineering methods in fire safety.

Metode poučevanja in učenja:

Predavanja in seminarji.

Learning and Teaching Methods:

Lectures and seminar.

Delež (v %) /

Načini ocenjevanja:

Weight (in %) **Assessment:**

Pisni (nadomestita ga lahko dva pozitivno ocenjena kolokvija) Ocene: pozitivno 6-10; negativno 1-5.		
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Reference nosilca / Lecturer's References:

- **SCHNABL, Simon**, TURK, Goran, PLANINC, Igor. Uklon lesenih stebrov pri požaru = Buckling of timber columns subjected to fire. V: Kuhljevi dnevi, 23. september 2010, Ljubljana. ŠIROK, Brane (ur.), EBERLINC, Matjaž (ur.). Zbornik del. Ljubljana: SDM - Slovensko društvo za mehaniko, 2010, str. 207-214, graf. prikazi. [COBISS.SI-ID 5132385]

- PLANINC, Igor, HOZJAN, Tomaž, TURK, Goran, **SCHNABL, Simon**. Fire analysis of timber composite beams with interlayer slip : paper no. 045. V: GAD, Emad (ur.), WONG, Bill (ur.). Australasian Structural Engineering Conference : ASEC 2008 : 26-27 June 2008, Melbourne, Australia : conference proceedings. Collingwood [VIC]: The meeting planners, 2008, str. 1-6, ilustr. [COBISS.SI-ID 4122977]

- **SCHNABL, Simon**, HOZJAN, Tomaž, TURK, Goran, PLANINC, Igor. Finite analysis of composite beams with interlayer slip : paper no. 046. V: GAD, Emad (ur.), WONG, Bill (ur.). Australasian Structural Engineering Conference : ASEC 2008 : 26-27 June 2008, Melbourne, Australia : conference proceedings. Collingwood [VIC]: The meeting planners, 2008, str. 1-9, ilustr. [COBISS.SI-ID 4123489]

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet:	KEMIJA
Course Title:	CHEMISTRY

Študijski program in stopnja Study Programme and Level	Študijska smer Study Field	Letnik Academic Year	Semester Semester
UŠP Tehniška varnost, 1. stopnja	/	1.	1.
USP Technical Safety, 1 st Cycle	/	1 st	1 st

Vrsta predmeta / Course Type obvezni / Mandatory

Univerzitetna koda predmeta / University Course Code: TV103

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje Work	Druge oblike študija	Samost. delo Individ. Work	ECTS
75	15	60 LV	/	/	150	10

Nosilec predmeta / Lecturer: doc. dr. Barbara Modec / Dr. Barbara Modec Assistant Professor
doc. dr. Uroš Grošelj / Dr. Uroš Grošelj, Assistant Professor

Jeziki / Languages: **Predavanja / Lectures:** Slovenski / Slovenian
Vaje / Tutorial: Slovenski / Slovenian

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti: **Prerequisites:**

Študent oz. kandidat mora imeti predmet opredeljen kot študijsko obveznost.	The course has to be assigned to the student.
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Vsebina:

Splošna kemija.
 Osnovni pojmi: množina snovi, molska masa, število delcev, enačbe kemijskih reakcij.
 Snov: čista snov – zmes; element, spojina; ločevanje zmesi; homogena, heterogena snov.
 Kemijske reakcije in energija: eksotermne in endotermne reakcije; reverzibilne in ireverzibilne kemijske reakcije; aktivacijska energija.
 Zgradba atomov: jedro in elektronski oblak; elektronski nivoji, periodni sistem.
 Kemijska vez: ionska, kovalentna in kovinska vez; pravilo okteta, ionizacijska energija, enojne, dvojne in trojne vezi, polarnost molekul.
 Molekulske vezi, vodikova vez, agregatna

Content (Syllabus Outline):

General chemistry
 Basic concepts: amount of substance, molar mass, stoichiometry of chemical reactions.
 Properties and composition of matter.
 Substance and mixture, separating mixtures.
 Elements and compounds.
 Exothermic and in endothermic reaction; reversible and irreversible reactions, activation energy.
 Dalton atomic theory. - Atom and the principal particles. The wave-mechanistic model of an atom. The periodic law.
 Chemical bond. Ionic bond – ionic compounds.
 Covalent bond. Molecular geometry. A valence electron pair repulsion theory. Molecular dipole moment.

stanja, molekulske vezi v raztopinah.
Plini: splošna plinska enačba, Avogadrov zakon, realni plini, kemijske reakcije v plinastem stanju.
Prehodi med agregatnimi stanji, entalpije taljenja in izparevanja, temperatura tališča in vrelišča.
Tekoče agregatno stanje, površinska napetost, parni tlak, fazni diagrami.
Trdno agregatno stanje. Kristalinične in amorfne snovi, molekulske, ionske, kovalentne in kovinske trdne snovi, specifična površina, adsorpcija. Raztopine: koncentracije raztopin, topnost, procesi pri raztapljanju. Hitrost in mehanizem kemijske reakcije. Homogena in heterogena kataliza. Kemijsko ravnotežje: zakon o vplivu koncentracij, Le Chatelierjev princip. Ravnotežja v raztopinah elektrolitov: kisline in baze, hidroliza, indikatorji, pufri, ionske reakcije, konstanta kisline, titracija. Reakcije oksidacije in redukcije: urejanje enačb reakcij, redoks potencial, galvanski člen, gorivna celica, elektroliza. Anorganska kemija. Vodik, kisik, voda, vodikov peroksid. Halogeni in njihove spojine: elementarni halogeni, vodikovi halogenidi, oksid kisline halogenov, ionski in molekularni halogenidi. Uporaba. Žveplo, vodikov sulfid, žveplove kislina, žveplove oksidi; uporaba. Dušik in fosfor: hidridi, oksidi, kisline, soli kislinski in uporaba. Ogljik in silicij: oksidi, kisline, karbonati, silikati in uporaba. Bor in aluminij: borat, aluminijeve soli. Zemeljskoalkalijski in alkalijski elementi: soli teh elementov. Prehodni elementi, njihove spojine in uporaba. Koordinacijske spojine.

Organska kemija: zgradba in nomenklatura organskih spojin. Lastnosti organskih spojin. Ogljikovodiki: osnovne pretvorbe, uporaba, pridobivanje, nafta in zemeljski plin. Organske halogenske spojine, lastnosti pridobivanje,

Molecular bonds, hydrogen bonds, molecular bonds in solutions.
- Properties of gases, ideal gas equation. States of matter and changes.
- Liquids. Viscosity and surface tension. Vapour pressure.
- Solid matter. Covalent and molecular crystals. Metals, metal bond. Adsorption.
- Solutions (composition, dissolution, solubility). Electrolytes. Ionic reactions.
- Chemical kinetics and mechanism of the chemical reaction. Homogeneous and heterogeneous catalysis.
- Principles of chemical equilibria. Le Chatelier principle.
- Chemical equilibria in solutions. Brønsted acid / base definition. Hydrolysis.
- pH. Indicators. K_a . Titration. Buffer solutions.
- Redox reactions. Galvanic cell. Fuel cells. Electrolysis.
Inorganic chemistry
Hydrogen, oxygen, water, hydrogen peroxide. Halogens and their compounds, elements, hydrogen halides, oxo halide acids, ionic and covalent halides. Applications.
Sulphur, hydrogen sulphide, sulphur oxides, acids. Applications.
Nitrogen and phosphorus, hydrides, oxides, acids, salts. Applications.
Carbon and silicon: oxides, acids, carbonates, silicates. Applications.
Boron and aluminium, borates, aluminium salts. Alkaline earth and alkali metals and their salts. The transition elements, their compounds and applications.
Coordination compounds.

Organic chemistry: structure and nomenclature of organic compounds. Properties.
Hydrocarbons: basic transformations, uses and sources. Petroleum and natural gas. Organic halogen compounds, properties, preparation, uses. Organic oxygen compounds (alcohols, carbonyl compounds, carboxylic acids and esters. Basic transformations, uses. Lipids and surfactants. Carbohydrates. Polymers.

uporaba. Kisikove spojine (alkoholi, karbonilne spojine, karboksilne kisline in estri) Osnovne pretvorbe in uporaba. Lipidi in PAS. Ogljikovi hidrati. Polimeri.

B. Eksperimentalne vaje: 1. Formule kemijskih spojin, 2. Plinski zakoni, 3. Kemijska reakcija, 4. Rastopine, 5. Topnost, 6. Kisline, baze, soli, 7. Elektrolitska disociacija, 8. in 9. Kemijsko ravnotežje, 10. Topnostni produkt in 11. Reakcije oksidacije in redukcije..

B. Tutorial in a chemistry laboratory

1. A chemical formula of a compound, 2. Gas law, 3. A chemical reaction, 4. Solutions, 5. Solubility, 6. Acids, bases and salts, 7. Electrolytes, 8. and 9. Chemical equilibria, 10. Solubility product, 11. Redox reactions...

Temeljni literatura in viri / Readings:

- LAZARINI, F. in BRENČIČ, J.V., *Splošna in anorganska kemija*. Založba FKKT, Ljubljana, 2004, 557 str., (30%).
- ČEH, B., *Splošna in anorganska kemija*. Založba FKKT, Ljubljana, 2005, 240 str., (60%).
- TRATAR PIRC, E., PEVEC, A. in DEMŠAR, A., *Vaje iz anorganske kemije*, Založba FKKT, Ljubljana, 2006, 65 str. (60%)
- N. BUKOVEC, R. CERC KOROŠEC, in E. TRATAR PIRC, *Praktikum iz splošne in anorganske kemije*, Založba FKKT, Ljubljana, 2009, 110 str. (20%).
- D. Dolenc, B. Šket, *Kemija za gimnazije 3*, DZS: Ljubljana, 2010 (190 str. 50 %).

Cilji in kompetence:

Študent bo spoznal osnove o lastnostih snovi in njihovi reaktivnosti na podlagi lastnosti osnovnih gradnikov snovi - atomov, molekul in ionov. Pridobljeno znanje je potrebno za razumevanje vseh predmetov, ki so kakorkoli navezani na snovi in seveda predvsem za delo diplomantov v poklicu. Študent se bo pri vajah naučil osnovnih prijemov v kemijskem laboratoriju.

Objectives and Competences:

All courses in higher semesters linked to matter demand mastering of fundamental structure and properties of matter studying in this course. It is also important for a professional work in the future. Students develop basic skills for experimental work in a chemical laboratory.

Predvideni študijski rezultati:

Znanje in razumevanje

Študent bo pridobil znanje in razumevanje o strukturi atomov, periodnem sistemu, vezeh med atomi in molekulami, lastnostih snovi v plinu, tekočinah in trdnem stanju, rastopinah, kemijskih reakcijah, lastnostih spojin in elementov posameznih skupin.

Uporaba

Uporaba zakonitosti o lastnostih snovi in kemijskih reakcijah za razumevanje tehnoloških procesov, vplivu na okolje in za razvoj strok.

Intended Learning Outcomes:

Knowledge and Comprehension

Students link composition of matter to its properties. Knowing the structure of atoms and the nature of chemical bonds explain properties of matter in gas, liquid and solid state and chemical reactions.

Application

Applying basic concepts to understand technological processes and environmental impact.

<u>Refleksija</u> Zna opazovati in razumeti pojave, procese in razvoj tudi skozi kemijske spremembe, ki so udeležene v procesu.	<u>Reflection</u> Students are able to observe and understand the phenomena and processes through chemical changes that are involved in the process.
<u>Prenosljive spretnosti</u> Študent se bo naučil laboratorijskih prijemov, ki so splošni, zapiskov pri eksperimentiranju; znal bo uporabljati podatke iz literature, izvajati kemijske in nekatere fizikalne meritve, eksperimentalne podatke bo znal ustrezno obdelati ter primerno interpretirati, dobil bo občutek za lastnosti snovi.	<u>Skill-transference Ability</u> The students adopt general laboratory skills, documentation of experimental work, application of literature data, chemical and physical measurements and their processing and interpretation.

Metode poučevanja in učenja:

Predavanja z eksperimenti, ki pojasnjujejo predavano snov, navezovanje tematike na reševanje problemov, ki so študentom blizu, povezovanje predelane snovi na odprta vprašanja pri seminarjih, laboratorijsko delo pri vajah.

Learning and Teaching Methods:

Lectures, Seminar, Tutorial
Lectures include some illustrative experiments; additional explanations and problem solving in seminars; experimental work in tutorial.

Načini ocenjevanja:	Delež (v %) / Weight (in %)	Assessment:
Pisni izpit. Pogoji za opravljanje pisnega izpita so opravljene vaje in kolokvij iz vaj. Vaje: Opravljen kolokvij (2/3 ocene vaj), pri vajah predstavlja delež ocene tudi uspešno laboratorijsko delo (1/3 ocene vaj). Ocene: 6-10 pozitivno (3/4 ocene iz pisnega izpita, 1/4 ocene iz vaj)	75% 25%	Examination after completion of laboratory work (1/3 of the tutorial grade) and test in tutorials (2/3). Grades: 6-10 positive (3/4 examination 1/4 tutorial)

Reference nosilca / Lecturer's References:

- B. Modec**, N. Lah. Vaje iz spektroskopije. 1. izdaja, Fakulteta za kemijo in kemijsko tehnologijo, Ljubljana, 2013.
- B. Modec**. Zbirka poskusov iz anorganske kemije za študente pedagoške fakultete. Založba FKKT, Ljubljana 2012.
- B. Modec**, J. Brenčič, D. Dolenc, J. Koller. Structures of polymorphic forms of *trans*-(PyH)[MoCl₄(Py)₂]: conformational isomerism of the *trans*-[MoCl₄(Py)₂]⁻ ion. *J. Mol. Struct.* 1042 (2013) 112–117.
- B. Modec**, M. Šala, R. Clerac. Pyrazine-assisted dimerization of molybdenum(V): synthesis and structural characterization of novel dinuclear and tetranuclear complexes. *Eur. J. Inorg. Chem.* (2010) 542–553.
- B. Modec**, J. Brenčič, J. Zubieta. A templated synthesis of tetranuclear polyoxoalkoxymolybdates(V). Bromo coordinated oxomolybdenum(V) clusters: known core

structure with new ligands oxidation to the Lindquist anion. *J. Chem. Soc., Dalton Trans.* (2002) 1500–1507.

1. TOMAŽIN, Urša, **GROŠELJ, Uroš**, POČKAJ, Marta, POŽGAN, Franc, ŠTEFANE, Bogdan, SVETE, Jurij. Combinatorial synthesis of acacen-type ligands and their coordination compounds. *ACS combinatorial science*, ISSN 2156-8952, str. 1-11, ilustr.
<http://pubs.acs.org/doi/full/10.1021/acscombsci.7b00027>, doi: 10.1021/acscombsci.7b00027. [COBISS.SI-ID 1537408707], [JCR, SNIP]
2. RIČKO, Sebastijan, MEDEN, Anže, IVANČIČ, Anže, PERDIH, Andrej, ŠTEFANE, Bogdan, SVETE, Jurij, **GROŠELJ, Uroš**. Organocatalyzed deracemisation of [Delta] [sup] 2-pyrrolin-4-ones. *Advanced Synthesis & Catalysis*, ISSN 1615-4150. [Print ed.], str. 1-9, ilustr.
<http://onlinelibrary.wiley.com/doi/10.1002/adsc.201700539/full>, doi: 10.1002/adsc.201700539. [COBISS.SI-ID 1537417667], [JCR, SNIP]
3. ŠTEFANE, Bogdan, BRODNIK ŽUGELJ, Helena, **GROŠELJ, Uroš**, KUZMAN, Petra, SVETE, Jurij, POŽGAN, Franc. Quinazoline-directed C-H bond functionalization catalyzed by ruthenium(II) carboxylate - construction of polyconjugated aryl-heteroaryl systems. *European journal of organic chemistry*, ISSN 1434-193X, Apr. 2017, vol. 2017, iss. 14, str. 1855-1864, ilustr.
<http://onlinelibrary.wiley.com/doi/10.1002/ejoc.201700097/full>, doi: 10.1002/ejoc.201700097. [COBISS.SI-ID 1537406403], [JCR, SNIP, Scopus do 1. 5. 2017: št. citatov (TC): 0, čistih citatov (CI): 0]
4. MIRNIK, Jona, PUŠAVEC KIRAR, Eva, RIČKO, Sebastijan, **GROŠELJ, Uroš**, GOLOBIČ, Amalija, POŽGAN, Franc, ŠTEFANE, Bogdan, SVETE, Jurij. Cu [sup] 0-catalyzed 1,3-dipolar cycloadditions of [alpha]-amino acid derived N,N-cyclic azomethine imines to ynones. *Tetrahedron*, ISSN 0040-4020. [Print ed.], str. 1-31, ilustr.
<http://www.sciencedirect.com/science/article/pii/S0040402017304404>, doi: 10.1016/j.tet.2017.04.050. [COBISS.SI-ID 1537416387], [JCR, SNIP]
5. RIČKO, Sebastijan, SVETE, Jurij, ŠTEFANE, Bogdan, PERDIH, Andrej, GOLOBIČ, Amalija, MEDEN, Anže, **GROŠELJ, Uroš**. 1,3-diamine-derived bifunctional organocatalyst prepared from camphor. *Advanced Synthesis & Catalysis*, ISSN 1615-4150. [Print ed.], 2016, vol. 358, iss. 23, str. 3786-3796, ilustr. <http://onlinelibrary.wiley.com/wol1/doi/10.1002/adsc.201600498/full>, doi: 10.1002/adsc.201600498. [COBISS.SI-ID 1537274819], [JCR, SNIP, WoS do 13. 1. 2017: št. citatov (TC): 0, čistih citatov (CI): 0, Scopus do 25. 12. 2016: št. citatov (TC): 0, čistih citatov (CI): 0]

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet:	MATEMATIKA I
Course Title:	MATHEMATICS I

Študijski program in stopnja Study Programme and Level	Študijska smer Study Field	Letnik Academic Year	Semester Semester
UŠP Tehniška varnost, 1. stopnja	/	1.	1.
USP Technical Safety, 1 st Cycle	/	1 st	1 st

Vrsta predmeta / Course Type obvezni / Mandatory

Univerzitetna koda predmeta / University Course Code: IN101

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje work	Druge oblike študija	Samost. delo Individ. work	ECTS
45	/	30 SV	/	/	75	5

Nosilec predmeta / Lecturer: izr. prof. dr. Jaka Smrekar / Dr. Jaka Smrekar, Associate Professor

Jeziki / Languages:

	Predavanja / Lectures: Slovenski / Slovenian
	Vaje / Tutorial: Slovenski / Slovenian

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:

Študent oz. kandidat mora imeti predmet opredeljen kot študijsko obveznost.

Prerequisites:

The course has to be assigned to the student.

Vsebina:

- **Zaporedja.** Osnovni pojmi. Limita. Računanje z zaporedji. Število e . Konvergenca številske vrste, geometrijska vrsta.
 - **Funkcija ene spremenljivke.** Definicija in načini podajanja funkcij. Osnovne operacije s funkcijami. Inverzna funkcija. Pregled, grafi in lastnosti elementarnih funkcij. Parametrično dana krivulja. Zveznost in enostranska zveznost. Računske operacije z zveznimi funkcijami in lastnosti zveznih funkcij.
 - **Limita funkcije.** Definicija in računanje z limitami.
 - **Odvod in diferencial funkcije.** Definicija odvoda in njegov pomen. Pravila za odvajanje in odvodi elementarnih funkcij. Diferencial

Content (Syllabus Outline):

Sequences. Basic notions. Limit. Operations with sequences. Euler's number e . Convergence of a series, geometric series.
Functions of one variable. Definition. Ways of specifying a function. Basic operations with functions. Inverse function. Overview, graphs, and properties of elementary functions. Parametrically defined curve. Continuity and one-sided continuity. Operations with continuous functions and properties of continuous functions.
Limit of a function. Definition. Properties of limits.
Derivative and differential of a function. The definition and meaning of derivative.

funkcije in uporaba. L'Hospitalovo pravilo.

- **Nedoločeni integral.** Definicija in osnovne lastnosti. Nedoločeni integrali osnovnih funkcij. Pravila in osnovne metode za integriranje. Integracija preprostih racionalnih, algebraskih, trigonometrijskih in drugih funkcij.
- **Določeni integral.** Definicija in osnovne lastnosti. Zveza med določenim in nedoločenim integralom. Uporabe določenega integrala (ploščine, prostornine in površine vrtenin ter nekatere druge uporabe). Izlimitirani integrali.
- **Višji odvodi.** uporaba prvega in višjih odvodov pri funkcijah. Konveksnost, konkavnost, prevoj.
- **Ekstremi funkcije ene spremenljivke.** Definicija in pogoji za ekstrem. Primeri in uporaba.

Differentiation rules and derivatives of elementary functions. The differential of a function and applications. L'Hôpital's rule.

Indefinite integral. Definition and basic properties. Standard integrals. Basic methods and rules for integration. The integration of rational, algebraic, trigonometric, and other functions.

Definite integral. Definition and basic properties. The relationship between the indefinite and the definite integral. Applications of the definite integral (lengths, areas, volumes). Improper integrals.

Higher derivatives: application of the first and of the higher derivatives in the analysis of functions. Convexity, concavity, inflection points.

Extrema of functions: Definition. Necessary conditions for the extrema. Examples and application.

Temeljni literatura in viri / Readings:

- R. Jamnik, Matematika, DMFA Slovenije, Ljubljana, 1994, 568 str. (30%)
- Vidav, Višja Matematika I, DMFA, Ljubljana, 1994, 477 str. (20%)

Dopolnilna literatura:

- P. Mizori-Oblak, Matematika za študente tehnike in naravoslovja I, FS, Ljubljana, 2001, 381 str.
- Turnšek, Tehniška matematika, FS, Ljubljana, 2007, 306 str.
- G. Doggett, B. T. Sutcliffe, Mathematics for chemistry, Longman, 1995, 286 str. (V poštev pridejo le posamezni deli dopolnilnih učbenikov).

Cilji in kompetence:

Cilj predmeta je pridobiti osnovna znanja iz matematične analize, ki so osnova za vsako strokovno visokošolsko izobraževanje v naravoslovju in tehniki

Objectives and Competences:

The objective of the course is to obtain basic knowledge and skills in mathematical analysis. Such knowledge represents the foundation of any higher educational studies in science and technology.

Predvideni študijski rezultati:

Znanje in razumevanje

Študent se pri predmetu Matematika 1 seznani s temeljnimi matematičnimi pojmi in tehnikami, kot so vektorji, funkcije, odvod in integral, ki so nujno potrebni za razumevanje drugih matematičnih in strokovnih predmetov

Intended Learning Outcomes:

Knowledge and Comprehension

Students get acquainted with foundational mathematical concepts and techniques such as vectors, functions, differentiation, and integration that are essentially important for the understanding of other mathematical and

pri nadaljnem študiju..	profession-related courses at further studies.
<u>Uporaba</u> Ob tem se uči matematičnega razmišljanja in strogosti, na vajah pa pridobiva praktično, delovno znanje obravnavanega področja.	<u>Application</u> Students learn about mathematical thinking and rigor, and obtain a working knowledge of the material at problem sessions.
<u>Refleksija</u> Spoznanja o zmogljivostih in omejitvah posameznih metod računanja v praksi pomenijo osnovo za mnoge pomembne odločitve.	<u>Reflection</u> Findings about the capabilities and limitations of various computational methods in practice can provide a basis for many important decisions.
<u>Prenosljive spretnosti</u> Razvoj induktivnega sklepanja, doslednosti natančnosti in logičnega razmišljanja je dobra osnova za naravoslovno tehniške predmete.	<u>Skill-transference Ability</u> The development of inductive reasoning, consistency, and logical thinking is a good basis for all courses in science and technology.

Metode poučevanja in učenja:

Predavanja
Računske vaje

Learning and Teaching Methods:

Lectures
Problem sessions

Načini ocenjevanja:

Kolokviji, pisni izpiti, ustni izpiti.

Delež (v %) /
Weight (in %)

Assessment:

Midterm exams, written exams, oral exams.

Reference nosilca / Lecturer's References:

1. **SMREKAR, Jaka**. Homotopy type of space of maps into a $K(G,n)$. Homology, homotopy, and applications, 2013, vol. 15, no. 1, str. 137-149.
<http://dx.doi.org/10.4310/HHA.2013.v15.n1.a8>. [COBISS.SI-ID 16643929]
2. CENCELJ, Matija, DYDAK, Jerzy, **SMREKAR, Jaka**, VAVPETIČ, Aleš. Sublinear Higson corona and Lipschitz extensions. *Houst. j. math.*, 2011, vol. 37, no. 4, str. 1307-1322.
<http://www.math.uh.edu/~hjm/Vol37-4.html>. [COBISS.SI-ID 16135001]
3. **SMREKAR, Jaka**. Homotopy type of mapping spaces and existence of geometric exponents. *Forum math.*, 2010, vol. 22, no. 3, str. 433-456.
<http://dx.doi.org/10.1515/FORUM.2010.024>. [COBISS.SI-ID 15638105]

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet:	MATHEMATICS II
Course title:	MATEMATIKA II

Študijski program in stopnja Study Programme and Level	Študijska smer Study Field	Letnik Academic Year	Semester Semester
UŠP Tehniška varnost, 1. stopnja	/	1.	2.
USP Technical Safety, 1 st Cycle	/	1 st	2 nd

Vrsta predmeta / Course Type obvezni / Mandatory

Univerzitetna koda predmeta / University Course Code: IN106

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje work	Druge oblike študija	Samost. delo Individ. work	ECTS
45	/	30 SV	/	/	75	5

Nosilec predmeta / Lecturer: prof. dr. Pavle Saksida / Dr. Pavle Saksida, Full Professor

Jeziki / Languages: Predavanja / Lectures: Slovenski / Slovenian
Vaje / Tutorial: Slovenski / Slovenian

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti: **Prerequisites:**

Študent oz. kandidat mora imeti predmet opredeljen kot študijsko obveznost.	The course has to be assigned to the student.
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Vsebina:

Razvoj funkcij. Taylorjeva formula in Taylorjeva vrsta. Vrste za eksponentno, trigonometrijsko in logaritemsko funkcijo. Razvoj potence binoma. Eulerjeva formula.

Navadne diferencialne enačbe. Osnovni pojmi in lastnosti. Enačbe prvega reda: z ločljivimi spremenljivkami, linearna enačba, Bernoullijeva enačba. Enačbe drugega reda: enačbe, ki se jim da znižati red, linearna enačba drugega reda (posebno enačba s konstantnimi koeficienti). Preprosti sistemi linearnih diferencialnih enačb. Robni in začetni problemi. Primeri in uporabe.

Determinante. Definicija in njene lastnosti. Poddeterminante. Praktično računanje determinant. Reševanje sistemov enačb s

Content (Syllabus Outline):

Series expansions of functions: Taylor formula and Taylor series. Exponential trigonometric, logarithmic and binomial series. Euler formula.

Ordinary differential equations: Basic concepts. First order equations: separable equations, linear equation, Bernoulli equation. Second order equations: reducible second order equations, linear equation, linear equation with constant coefficients. Simple systems of linear differential equations. Boundary and initial problems. Examples an application.

Determinants: Definition and properties. Subdeterminants. Evaluation of determinants. Solving linear systems by means of Cramer's rule.

Lines and planes in the space: Equation of a

Cramerjevim pravilom.

Premica in ravnina v prostoru. Enačbe ravnine in premice v prostoru. Razdalje in koti.

Vektorski prostor n-teric. Linearna neodvisnost, baza, skalarni produkt.

Matrike. Osnovne operacije z matrikami. Rang matrike. Kvadratne matrike. Inverzna matrika. Matrika rotacije v ravnini in v prostoru.

Sistemi linearnih enačb. Rešljivost sistema linearnih enačb. Gaussova metoda. Lastne vrednosti in lastni vektorji matrike.

Metoda najmanjših kvadratov. Iskanje najboljše aproksimacije prek normalnega sistema enačb.

Vektorji. Definicija, seštevanje in množenje s skalarjem. Linearna neodvisnost, baza, koordinatni sistem. Skalarni, vektorski in mešani produkt.

Pojem diferencialne enačbe. Preprosti primeri diferencialne enačbe 1. reda.

plane. Equation of a line. Distances and angles.

Vector space of n-tuples: Linear independence, bases of the space, inner product.

Matrices: Matrix operations. Rank of a matrix. Quadratic matrices. The inverse of a matrix. Matrices of rotations in the plane and in the space.

Systems of linear equations: Solubility of a system of linear equations: Gauss' elimination method. Eigenvalues and eigenvectors.

Least squares: Determining the best approximation by means of the equations.

Vectors. Definition; addition and scalar multiplication. Linear independence, basis, coordinate system. Scalar (dot) product, vector (cross) product, and mixed (triple) product.

The concept of differential equation. Basic first-order differential equations.

Temeljni literatura in viri / Readings:

- R. Jamnik, Matematika, DMFA Slovenije, Ljubljana, 1994, 568 str. (30%)
- G. Tomšič, N. Mramor-Kosta, B. Orel, Matematika II, FE, 2005, 236 str. (40%) Vidav, Višja Matematika I, DMFA, Ljubljana, 1994, 477 str. (20%)

Dopolnilna literatura:

- Vidav, Višja Matematika I, DMFA, Ljubljana, 1994, 477 str.
 - P. Mizori-Oblak, Matematika za študente tehnike in naravoslovja I, FS, Ljubljana, 2001, 381 str.
 - Turnšek, Tehniška matematika, FS, Ljubljana, 2007, 306 str.
 - Varma, M. Morbidelli, Mathematical methods in chemical engineering, Oxford. Univ. Press, 1997, 690 str.
- (Opomba: v poštev pridejo le posamezni deli dopolnilnih učbenikov).

Cilji in kompetence:

Cilj predmeta je pridobiti nekatera nadaljnja znanja iz matematične analize in linearne algebre, ki so osnova za vsako visokošolsko strokovno izobraževanje v naravoslovju in tehniki.

Objectives and Competences:

The objective of the course is to acquire the knowledge of some further topics in mathematical analysis and in linear algebra. These topics are essential for every university-level course in science and technology.

Predvideni študijski rezultati:

Intended Learning Outcomes:

<u>Znanje in razumevanje</u> Študent se pri predmetu Matematika 2 seznani s temeljnimi matematičnimi pojmi in tehnikami, kot so višji odvodi in razvoji funkcij, diferencialne enačbe, matrike in sistemi enačb. Poznavanje teh poglavij je nujno potrebno za razumevanje drugih matematičnih in večine strokovnih predmetov.	<u>Knowledge and Comprehension</u> Some basic mathematical concepts and techniques, such as higher derivatives and series expansions, differential equations, matrices and linear systems, are introduced in the course. A good grasp of these concepts is necessary for understanding of further mathematical and of many other technical courses.
<u>Uporaba</u> Na predavanjih in vajah se uči matematičnega razmišljanja in strogosti, ter pridobiva praktično, delovno znanje obravnavanega področja.	<u>Application</u> During the lectures and classes students learn the mathematical approach and rigor. They acquire practical working knowledge of the field.
<u>Refleksija</u> Spoznanja o zmogljivostih in omejitvah posameznih metod računanja v praksi pomenijo osnovo za mnoge pomembne odločitve.	<u>Reflection</u> Understanding the power and the limitations of certain methods of calculation provides a ground for many important decisions.
<u>Prenosljive spretnosti</u> Razvoj induktivnega sklepanja, doslednosti natančnosti in logičnega razmišljanja je dobra osnova za naravoslovno tehniške predmete.	<u>Skill-transference Ability</u> Training of rigour, of punctuality and of disciplined logical thinking provides a solid basis for studying courses in science and technology.

Metode poučevanja in učenja:

Predavanja
Računske vaje

Learning and Teaching Methods:

Lectures
Classes

Delež (v %) /

Načini ocenjevanja:

Weight (in %) **Assessment:**

Kolokviji, pisni izpiti, ustni izpiti

Partial exams, written exam, oral exam.

Reference nosilca / Lecturer's references:

1. **SAKSIDA, Pavle.** On zero-curvature condition and Fourier analysis. *J. phys., A, Math. theor. (Print)*, 2011, vol. 44, no. 8, 085203 (19 str.). <http://dx.doi.org/10.1088/1751-8113/44/8/085203>. [COBISS.SI-ID [15909465](#)]
2. **SAKSIDA, Pavle.** Non-linear oscillators and solitons of Maxwell-Bloch equations. *Czechoslovak Journal of Physics*, 2006, vol. 56, no. 10-11, str. 1275-1280. <http://dx.doi.org/10.1007/s10582-006-0437-3>. [COBISS.SI-ID 14213721]
3. **SAKSIDA, Pavle.** Lattices of Neumann oscillators and Maxwell-Bloch equations. *Nonlinearity (Bristol)*, 2006, vol. 19, no. 3, str. 747-768. <http://dx.doi.org/10.1088/0951-7715/19/3/012>. [COBISS.SI-ID 13932377]

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet: MEDICINA DELA
Course Title: OCCUPATIONAL HEALTH

Študijski program in stopnja Study Programme and Level	Študijska smer Study Field	Letnik Academic Year	Semester Semester
UŠP Tehniška varnost, 1. stopnja	/	2.	4.
USP Technical Safety, 1 st Cycle	/	2 nd	4 th

Vrsta predmeta / Course Type

obvezni / Mandatory

Univerzitetna koda predmeta / University Course Code:

TV116

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje Work	Druge oblike študija	Samost. delo Individ. Work	ECTS
30	15	30 SV	/	/	75	5

Nosilec predmeta / Lecturer:

Izr. prof. dr. Alenka Franko / Dr. Alenka Franko, Associate Professor

Jeziki / Languages:

Predavanja / Lectures: Slovenski / Slovenian

Vaje / Tutorial: Slovenski / Slovenian

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:

Študent oz. kandidat mora imeti predmet opredeljen kot študijsko obveznost.

Prerequisites:

The course has to be assigned to the student.

Vsebina:

Predavanja:

1sklop: Zgodovina, organizacija, zakonodaja aktivnega zdravstvenega varstva zaposlenih. Naloge pooblaščenega zdravnika. Ocene tveganja – zdravstveni vidik. Obremenitev in obremenjenost v delovnem okolju. Preventivni zdravstveni pregledi. Kazalci negativnega zdravja. Bolniški stalež. Poškodbe pri delu. Poklicne bolezni. Invalidnost. Poklicna rehabilitacija. Ekonomski vidik poškodb pri delu.
 2. sklop: Veliki javno zdravstveni problemi. Ergonomija v aktivnem zdravstvenem varstvu zaposlenih. Utrujenost- praktični primer proučevanja. Telesna aktivnost. Etika v

Content (Syllabus Outline):

Lectures:

Section 1: History, organization, legislation of active healthcare for employees. Tasks of the authorized physician. Risk assessment – the medical perspective. Strain and stress in the work environment. Preventive medical examinations. Negative health indicators. Sick leave. Work-related injuries. Occupational diseases. Disability. Occupational rehabilitation. The financial aspect of work-related injuries.
 Section 2: Major problems in public healthcare. Ergonomics in the context of active healthcare for employees. Tiredness – a practical examination case. Physical activity. Ethics in active healthcare.

aktivnem zdravstvenem varstvu.

3. sklop: Analize delovnih mest z vidika poklicne orientacije in selekcije ter rehabilitacije. Uvod v industrijsko patologijo. Hrup in vibracije. Sevanje.

4. sklop: Promocija zdravja. Poklicne bolezni dihal. Poklicne bolezni kože. Plini pare in aerosoli.

5. Sklop: Epidemiologija delovnega okolja. Težke kovine. Pesticidi. Poklicni rak. Medicina prometa. Problematika alkohola in drog v delovnem okolju.

Seminarji: področje patologije dela in aktivnega zdravstvenega varstva zaposlenih oz. večjih zdravstvenih problemov v povezavi z delovnim okoljem. Vsak študent pripravi seminar določene dolžine in določenega števila literaturnih virov, ga odda v pisni obliki ter predstavi študentom

Teoretično in praktično usposabljanje iz osnov prve pomoči v delovnem okolju

Vaje: analiza kazalcev negativnega zdravja v konkretnem delovnem okolju (pojavnosti bolniškega staleža, poškodb pri delu ali invalidnosti po predlogi in z izdelavo predloga ustreznih ukrepov za zmanjševanje oz. odpravljanje kazalcev

Section 3: Analysis of workplaces from the perspective of occupational orientation as well as selection and rehabilitation. Introduction to industrial pathology. Noise and vibrations. Radiation.

Section 4: Promotion of health. Occupational diseases of the respiratory system. Occupational skin diseases. Gases, vapors and aerosols.

Section 5: Epidemiology of the work environment. Heavy metals. Pesticides. Occupational cancer. Traffic medicine. The issue of alcohol and other substances at the workplace.

Seminars: In labor pathology and active healthcare for employees or in major medical issues related to the workplace. Every student writes a paper with the specified number of words and number of references turns it in in writing and gives a presentation to other students.

Theoretical and practical instruction on the basics of first aid at the workplace

Practical work: Analysis of negative health indicators in a concrete work environment (incidence of sick leave, work-related injuries and disability) according to template; formulation of a proposal for appropriate measures to reduce or eliminate negative indicators.

Temeljna literatura in viri / Readings:

1. Bilban M. Medicina dela za študente tehniške varnosti, ZVD, Ljubljana 2005, 191 str. (80%)
- Additional literature:**
2. Bilban M. Medicina dela, ZVD, Ljubljana 1999, 605 str.
 3. Bilban M. Medicina dela za zdravnike družinske medicine, SZD – ZMDPŠ Ljubljana 2002, 227 str.
 4. Bilban M. Prva pomoč v delovnem okolju, ZVD, Ljubljana 2003, 201 str.
 5. Sušnik J. Ergonomska fiziologija, Didakta, 1992, 352 str.
 6. Šarić M. Žuškin E. Medicina rada i okoliša, Medicinska naklada, Zagreb 2002, 829 str.
 7. Vidaković A. Medicina rada, KCS – Institut za medicinu rada i radiološku zaštitu, Udruženje za medicinu rada Jugoslavije, Beograd 1996 in 1997

Cilji in kompetence:

Objectives and Competences:

Študent spozna:

- oblike in metode ter načine proučevanj tveganj na delu (obremenitve in škodljivosti), v prometu in športu (rekreaciji);
- vplive delovnega okolja na zmogljivosti posameznih organov in organskih sistemov ter človeka kot celote;
- vplive delovnega okolja na zdravje in delazmožnost (zdravstveni, pravno-upravni, tehnični, organizacijski vidik);
- obremenitve (ekološki monitoring) in zgodnje učinke obremenjenosti na zdravje in delazmožnost (biološki monitoring);
- vplive delovnega okolja na specifične kazalce negativnega zdravja posameznika ali skupine (epidemiološki monitoring);
- osnovne principe ocenjevanja začasne in trajne dela nezmožnosti ter poklicne orientacije, selekcije in rehabilitacije;
- osnove humanizacije dela oziroma ergonomije v najširšem smislu;
- osnove promocije zdravja v delovnem okolju;

The student will familiarize himself with:

- forms, methods and procedures used to research risks present at the workplace (causes of strain and harm), in traffic and in sports (recreation);
- how the work environment affects the capacities of various organs and organ systems, as well as the whole human being;
- how the work environment affects general health and ability to work (the medical, legal-administrative, technical, organizational aspects);
- types of strain (ecology monitoring) and early effects of stress on health and ability to work (bio monitoring);
- how the work environment affects specific negative health indicators of an individual or of a group (epidemiological monitoring);
- basic principles of assessment of temporary or permanent inability to work, as well as occupational orientation, selection and rehabilitation;
- basics of the humanization of labor or ergonomics in its broadest sense;
- Basics of health promotion in the work environment.

Predvideni študijski rezultati:

Znanje in razumevanje

- organizacija dela v medicini dela;
- praktične in teoretične oblike analiz delovnega okolja z zdravstvenega vidika;
- teoretski in praktični pristop k meritvam fizioloških funkcij v oceni delazmožnosti;
- principe in postopke preprečevanja poklicnih tveganj v delovnem okolju;
- osvoji vrednotenje ekološkega in biološkega monitoringa ter osnovne principe epidemiologije delovnega okolja;
- osvoji osnove izdelave ergonomskega nasveta, rešitve spoznavno – izvajalske ergonomije, ergonomije delovnega mesta in izdelka;
- osvoji načine in postopke izdelave celovite delovne anamneza (anamneza ekspozicije);
- osvoji osnove ocenjevanja začasne in trajne dela nezmožnosti, poklicne orientacije,

Intended Learning Outcomes:

Knowledge and Comprehension

- organization of work in occupational medicine;
- practical and theoretical forms of the analysis of the workplace from the medical perspective;
- theoretical and practical approach to the measurement of bodily functions in working ability assessment;
- principles and procedures of work-related risk mitigation at the workplace;
- evaluation of ecology and bio monitoring, as well as basic principles of epidemiology of the workplace;
- basics of ergonomic counseling, solutions presented by cognitive-organizational ergonomics as well as those presented by workplace and product ergonomics;
- methods and procedures of a complete workplace anamnesis (exposition anamnesis);
- basics of assessment of temporary and

<p>selekcije in rehabilitacije;</p> <ul style="list-style-type: none"> - spozna obremenitve, tveganja in zahteve posameznih oblik in kategorij vožnje; - osvoji osnovne oblike, metode in načine izvedbe različnih oblik promocije zdravja v delovnem okolju; - spozna zahteve in posebnosti rizičnih skupin delavcev; - spozna in zna vrednoti osnove tehničnega varstva pri delu... 	<p>permanent inability to work, basics of occupational orientation, selection and rehabilitation;</p> <ul style="list-style-type: none"> - strains, risks and demands of various types and categories of driving; - basic forms, methods and procedures of various types of health promotion at the workplace; - demands and special features of various groups of at-risk workers; - evaluation of basic of technical workplace safety ...
<p><u>Uporaba</u></p> <p>Varovanje in izboljšanje zdravja zaposlenih; Preprečevanje in obvladovanje poklicnih bolezni, poškodb pri delu... Odpravljanje poklicnih tveganj in pogojev dela, ki ogrožajo varnost in zdravje pri delu; Razvoj in napredek varstva pri delu, organizacije dela, pogojev dela... Izboljšanje poklicnega in socialnega statusa zaposlenih, fizičnega in materialnega statusa zaposlenih; Ohranjanje in razvoj delazmožnosti zaposlenih; Omogočanje socialno in ekonomsko produktivnega življenja...</p>	<p><u>Application</u></p> <p>Protection and improvement of employee health; prevention and management of occupational diseases, work-related injuries ...; mitigation of occupational hazards and working conditions that present a danger to occupational health and safety; development and advancement of occupational safety, work organization, work conditions ... improvement of the occupational, social, physical and material status of employees; protection and development of the employees' ability to work; fostering a socially and financially productive life ...</p>
<p><u>Refleksija</u></p> <p>Spoznati osnove in pomembnosti proučevanj tveganj in njihov vpliv na zmogljivosti človeka v celoti.</p>	<p><u>Reflection</u></p> <p>To know the basics and the importance of researching risks and the effect they have on a person's overall capacities.</p>
<p><u>Prenosljive spretnosti</u></p> <p>Sposobnost iskanja po medicinski literaturi, komuniciranja z zdravstvenimi delavci.</p>	<p><u>Skill-transference Ability</u></p> <p>Ability to search medical literature, communicate with healthcare workers.</p>

Metode poučevanja in učenja:

Predavanja
Vaje – obvezna prisotnost in sodelovanje, ter izdelava poročila o analizi izbranega kazalca negativnega zdravja
Seminarji – obvezna prisotnost, priprava seminarja, izvedba : ocena izdelka in predstavitev

Learning and Teaching Methods:

Lectures
Practical work – required attendance and participation, preparation of a report on the analysis carried out on the chosen negative health indicator
Seminars – required attendance, preparation of paper, execution: marks are given for the paper as well as presentation

Delež (v %) /

Načini ocenjevanja:

Weight (in %)

Assessment:

Pisni izpit esejskega tipa (10 vprašanj) 50 % ocene	50%	Written examination, essay type (10 questions): 50% of final grade Seminar paper: 50% of final grade
Seminarska naloga 50 % ocene	50%	

Reference nosilca / Lecturer's References:

1. GORIČAR, Katja, KOVAČ, Viljem, **FRANKO, Alenka**, DODIČ-FIKFAK, Metoda, DOLŽAN, Vita. Serum survivin levels and outcome of chemotherapy in patients with malignant mesothelioma. Disease markers, ISSN 1875-8630, 2015, vol. 2015, str. 1-8. <http://www.hindawi.com/journals/dm/2015/316739/>, doi: 10.1155/2015/316739. [COBISS.SI-ID 32176857], [JCR, SNIP, WoS do 24. 10. 2015: št. citatov (TC): 0, čistih citatov (CI): 0, Scopus do 10. 10. 2015: št. citatov (TC): 0, čistih citatov (CI): 0]
2. KOVAČ, Viljem, DODIČ-FIKFAK, Metoda, ARNERIĆ, Niko, DOLŽAN, Vita, **FRANKO, Alenka**. Fibulin-3 as a biomarker of response to treatment in malignant mesothelioma. Radiology and oncology, ISSN 1318-2099. [Print ed.], Sep. 2015, vol. 49, no. 3, str. 279-285, doi: 10.1515/raon-2015-0019. [COBISS.SI-ID 2427564], [JCR, SNIP, WoS do 19. 4. 2017: št. citatov (TC): 3, čistih citatov (CI): 2, Scopus do 30. 3. 2017: št. citatov (TC): 3, čistih citatov (CI): 2]
3. **FRANKO, Alenka**, DOLŽAN, Vita, ARNERIĆ, Niko, DODIČ-FIKFAK, Metoda. The influence of gene-gene and gene-environment interactions on the risk of asbestosis. BioMed research international, ISSN 2314-6141, 2013, vol. 2013. <http://www.hindawi.com/journals/bmri/2013/405743/>, doi: 10.1155/2013/405743. [COBISS.SI-ID 30775769], [JCR, SNIP, WoS do 3. 4. 2015: št. citatov (TC): 1, čistih citatov (CI): 1, Scopus do 3. 7. 2015: št. citatov (TC): 2, čistih citatov (CI): 2]
4. **FRANKO, Alenka**, DOLŽAN, Vita, KOVAČ, Viljem, ARNERIĆ, Niko, DODIČ-FIKFAK, Metoda. Soluble mesothelin-related peptides levels in patients with malignant mesothelioma. Disease markers, ISSN 0278-0240, 2012, vol. 32, no. 2, str. 123-131, doi: 10.3233/DMA-2011-0866. [COBISS.SI-ID 29611737], [JCR, SNIP, WoS do 19. 4. 2017: št. citatov (TC): 7, čistih citatov (CI): 4, Scopus do 25. 4. 2017: št. citatov (TC): 8, čistih citatov (CI): 5]
5. ERČULJ, Nina, KOVAČ, Viljem, HMELJAK, Julija, **FRANKO, Alenka**, DODIČ-FIKFAK, Metoda, DOLŽAN, Vita. DNA Repair Polymorphisms and Treatment Outcomes of Patients with Malignant Mesothelioma Treated with Gemcitabine-Platinum Combination Chemotherapy. Journal of thoracic oncology, ISSN 1556-0864, October 2012, vol. 7, no. 10, str. 1609-1617. [COBISS.SI-ID 512300345], [JCR, SNIP, WoS do 17. 11. 2016: št. citatov (TC): 6, čistih citatov (CI): 2, Scopus do 5. 2. 2016: št. citatov (TC): 7, čistih citatov (CI): 4]

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet:	MERITVE V DELOVNEM OKOLJU
Course Title:	MEASUREMENTS IN WORKING ENVIRONMENT

Študijski program in stopnja Study Programme and Level	Študijska smer Study Field	Letnik Academic Year	Semester Semester
UŠP Tehniška varnost, 1. stopnja	/	2.	4.
USP Technical Safety, 1 st Cycle	/	2 nd	4 th

Vrsta predmeta / Course Type izbirni / Elective

Univerzitetna koda predmeta / University Course Code: TV161

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje Work	Druge oblike študija	Samost. delo Individ. Work	ECTS
30	15	30 LV	/	/	75	5

Nosilec predmeta / Lecturer: Izr. prof. dr. Mitja Kolar/ Dr. Mitja Kolar, Associate Professor

Jeziki / Languages:

Predavanja / Lectures:	Slovenski / Slovenian
Vaje / Tutorial:	Slovenski / Slovenian

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:

Študent oz. kandidat mora imeti predmet opredeljen kot študijsko obveznost.

Prerequisites:

The course has to be assigned to the student.

Vsebina:

Snov predmeta meritve v delovnem okolju zajema teoretske osnove metod, s katerimi kvalitativno in kvantitativno ovrednotimo sestavo okoljskih vzorcev, ter tistih, ki omogočajo stalen monitoring delovnega okolja. Vključene so naslednje teme:

- Osnove analize kemije; ravnotežja v raztopinah.
- Klasifikacija analiznih metod, njihove značilnosti in omejitve
- Osnove elektrokemijskih metod, potenciometrija, voltometrija
- Elektrokemijski senzorji in detektorji.
- Osnove spektroskopskih analiznih metod: UV-VIS spektrofotometrija, atomska spektrometrija, IR spektroskopija in masna

Content (Syllabus Outline):

Content of the course contains theoretical background of methods for qualitative and quantitative analysis of environmental samples and monitoring of working environment. The following topics are included:

- Fundamentals of analytical chemistry, equilibria in solutions.
- Classification of analytical methods, their properties and limitations.
- Fundamentals of electroanalytical methods; potentiometry and voltammetry.
- Electrochemical sensors and detectors.
- Fundamentals of spectroscopic analytical methods; UV-VIS spectrophotometry, IR spectrometry, atomic spectrometry and mass spectrometry.

spektrometrija,

- Senzorji na osnovi spektroskopskih tehnik.
- Osnove kromatografskih tehnik; plinska in tekočinska kromatografija.
- Vzorčevanje plinskih, tekočih in trdnih vzorcev;
- Pregled metod za določanje in monitoring škodljivih snovi v vodah in trdnih vzorcih,
- Pregled metod za določanje in monitoring škodljivih snovi v delovnem okolju, kontinuirni merilniki onesnaževalcev, karakterizacija aerosolov, trdnih delcev, prahu,
- Vrednotenje analiznih rezultatov; napake zagotovitev kvalitete analiznega postopka.

VSEBINA SEMINARJA: Študent pripravi in predstavi seminarsko nalogo

VSEBINA VAJ:

- Primeri identifikacije nekaterih kationov in anionov v raztopinah in trdnih vzorcih (kisline, baze in njihove soli, identifikacija nekaterih pomembnih kationov in anionov, zlasti toksičnih kovin).
- Uporaba hitrih testov za določanje škodljivih snovi.
- Potenciometrija in ionoselektivne elektrode.
- Osnovne spektroskopske tehnike, (UV-VIS AAS).
- Pasivni vzorčevalniki (priprava in vrednotenje)

Primeri so izbrani tako, da slušatelji spoznavajo posamezne instrumentalne tehnike, potrebne aparature in rešujejo praktične probleme, ki so povezani z analitiko v delovnem okolju.

Eksperimentalne vaje potekajo individualno ali v skupinah z največ dvema študentoma pod mentorstvom učitelja ali asistenta.

- Sensors based on spectrometric techniques.
- Fundamentals of chromatographic techniques; gas and liquid chromatography.
- Sampling; gas liquid and solid samples.
- Survey of methods for determination and monitoring of hazardous compounds in water and solid samples.
- Survey of methods for determination and monitoring of hazardous compounds in working environment, continuous measuring devices. Characterization of aerosols, solid particles and dust.
- Evaluation of analytical data.

Seminar: Student prepares and present a selected problem related to the subject in front of a class.

Content of laboratory work:

- Identification of selected cations and anions in solutions and solid samples (acids, bases, salts).
- The use of analytical tests for identification and determination of hazardous compounds.
- Potentiometry and iono-selective electrodes.
- Basic spectroscopic methods (UV-VIS spectrometry, AAS).
- Passive samplers (preparation and evaluation).

Problems are selected with the aim that students gain knowledge on different instrumental techniques and get skills for practical analytical work. Experimental work is carried out in groups (2 students) or individually under guidance of teacher or assistant.

Temeljni literatura in viri / Readings:

- D. C. Harris Quantitative Chemical Analysis, (5th edition) W. H. Freeman N.Y, 2000, 899 str. (30%)
- Kebbekus, B. B., Mitra, S., 1998. Environmental Chemical Analysis, Blackie Academic & Professional, London, 330 str. (30%)

Dopolnilna literatura:

- Kirkwood, R. C., Longley, A. J., 1995. Clean Technology and the Environment, Blackie Academic & Professional, London, 350 str.
- McManus, N., 1998. Safety and Health in Confined Spaces, Lewis Publishers, 928 str.

Cilji in kompetence:

Pri predmetu meritve v delovnem okolju bo študent pridobili znanje o osnovah inštrumentalne analize kemije, sodobnih metodah monitoringa delovnega okolja ter pridobili znanja za evaluacijo analiznih podatkov. Seznanil se bo z nekaterimi pristopi k analizi značilnih realnih vzorcev na področju analize delovnega okolja, zlasti pa s tehnikami, ki omogočijo hitro enostavno in zanesljivo določanje škodljivih snovi.

Objectives and Competences:

Students will learn basic fundamentals of instrumental analytical chemistry, modern monitoring methods and evaluation of analytical data. They will become aware of some approaches in analysis of samples relevant for working environment, especially on techniques for fast, simple and reliable determination of hazardous compounds.

Predvideni študijski rezultati:**Znanje in razumevanje**

Študent bo pridobil osnovna teoretska in praktična znanja, ki so potrebna za razumevanje inštrumentalnih analiznih postopkov, ki jih strokovnjak s področja varstva pri delu in požarnega varstva nujno potrebuje pri vsakodnevni odločitvi in so temeljni pogoj za kompetentno odločanje. Prav tako bodo sposobni kritično presoditi zmogljivosti nekaterih analiznih metod ter ustrezno obravnavati rezultate kemijskih analiz. Razen teoretskih temeljev bodo pridobili tudi praktična znanja.

Uporaba

Predmet je usmerjen v razumevanje in prepoznavanje možnosti reševanja praktičnih problemov, kar je nujno pri vsakodnevni odločitvi in uporabi analiznih podatkov. Pri predmetu bodo študentje pridobili tudi praktična znanja, ki jim bodo omogočala izvedbo preprostejših analiznih postopkov in monitoringa, npr. meritve na terenu.

Refleksija

Spoznanja o uporabnosti in omejitvah posameznih metod merjenja v praksi pomenijo osnovo za odločitve pri analizi delovnega okolja.

Prenosljive spretnosti

Pri predmetu bo študent pridobil laboratorijske spretnosti, znal bo uporabljati literaturne podatke, izvajati meritve, eksperimentalne podatke bo znal ustrezno obdelati ter primerno interpretirati.

Intended Learning Outcomes:**Knowledge and Comprehension**

Students will learn the principles of most important instrumental techniques. This knowledge is necessary for experts of technical safety and fire protection in their professional activities. They will be also informed about capabilities and limitations of selected analytical methods and will be able to evaluate analytical results. Besides theoretical knowledge they will get also some practical experiences.

Application

Students will be informed on some possibilities for solving practical analytical problems and critical evaluation of results of measurements. Practical experiences and skills will enable to perform simple analytical procedures and field monitoring (e.g. field measurements).

Reflection

Awareness of applicability and limitations of measuring methods in practice is important for decisions regarding evaluation of working environment.

Skill-transference Ability

Students will gain skills for laboratory work, they will be able to use and understand relevant literature, to perform simple measurements as well as they will be able to handle experimental data.

Metode poučevanja in učenja:

Predavanja
Laboratorijske vaje

Learning and Teaching Methods:

Lectures
Experimental work in the laboratory

Delež (v %) /

Načini ocenjevanja:

Weight (in %)

Assessment:

Izpit pisni in ustni. Ocene: 6-10 pozitivno Vaje: Opravljen kolokvij. Pri vajah predstavlja delež ocene tudi uspešno laboratorijsko delo (1/3).	70% 30%	Written test and oral examination Marks 6-10 Successful experimental (Laboratory) work, and test
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Reference nosilca / Lecturer's References:

- PIVEC, Tanja, HRIBERNIK, Silvo, **KOLAR, Mitja**, STANA-KLEINSCHEK, Karin. Environmentally friendly procedure for in-situ coating of regenerated cellulose fibres with silver nanoparticles. Carbohydrate polymers, ISSN 0144-8617. [Print ed.], 2017, vol. 163, str. 92-100, ilustr. <http://www.sciencedirect.com/science/article/pii/S0144861717300711>, doi: 10.1016/j.carbpol.2017.01.060. [COBISS.SI-ID 20172822], [JCR, SNIP, WoS do 18. 4. 2017: št. citatov (TC): 0, čistih citatov (CI): 0, Scopus do 2. 2. 2017: št. citatov (TC): 0, čistih citatov (CI): 0]
- STAVBAR, Severina, KNEZ HRNČIČ, Maša, PREMZL, Katarina, **KOLAR, Mitja**, ŠOSTAR-TURK, Sonja. Sub- and super-critical water oxidation of wastewater containing amoxicillin and ciprofloxacin. The Journal of supercritical fluids, ISSN 0896-8446. [Print ed.], 2017, vol. 128, str. 73-78, doi: 10.1016/j.supflu.2017.05.013. [COBISS.SI-ID 20595990], [JCR, SNIP, Scopus do 3. 6. 2017: št. citatov (TC): 0, čistih citatov (CI): 0]
- KOLAR, Amadeja, PALJEVAC, Muzafera, CMAGER, Nuša, ISKRA, Jernej, **KOLAR, Mitja**, KRAJNC, Peter. Poly(4-vinylpyridine) polyHIPEs as catalysts for cycloaddition click reaction. Polymer, ISSN 0032-3861. [Print ed.], Available online 22 April 2017, str. 1-4, doi: 10.1016/j.polymer.2017.04.051. [COBISS.SI-ID 20537622], [JCR, SNIP, Scopus do 10. 5. 2017: št. citatov (TC): 0, čistih citatov (CI): 0]
- IVANOVIĆ, Milena, ISLAMČEVIĆ RAZBORŠEK, Maša, **KOLAR, Mitja**. Simultaneous GC-MS determination of free and bound phenolic acids in Slovenian red wines and chemometric characterization. Acta chimica slovenica, ISSN 1318-0207, 2016, vol. 63, no. 3, str. 661-669. <https://journals.matheo.si/index.php/ACSi/article/view/2534>, doi: 10.17344/acsi.2016.2534. [COBISS.SI-ID 19728662], [JCR, SNIP, WoS do 16. 12. 2016: št. citatov (TC): 0, čistih citatov (CI): 0, Scopus do 25. 9. 2016: št. citatov (TC): 0, čistih citatov (CI): 0]
- BRGLEZ, Polonca, HOLOBAR, Andrej, PIVEC, Aleksandra, **KOLAR, Mitja**. Spin-coating for optical-oxygen-sensor preparation = Uporaba spinskega nanosa pri izdelavi optičnih senzorjev za kisik. Materiali in tehnologije, ISSN 1580-2949. [Tiskana izd.], mar.-apr. 2014, letn. 48, št. 2, str. 181-188. [COBISS.SI-ID 17746454], [JCR, SNIP, WoS do 27. 8. 2015: št. citatov (TC): 0, čistih citatov (CI): 0, Scopus do 27. 5. 2017: št. citatov (TC): 1, čistih citatov (CI): 1]

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet:	NEVARNE SNOVI
Course Title:	DANGEROUS SUBSTANCES

Študijski program in stopnja Study Programme and Level	Študijska smer Study Field	Letnik Academic Year	Semester Semester
UŠP Tehniška varnost, 1. stopnja	/	3.	5.
USP Technical Safety, 1 st Cycle	/	3 rd	5 th

Vrsta predmeta / Course Type obvezni / Mandatory

Univerzitetna koda predmeta / University Course Code: TV113

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje work	Druge oblike študija	Samost. delo Individ. work	ECTS
45	/	30 LV	/	/	75	5

Nosilec predmeta / Lecturer: Doc. dr. Barbara Novosel /
Dr. Barbara Novosel, Assistant Professor

Jeziki / Languages: Predavanja / Lectures: Slovenski / Slovenian
Vaje / Tutorial: Slovenski / Slovenian

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:

Študent oz. kandidat mora imeti predmet opredeljen kot študijsko obveznost.

Prerequisites:

The course has to be assigned to the student.

Vsebina:

UVOD: V uvodnem delu se seznanijo z različnimi definicijami nevarnih snovi, slovensko zakonodajo (usklajeno z direktivami EU na tem področju), z osnovnimi fizikalno-kemijskimi lastnostimi, razvrščanjem in označevanjem nevarnih snovi ter z vsebino varnostnega lista.
EKSPLOZIVNE SNOVI: definicije parametrov in različne vrste eksplozij (eksplozije, prašne in plinske eksplozije, spodnja in zgornja eksplozijska meja)
VNETLJIVE TEKOČINE IN TRDNE SNOVI: vnetljive tekočine in trdne snovi, trdne snovi, ki pri stiku z vodo sproščajo gorljive pline. Pogoji za nastanek neželenega dogodka (viri vžiga,

Content (Syllabus Outline):

INTRODUCTION : In the introductory part, the student learns about different definitions of hazardous substances, Slovenian legislation (harmonized with EU directives in this area), the basic physico- chemical properties, classification and labeling of dangerous substances and the content of the material safety data sheet .
EXPLOSIVES : definition of parameters and different types of explosions (explosions , dust and gas explosion, upper and lower explosion limit).
FLAMMABLE LIQUID AND SOLID: flammable liquids and solids , solids that in contact with water emit flammable gases . Conditions for the unlikely event (ignition sources, vapor

koncentracija hlapov, koncentracija oksidanta).
Nevarnosti, ki jo posamezne snovi predstavljajo, BLEVE efekt.

OKSIDATIVNE SNOVI: dinamika reakcijskih sistemov oksidant-reducent, sprememba reakcijske hitrosti zaradi prisotnosti oksidativnih snovi, razdelitev in spoznavanje nekaterih najpogosteje uporabljenih snovi. Skladiščenje/hranjenje snovi, pri katerih lahko potekajo kemijske spremembe, ki vodijo do nastanka oksidativnih snovi.

STRUPI: osnove toksikologije, načini vstopa v telo, delovanje in škodljivi učinki, dejavniki, ki vplivajo na nastanek škodljivih učinkov (MV, KTV, BAT, TDK, ALARA)

RADIOAKTIVNE SNOVI: nestabilni izotopi, vrste radioaktivnega razpada, škodljivi učinki in način zaščite

JEDKE SNOVI: razdelitev, pH, pravilno ravnanje z jedkimi snovmi in raztopinami, škodljivi učinki kislin in baz, delovanje in ukrepanje ob poškodbah, dodatne nevarnosti organskih kislin

PLINI: nevarnosti, načini shranjevanja plinov v tlačnih posodah, pravilna uporaba plinov

PREVOZ NEVARNEGA BLAGA: osnovna pravila varnega prevoza nevarnega blaga

SKLADIŠČENJE NEVARNIH SNOVI: sistem skladiščenja nevarnih snovi in pripravkov po nemškem modelu.

Za ilustracijo posameznih tem predavanj so pripravljene računske naloge s področij eksplozivov, prašnih in plinskih eksplozij, vnetljivih tekočin, strupov, oksidativnih in jedkih snovi ter plinov.

Pri vajah se študent spozna z označevanjem kemikalij v skladu z zahtevami zakonodaje, določevanjem nekaterih snovnih lastnosti (tališče, plamenišče), z gorljivimi prahovi, vnetljivimi, eksplozivnimi, jedkimi in strupenimi snovmi, problemi preseganja mejnih vrednosti omenjenih snovi in ukrepanji. Spoznajo se z različnimi načini shranjevanja plinov v tlačne posode, pravilnim ravnanjem s plini (namestitvev tlačne posode, odvzem in

concentration, concentration of oxidant) .

Dangers caused by different substances present , BLEVE effect.

OXIDISERS : Dynamics of reaction systems oxidant - reductant , the change rate of the reaction due to the presence of oxidising agents, familiarization and introduction to most commonly used substances.

Warehousing/storage of materials where chemical changes can lead to the formation of oxidising agents .

TOXIC: the basics of toxicology, route of entry into the body , function and adverse effects , factors that influence the formation of harmful effects (TWA , STEL , BAT , TDK , ALARA)

RADIOACTIVE MATERIALS : unstable isotopes , types of radioactive decay , adverse effects and mode of protection.

CORROSIVES: distribution , pH, proper handling of corrosive substances and solutions, adverse effects of acids and bases , function and response to injury , additional hazards of organic acids.

GASES: compressed, liquefied, refrigerated liquefied and dissolved gases, safe handling of gases.

TRANSPORT OF DANGEROUS GOODS: basic rules of safe transport of dangerous goods

STORAGE OF HAZARDOUS MATERIALS: a system of mixed storage of dangerous substances and preparations.

During the tutorial , the student learns the labeling of chemicals in accordance with the law requirements, the determination of certain material properties (melting point , flash point) , combustible dusts, flammable , explosive , corrosive and toxic substances , problems exceeding the substances limit values and activities. Understanding of different ways of storing gas in pressure vessels , proper handling of gases (pressure vessel installation , removal and distribution of gas) , marking cylinders and determine the danger. Research through various electronic media to seek information on hazardous substances and prepare safety data sheet or summary of the most important

distribucija plinov), označevanjem jeklenk in določijo nevarnosti. Po različnih elektronskih medijih poiščejo podatke o nevarni snovi in pripravijo varnostni list ali povzetek najpomembnejših nevarnosti, zahtev in opozoril iz varnostnega lista (safety card, navodila za varno delo s kemikalijo).

threats , demands and warned of the safety data sheet (safety card).

Temeljni literatura in viri / Readings:

- Burke R.: Hazardous materials chemistry for emergency responders , 3rd Ed., CRC Press, Boca Raton, 2013., 527 str. (30%)
- Brauer, R.L.: Safety and health for engineers, 3rd Ed., Wiley, cop. Hoboken (New Jersey), 2016, 765 str. (30%)
- Carson P.A., Mumford C.J.: Hazardous Chemicals Handbook, Butterworth-Heinemann Ltd, Oxford 1994, 378 str., (20%)

Dopolnilna literatura:

- Carson P.A., Mumford C.J.: The Safe Handling of Chemicals in Industry, Vol. 1 and Vol. 2, Longman Scientific & Technical, New York 1988, 1089 str.,
- Različne elektronske baze podatkov o nevarnih snoveh in pripravkih (Merck, IUCLID, baze na medmrežju)

Cilji in kompetence:

Pri predmetu se študent seznanja s področjem nevarnih snovi. Spozna obseg, razdelitev nevarnih snovi in veljavno zakonodajo na tem področju. Poznavanje in razumevanje fizikalno-kemijskih lastnosti in pogojev v sistemu omogoča prepoznavanje in oceno nevarnosti snovi.

Pri posameznih skupinah nevarnih snovi se poudarjajo nevarnosti, pogoji potrebni za nastanek neželenega dogodka in spremenljivke, ki vplivajo na potek dogodka. Praktične vaje in računske naloge dodatno pojasnjujejo nekatere definicije in omogočajo podrobnejši pregled in obseg posameznih skupin nevarnih snovi.

Objectives and Competences:

The course student is introduced to the field of hazardous substances. The student gets knowledge about the extent, the classification of hazardous substances and the valid legislation in this area. Knowledge and understanding of the physico-chemical properties and conditions in the system enable the identification and assessment of hazards of substances. At different groups of hazardous substances the dangers shall be stressed the importance of danger conditions necessary for the formation of an undesirable event and the variables through which the course of the event is effected. Practical exercises and computational tasks further clarify some definitions and enable a more detailed overview and the extent of particular categories of dangerous substances.

Predvideni študijski rezultati:

Znanje in razumevanje

Pridobljeno znanje usposobi študenta za razumevanje in presojanje področja nevarnih snovi pri drugih predmetih ter za praktično delo z nevarnimi snovmi in pripravki na

Intended Learning Outcomes:

Knowledge and Comprehension

Knowledge gained prepares students to understand and assess the areas of hazardous materials in other subjects as well as for practical work with dangerous substances and

delovnem mestu v različnih panogah.	preparations at the workplace in a variety of industries.
<u>Uporaba</u> Teoretska in praktična znanja bo lahko študent uporabil pri zagotavljanju varnosti in zdravja pri transportu, skladiščenju ali uporabi nevarnih kemikalij v različnih dejavnostih.	<u>Application</u> Students can use theoretical and practical knowledge to ensure health and safety at transport, storage or use of dangerous chemicals in various industries.
<u>Refleksija</u> Kritično bo lahko primerjal teoretska znanja s stanjem na področju nevarnih snovi v realnem svetu.	<u>Reflection</u> The student will be able to critically assess theoretical knowledge in comparison to the situation in the field of hazardous substances in the real world.
<u>Prenosljive spretnosti</u> Pridobljena znanja bo lahko uporabljal pri zagotavljanju varnosti in zdravja v kompleksnejših primerih kot so gorenje in dinamika požarov, kemijski procesni varnosti, varstvu okolja in medicini dela.	<u>Skill-transference Ability</u> Students will be able to use the acquired knowledge to ensure health and safety in more complex cases such as burning and fire dynamics, chemical process safety, environmental safety and occupational medicine.

Metode poučevanja in učenja:

Predavanja
Laboratorijske vaje

Learning and Teaching Methods:

Lectures
Laboratory exercises

Delež (v %) /

Načini ocenjevanja:

Weight (in %)

Assessment:

pisni izpit, ustno izpraševanje, naloge		Written exam Oral exam
Izpit pisni in ustni. Ocene: 6-10 pozitivno	70%	
Vaje: Opravljene vaje. Delež ocene predstavlja tudi uspešno laboratorijsko delo (1/3).	30%	

Reference nosilca / Lecturer's References:

1. GENORIO, Boštjan, LU, Wei, DIMIEV, Ayrat M., ZHU, Yu, RAJI, Abdul-Rahman O., NOVOSEL, Barbara, ALEMANY, Lawrence B., TOUR, James M. In-situ intercalation replacement and selective functionalization of graphene nanoribbon stacks. *ACS nano*, 2012, vol. 6, no. 5, str. 4231-4240, doi: [10.1021/nn300757t](https://doi.org/10.1021/nn300757t). [COBISS.SI-ID 35878405]
2. GENORIO, Boštjan, PENG, Zhiwei, LU, Wei, PRICE HOELSCHER, B. Katherine, NOVOSEL, Barbara, TOUR, James M. Synthesis of dispersible ferromagnetic graphene nanoribbon stacks with enhanced electrical percolation properties in a magnetic field. *ACS nano*, 2012, vol. 6, no. 11, str. 10396-10404, doi: [10.1021/nn304509c](https://doi.org/10.1021/nn304509c). [COBISS.SI-ID 36326405]
3. TRATAR-PIRC, Elizabeta, NOVOSEL, Barbara, BUKOVEC, Peter. Comparison of GC and OxiTop analysis of biogas composition produced by anaerobic digestion of glucose in cyanide inhibited systems. *Acta chim. slov.* [Tiskana izd.], 2012, vol. 59, no. 2, str. 398-404. <http://acta.chem-soc.si/59/59-2-398.pdf>. [COBISS.SI-ID 36027653]

UL
EFK

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet:	NUMERIČNA IN RAČUNALNIŠKA ORODJA V VARNOSTI
Course Title:	NUMERICAL AND COMPUTER TOOLS IN SAFETY

Študijski program in stopnja Study Programme and Level	Študijska smer Study Field	Letnik Academic Year	Semester Semester
UŠP Tehniška varnost, 1. stopnja	/	2.	3.
USP Technical Safety, 1 st Cycle	/	2 nd	3 rd

Vrsta predmeta / Course Type

obvezni / Mandatory

Univerzitetna koda predmeta / University Course Code: TV108

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje Work	Druge oblike študija	Samost. delo Individ. Work	ECTS
45	15	15 LV	/	/	75	5

Nosilec predmeta / Lecturer: prof. dr. Jurij Reščič / Dr. Jurij Reščič, Full Professor

Jeziki / Languages:

Predavanja / Lectures: Slovenski / Slovenian

Vaje / Tutorial: Slovenski / Slovenian

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:

Prerequisites:

Študent oz. kandidat mora imeti predmet opredeljen kot študijsko obveznost.

The course has to be assigned to the student.

Vsebina:

Snov predmeta zajema osnovna znanja iz računalništva informatike, numeričnih metod in aplikacijo teh znanj na področje varnosti in požarne varnosti.

- Računalništvo: računalnik in zunanje enote, osnovna programska oprema, varno delo z računalniki, operacijski sistemi, urejanje teksta, omrežja in povezave, osnove informacijske tehnologije.
- Numerične metode reševanja problemov iz področja varnosti, napake, reševanje sistema linearnih enačb, numerično integriranje, numerično odvajanje, interpolacija, iskanje minimumov in maksimumov funkcij.
- Programski jezik (Fortran): operacije in osnovne funkcije, deklaracijski ukazi, vhodno-izhodni ukazi, zanke, formatiranje,

Content (Syllabus Outline):

The course covers basics knowledge of numerical methods and informatics with application to the technical safety area.

- Computer and peripherals; basic software: operating system and applications; networks; web-based services
- Numerical methods with application to technical safety: system of linear equations; numerical integration, numerical differentiation, interpolation, solutions of nonlinear equations, optimization (golden ratio search)
- Basics of high-level programming language Fortran: intrinsic functions, declaration statements, input-output commands, formatting, file types, loops,

funkcije, podprogrami, lokalne in globalne spremenljivke, vrste datotek, čitanje in shranjevanje podatkov, polja.

VSEBINA VAJ :

Laboratorijske vaje v računalniški učilnici, praktično delo na računalniku, osnovna programerska praksa (numerično reševanje problemov s Fortranom in kjer je možno, tudi z Excelom), uporaba nekaterih aplikativnih programov.

conditional statements, arrays.

Lab course: practical work with computers, use of Excel and Fortran to solve numerical problems, use of selected applications.

Temeljni literatura in viri / Readings:

- Petrišič J., Numerično reševanje enačb, FS, Ljubljana 1996, (15%)
- Bohte Z., Numerične metode, IMFM, Ljubljana 1987, (15%)
- Petrišič J., Fortran, FS, Ljubljana 1994, (15%)
- Atkinson K., Han W., Elementary Numerical Analysis, 3rd Edition, JW, 2003 (10%)
- E. Joseph Billo, Excel for Chemists 2nd ed., Wiley, New York 2001. (10%)
- Kreyszig E., Advanced engineering mathematics, 9th edition, JW. 2006, (5%)

Dopolnilna literatura:

REŠČIČ, Jurij, URBIČ, Tomaž. Numerične metode - praktikum. 1. izd. Ljubljana: Fakulteta za kemijo in kemijsko tehnologijo, 2015.

Cilji in kompetence:

Študent se bo naučil računskih metod pri reševanju problemov, podprtih z računalniškim programiranjem in uporabo računalniških aplikacij.

Objectives and competences:

A student will acquire knowledge for solving numerical problems with the help from commercial software applications and from programs designed by her/his own.

Predvideni študijski rezultati:

Znanje in razumevanje

Študent bo pridobil znanje s področja računalništva, numeričnih metod in informatike. Naučil se bo razumevati prehod iz teoretičnega matematičnega modela v uporabno obliko, ki jo je mogoče računati s približnimi metodami. Pri tem se bo naučil uporabljati računalnik in programska orodja.

Uporaba

Matematične metode v varnosti so usmerjene v pridobitev temeljnih orodij za matematično računski del obravnave, pojasnjevanja in reševanja inženirskih problemov povezanih z znanji iz področja varnosti, delovnega okolja in požarne varnosti.

Intended Learning Outcomes:

Knowledge and Comprehension

A student will acquire basic knowledge about computers, numerical methods and informatics. She/he will understand transition of theoretical mathematical model into applicable form ready to be solved numerically using computers.

Application

Mathematical methods in security are focused on the acquisition of basic tools for numerical part of analysis, interpretation, and solving engineering problems in the field of safety, working environment and fire safety.

<u>Refleksija</u> Spoznanja o zmogljivostih in omejitvah posameznih metod v praksi, zlasti o omejenosti rezultatov, pomenijo osnovo za kritično presojanje izračunov.	<u>Reflection</u> Knowledge of the capabilities and limitations of each method in practice constitute the basis for a critical interpretation of the calculations.
<u>Prenosljive spretnosti</u> Uporaba računalnika in osnovne programske opreme (Word, Excel, Powerpoint) programiranje (Fortran), uporaba aplikativnih programov (ODE architect itd.).	<u>Skill-transference Ability</u> Use of a computer and common software application (e.g. Microsoft Office) as well as selected applications (ODE Architect etc.), basics of programming in Fortran.

Metode poučevanja in učenja:

Predavanja
Laboratorijske vaje v računalniški učilnici
Seminar

Learning and teaching methods:

Lectures, seminar, and lab course.

Načini ocenjevanja:

Pisni izpit.

Dva pisna kolokvija (eden sredi semestra, drugi ob koncu); povprečna ocena kolokvijev nad 60% nadomesti pisni izpit.

Delež (v %) /
Weight (in %)

100%

Assessment:

Written exam.

Two partial tests during the semester with total average of 60% or more can replace the written exam.

Reference nosilca / Lecturer's References:

1. eden izmed soavtorjev računalniškega programa MOLSIM za simulacije molekularnih sistemov (avtor je prof. Per Linse, Univerza v Lundu, Švedska)
2. **REŠČIČ, Jurij**, VLACHY, Vojko, HAYMET, A. D. J. Highly asymmetric electrolytes: beyond the hypernetted chain integral equation. *J. Am. Chem. Soc.*, **1990**, vol. 112, no. 9, str. 3398-3401.
3. **REŠČIČ, Jurij**, LINSE, Per. Potential of mean force between charged colloids : effect of dielectric discontinuities. *J. Chem. Phys.*, **2008**, vol. 129, no. 11, art. no. 114505.
4. BOHINC, Klemen, **REŠČIČ, Jurij**, MASET, Stefano, MAY, Sylvio. Debye-Hückel theory for mixtures of rigid rodlike ions and salt. *The Journal of chemical physics*, **2011**, vol. 134, no. 7, str. 074111-1-074111-9

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet: ODKRIVANJE IN GAŠENJE POŽAROV
Course Title: FIRE DETECTION AND SUPPRESSION

Študijski program in stopnja Study Programme and Level	Študijska smer Study field	Letnik Academic Year	Semester Semester
UŠP Tehniška varnost, 1. stopnja	/	3.	6.
USP Technical Safety, 1 st Cycle	/	3 rd	6 th

Vrsta predmeta / Course Type

obvezni / Mandatory

Univerzitetna koda predmeta / University Course Code:

TV122

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje Work	Druge oblike študija Other forms of study	Samost. delo Individ. Work	ECTS
45	/	30 SV	/	/	75	5

**Nosilec predmeta /
Lecturer:**

Izr. prof. dr. Simon Schnabl / Dr. Simon Schnabl, Associate Professor

Jeziki / Languages:

Predavanja / Lectures: Slovenski / Slovenian

Vaje / Tutorial: Slovenski / Slovenian

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:

Študent oz. kandidat mora imeti predmet opredeljen kot študijsko obveznost.

Prerequisites:

The course has to be assigned to the student.

Vsebina:

- Sistemi in naprave za odkrivanje in javljanje požara
 - vrste
 - sestavni deli in lastnosti
 - preskušanje, nadzor in vzdrževanje
- Sistemi in naprave za prenos signala in alarmiranje
 - vrste
 - sestavni deli in lastnosti
 - preskušanje, nadzor in vzdrževanje
- Sistemi in naprave za kontrolo dima pri požaru
 - nastajanje dima pri požaru
 - načini kontrole dima
 - odvod z naravnim prezračevanjem (elementi, dimenzioniranje in izvedba)

Content (Syllabus Outline):

- Fire detection systems and devices
 - types
 - design and characteristics
 - testing, control and maintenance
- Fire notification system
 - types
 - design and characteristics
 - testing, control and maintenance
- Smoke and heat control system in the case of fire
 - smoke production
 - types of smoke control
 - natural smoke control by ventilation (elements, design and implementation)
 - mechanical smoke control by forced ventilation (elements, design and

- d. odvod s prisilnim prezračevanjem (elementi, dimenzioniranje in izvedba)
4. Gašenje
 - a. mehanizmi gašenja
 - b. sredstva za gašenje (voda, pena, prah, inertni plini, haloni)
 - c. principi gašenja požarov, če gori plini, tekočine in trdne snovi
 5. Gozdni požari: preventivne, pravočasno zaznavanje in organizacija gašenja ter gašenje.
 6. Prenosne naprave in oprema za gašenje
 - a. ročni gasilniki (vrste, področje uporabe in dimenzioniranje)
 - b. prevozni gasilniki (vrste, področje uporabe in dimenzioniranje)
 - c. cevi in nastavki za gašenje (vrste, dimenzije spojke)
 - d. priročna oprema za gašenje
 7. Notranja in zunanja hidrantna mreža in oskrba z vodo
 - a. vrste, sestavni deli
 8. Oskrba z vodo za gašenje
 - a. viri vode, dimenzioniranje, izvedba črpalšč za vodo za gašenje (bazeni, jezera, tekoče vode)
 9. Sprinklerski sistemi
 - a. vrste, sestavni deli
 10. Drugi vgrajeni sistemi za gašenje z vodo
 - a. vrste, sestavni deli
 11. Vgrajeni sistemi za gašenje s peno
 - a. vrste, sestavni deli
 12. Vgrajeni sistemi za gašenje s plini
 - a. vrste, sestavni deli

- implementation)
4. Fire suppression
 - a. suppression mechanisms
 - b. Suppression agents (water, foam, powder, inert gases , halons)
 - c. Principles of fire fighting in the case of burning gases, liquids and solids
 5. Forest fires: prevention, timely detection, organization of fire-fighting and fire-fighting.
 6. Portable and movable fire extinguishers
 - a. hand-held fire extinguishers (type , scope and design)
 - b. movable fire extinguishers (type, scope and design)
 - c. hoses and nozzles for fire-fighting (type , dimensions of couplings)
 - d. handy equipment for fire-fighting
 7. Indoor and outdoor hydrant network and water supply
 - a. types, components
 8. Water supply for extinguishing fires
 - a. water resources, design, construction of pumping stations for fire-fighting water (pools, lakes, rivers and brooks)
 9. Fire sprinkler systems
 - a. types, components
 10. Other installed water fire suppression systems
 - a. types, components
 11. Foam fire suppression systems
 - a. types, components
 12. Gas fire suppression systems
 - a. types, components

Temeljni literatura in viri / Readings:

- R.Gagnon; Design of Water-Based Fire Protection Systems, 1997, 458 str. (30%)
- DiNenno P.J., The SFPE Handbook of Fire Protection Engineering, National Fire Protection Engineers, Third Edition, ISBN: 087765-451-4, 2002.(15 %)
- Drysdale, D., An Introduction to Fire Dynamics, 2nd edition, Wiley and Sons, 1998, 451 str. (30%)
- Omi N.P., Forest Fire contemporary world issues, ABC-CLIO's, ISBN 1-85109-443-1, 2005. (15%)
- Ferguson L.H.,Janicak C.A., Fundamentals of Fire Protection for the Safety Professional, The Scarecrow Press, Inc., ISBN 0-86587-988-5, 2005. (15 %)

Dopolnilna literatura:

- Cowley J., Fire Safety at Sea, IMAREST, ISBN 1-902536-42-8, 2002.

- Cote A.E., Fire protection Handbook, National Fire Protection Association, ISBN: 0-87765-474-3, 2003.
- Schroll R.C., Industrial Fire Protection Handbook, Second Edition, CRC Press, ISBN 1-58716-058-7, 2003.
- Karlsson B., Quintiere J.G., Enclosure Fire Dynamics, CRC Press, 2000.
- Cox G., Combustion Fundamentals of Fire, Academic Press Limited, 1996.
- Turns S.R., An Introduction to Combustion Concepts and Application, Third Edition, McGrawHill 2012, ISBN 978-007-108687-5.
- Furness A., Muckett M., Introduction to Fire Safety Management, Elsevier Ltd., ISBN: 978 0 7506 8068 4, 2007.
- Marc J. Assael M.J., Kakosimos K.E., FIRES, EXPLOSIONS, AND TOXIC GAS DISPERSIONS Effects Calculation and Risk Analysis, CRC Press Taylor and Francis Group, ISBN: 978-1-4398-2675-1, 2010.
- NFPA predpisi
- Smernice SZPV

Cilji in kompetence:

Pri predmetu študenti spoznajo osnovne operacije odkrivanja, javljanja in gašenja požarov. Srečajo se z opremo, njeno vgradnjo, zanesljivostjo itd. Glede na produkte gorenja spoznajo sisteme za odkrivanje požarov, srečajo pa se tudi z posameznimi vrstami prenosnih, prevoznih in vgrajenih naprav za gašenje. (Namen predmeta je dati študentu osnovna znanja, ki bodo predvsem v drugostopenjskem študiju vsaj delno podkrepljena tudi s praktičnimi primeri.)

Objectives and Competences:

In this course students learn the basic operations of detection, fire alarm and fire extinguishing, they learned about the equipment, its installation and reliability, etc.. Depending on the products of combustion, different fire detection systems and individual types of portable, mobile and suppression systems for fire extinguishing are introduced. (The purpose of the course is to give students the basic skills, which will be supported at the second level with practical examples.)

Predvideni študijski rezultati:

Znanje in razumevanje
Študentje naj bi pridobil osnovna teoretska in praktična znanja, ki so potrebna za razumevanje procesov odkrivanja, javljanja in alarmiranja požarov ter gašenja in vpliva posameznih vrst gasil na razvoj požara.

Uporaba
Študent bo spoznal osnove aktivne požarne zaščite, osnove gašenja in vpliva teh komponent na razvoj požara v objektu.

Refleksija
Spoznanja o zmogljivostih in omejitvah posameznih metod v praksi omogočajo kitično obnašanje pri praktičnem delu.

Intended Learning Outcomes:

Knowledge and Comprehension
Students should acquire basic theoretical and practical knowledge necessary for understanding the processes of fire detection, fire alarm and fire-extinguishing. They should be aware on the impact of certain types of fire suppression agents on fire development.

Application
Student will learn the basics of active fire protection, basic concepts of fire-fighting and the impact of these factors on the development of a fire in the building.

Reflection
Knowledge of the capabilities and limitations of each method in practice allow the critical behavior in practical work.

Prenosljive spretnosti

Pri predmetu bo študent pridobil osnovna znanja, uporabna tudi na drugih področjih in pri drugih predmetih: Osnove tehniške in požarne varnosti, Fizika, Kemija, Matematika, Gorenje in dinamika požarov, Osnove procesne tehnike, Nevarne snovi, Varstvo okolja, Požarna varnost v objektih, Intervencije in reševanje, Požarni praktikum in Inženirske metode v požarni varnosti, Inštrumentalna analiza, monitoring, sistemi.

Skill-transference Ability

In this course the student will acquire basic skills useful in other areas and in other subjects: Fundamentals of technical and fire safety, Physics, Chemistry, Mathematics, Fire and Fire Dynamics, Fundamental of processing techniques, Hazardous materials, Environmental protection, Fire safety of buildings, Intervention and rescuing, Engineering methods in fire safety, Instrumental analysis, monitoring, systems.

Metode poučevanja in učenja:

- predavanja
- vaje v predavalnici
- vaje v računalnici ali v laboratoriju in na terenu

Learning and Teaching Methods:

- lectures
- exercises in the classroom
- exercises in the computer room or in the laboratory and in the field

Načini ocenjevanja:

Oceno sestavljajo:

- 10% domače naloge
- 20% kolokviji
- 30% seminar/projekt
- 40% izpit (pisni in ustni)

• za zaključeno oceno je potrebno:

- napisati seminar in domače naloge
- opraviti izpit pozitivno

Ocene od 1-5 (negativno), 6-10 (pozitivno)

Delež (v %) /
Weight (in %)

10%
20%
30%
40%

Assessment:

Type (examination, oral, coursework, project):

- 10% homeworks
- 20% midterm exams
- 30% seminar work/project work
- 40% examination (oral or written)

For passing, it is necessarily to complete a seminar work and homeworks, and pass the exam.

Marks:

1-5 fail

6-10 pass

Reference nosilca / Lecturer's References:

- **SCHNABL, Simon**, TURK, Goran, PLANINC, Igor. Uklon lesenih stebrov pri požaru = Buckling of timber columns subjected to fire. V: Kuhljevi dnevi, 23. september 2010, Ljubljana. ŠIROK, Brane (ur.), EBERLINC, Matjaž (ur.). Zbornik del. Ljubljana: SDM - Slovensko društvo za mehaniko, 2010, str. 207-214, graf. prikazi. [COBISS.SI-ID 5132385]

- **SCHNABL, Simon**, TURK, Goran, PLANINC, Igor. Fire resistance of timber columns. V: CECCOTTI, Ario (ur.), KUILEN, Jan-Willem van de (ur.). WCTE 2010 : conference proceedings. Riva del Garda [Italy]: s.n., 2010, str. 1-7, ilustr. [COBISS.SI-ID 5069409]

- **SCHNABL, Simon**, PLANINC, Igor, TURK, Goran, SRPČIČ, Stane. Fire analysis of timber composite beams with interlayer slip. Fire safety journal, ISSN 0379-7112. [Print ed.], 2009, letn. 44, št. 5, str. 770-778, ilustr., doi: 10.1016/j.firesaf.2009.03.007. [COBISS.SI-ID 4598369]

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet:	OSNOVE MATERIALOV
Course Title:	FUNDAMENTALS OF MATERIALS

Študijski program in stopnja Study Programme and Level	Študijska smer Study Field	Letnik Academic Year	Semester Semester
UŠP Tehniška varnost, 1. stopnja	/	2.	4.
USP Technical Safety, 1 st Cycle	/	2 nd	4 th

Vrsta predmeta / Course Type obvezni / Mandatory

Univerzitetna koda predmeta / University Course Code: TV110

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje work	Druge oblike študija	Samost. delo Individ. work	ECTS
45	/	15 SV+15 LV	/	/	75	5

Nosilec predmeta / Lecturer: doc. dr. Boštjan Genorio / Dr. dr. Boštjan Genorio, Assistant Professor

Jeziki / Languages: Predavanja / Lectures: Slovenski / Slovenian
Vaje / Tutorial: Slovenski / Slovenian

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti: **Prerequisites:**

Študent oz. kandidat mora imeti predmet opredeljen kot študijsko obveznost.	The course has to be assigned to the student.
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Vsebina:

4.a) Uvod.
 Materiali v tehniki in vsakdanjem življenju. Razdelitev in pregled osnovnih skupin materialov: kovine, polimeri, keramika, steklo in anorganska veziva, kompoziti, polprevodniki. Značilne lastnosti: mehanske, termične, optične, električne, magnetne. Kriteriji za izbor materialov.

4.b) Struktura in lastnosti
 Povezava med fizikalnimi in kemijskimi lastnostmi (na primer tip vezi, jakosti vezi in kristalne zgradbe) in lastnostmi materialov. Podane so osnove za razumevanje katere lastnosti snovi niso odvisne od mikrostrukture materiala (na primer modul elastičnosti, meja

Content (Syllabus Outline):

Introduction: Materials in everyday life. Classification of materials: metals, polymers, ceramics, glasses, composites, semiconductive materials. Basic properties of materials: mechanical, thermal, optical, electrical, magnetic. Choice of a material.

Materials' structure and properties: Correlation between physical or chemical properties (i.e. interatomic bonds, crystal structure) and basic properties of materials. Basic principles about materials' properties independent on their microstructure (i.e. modulus of elasticity, elastic limit, thermal

plastičnosti, termični razteznostni koeficient,....) in kako ter na katere lastnosti ima mikrostruktura odločilen vpliv (npr.: natezna trdnost, zlomna trdnost, žilavost, krhkost,...). Ker je razvoj mikrostrukture odvisen od kristalne strukture, nukleacije, rasti zrn preko difuzije v trdnem in od faznih ravnotežij, so obnovljene in na posebnih primerih obravnavane osnove teh poglavij. Posebej so obravnavani trije fazni diagrami: Fe-C, Al-Cu in Al_2O_3 - SiO_2 , razvoj mikrostruktur v njih ter pomembnost za konstrukcijske materiale in keramiko.

4.c) Procesiranje materialov

V poglavju je razloženo zakaj je za uporabnost gradiv nujno potrebno poznavanje procesa izdelave gradiva.

Kovine. Vpliv sestave in v proizvodnem procesu uporabljene tehnologije na njihove lastnosti. Mehanizmi in tehnika utrjevanja kovin (hladna obdelava, nastanek trdne raztopine, martenzitna transformacija, izločevalno utrjevanje). Podano je procesiranje in lastnosti za nekatere v praksi največkrat uporabljene kovine (jekla – Bainov diagram, Fe litine in zlitine, duraluminij, cink in zlitine, baker..).

Polimeri. Naravni polimeri (kavčuk, celuloza, usnje...) in njihove lastnosti ter uporabnost. Sintetični polimeri – delitev, vpliv strukture in sestave na lastnosti. Termoplasti, duroplasti in elastomeri. Deformacija in utrjevanje polimernih materialov. Lezenje in zlom. Termična razgradnja polimerov in zaviranje gorenja.

Kompoziti. Osnovne karakteristike, napoved lastnosti in osnove priprave. Les, beton, asfalt, polimerni materiali ojačeni z vlakni, kompoziti s kovinsko in keramično matrico.

Keramika. Značilne lastnosti. Struktura silikatne keramike. Klasična in sodobna tehnična keramika. Krhki lom in utrjevanje keramike. Funkcijska in inženirska keramika. Gradbeni materiali (cement, opeka, steklo, izolacijski materiali....)

4.d) Propad in odpoved materialov.

Osnove elektrokemijske korozije.

expansion coefficient,...) and materials' properties dependent on their microstructure (i.e. tensile strength, breaking strength, toughness,...). Development of microstructure during materials processing (crystalline structure, nucleation, grain growth). Diffusion in solids and phase equilibria – three cases are emphasized: Fe-C, Al-Cu and Al_2O_3 - SiO_2 .

Processing of materials: Processing of materials and the usage of materials.

Metals: Technologies for processing of metals. Hardening of metals (cold working, solid solution formation, martensitic transformation, precipitation hardening). Some often used metallic materials: preparation of steel, cast iron, aluminum alloys, zinc alloys, copper,...

Polymer materials: Natural polymers (rubbers, cellulose, leather) and synthetic polymers (thermoplastics, elastomers, duroplastics). Basic properties and application. Creep and fracture of polymer materials. Thermal decomposition of polymers.

Composites: Basic characteristic and preparation of composites. Basic properties of composites. Examples of composites: wood, concrete, asphalt, polymers reinforced with fibers, cermets.

Ceramics: Basic properties of ceramic materials. Traditional silicate ceramics and engineer ceramic materials. Brittle fracture of ceramic materials. Toughening of ceramics. Cement, bricks, glass, ceramic insulators,...

Materials degradation: Basics of the electrochemical corrosion. High temperature

Visokotemperaturni propad. Ocena možnosti, da pri obremenitvah materialov, zaostrenih ali izrednih razmerah pride do sprememb, ki vodijo do loma, pospešene korozije ali razpada snovi pri katerem nastajajo zdravju nevarni ali strupeni plinski produkti, aerosoli, taline idr. Osnove zaščite materialov proti koroziji in visokotemperaturnim obremenitvam.

4. f) Drugi kriteriji za izbor materiala.

Možnost za njegovo obdelavo (rezkanje, vlivanje, varjenje, poliranje,...), njegova skladnost z okoljem in ekonomska upravičenost uporabe določenega materiala.

Seminar: Slušatelji v okviru seminarja v sodelovanju z mentorjem na osnovi podatkov iz literature pripravijo študijski primer izbire in načrtovanja uporabe določenega materiala. Analizirajo poznane primere iz prakse, ki ilustrirajo principe pridobljene pri predavanjih (npr.: izbor materialov za konstrukcijske materiale, avtomobilsko industrijo, gradbeništvo, prehransko industrijo, za kemijski reaktor, toplotno izolacijo, zaščitno prevleko optičnega vlakna itd...) Analizirajo smotrnost uporabe določenih materialov v industriji, gradbeništvu idr. in možnosti, da pri njihovi uporabi zaradi določenih pogojev pride do neželenih sprememb v mehanskih, kemijskih, termičnih in drugih lastnostih in kakšno tveganje in posledice ima to lahko za določene naprave in sisteme

degradation of materials. Mechanical degradation. Degradation of materials and evolution of hazard components. Protection of materials.

Choice of material:

Working with materials. Economic aspects for choosing a material.

Seminar work: Written seminar about a chosen material, reasons for its choice and its application (materials for car industry, building materials, construction materials, materials in chemical industry, high temperature materials, optical materials).

Temeljni literatura in viri / Readings:

- D.R. Askeland, P.P. Phule, The Science and Engineering of Materials, 5th.ed. Thomson Learning, Brooks Cole, 2006
- J.F. Shackelford, Introduction to Materials Science for Engineers, 5th.ed. Prentice Hall PTR, New Jersey, 2000
- W,D.Jr. Callister, Materials Science and Engineering – An Itroductin, 7th. ed. John Wiley & Sons, Inc., New York, 2007

Cilji in kompetence:

Študent bo pridobil znanja potrebna za osnovno oceno uporabnosti in primernosti določenih materialov za posamezne funkcije ali za kvalitetno napoved možnosti odpovedi gradiv, ki se uporabljajo bodisi kot komponente ali sestavni deli različnih struktur

Objectives and Competences:

Students get knowledge about various types of materials, possibilities of their application and risk for their failure in specific environment.

(gradbeni elementi ali strukture, reaktorske posode, stroji, naprave, sistemi in podobno).

Predvideni študijski rezultati:

Znanje in razumevanje

Pridobil bo celovita znanja o lastnostih materialov s poudarkom na kemijskih, fizikalnih in mehanskih lastnostih. Razumel bo zakaj in katere lastnosti so neodvisne od priprave, katere lastnosti pa so v bistvu odvisne od izbire procesa priprave in z njim določene mikrostrukture. Ob tem bo spoznal konkretne materiale (kovine, polimerne snovi, keramiko, kompozite idr.), ki se uporabljajo v industrijskih in drugih aplikacijah ter pridobil znanja potrebna za pravilno tolmačenje podatkov v priročnikih in bazah podatkov. To je še posebej pomembno kadar je gradivo izpostavljeno korozivni sredini ali drugim pogojem in obremenitvam, kjer prihaja do interakcije kemijskih, fizikalnih in mehanskih vplivov.

Uporaba

V okviru predmeta bo študent pridobil znanja potrebna za sodelovanje z drugimi strokovnjaki pri izboru primerne materiala za določeno aplikacijo ter za analizo tveganja in nevarnosti odpovedi pod normalnimi pogoji obratovanja in možnosti, da bo pri dodatnih obremenitvah materialov, zaostrenih ali izrednih razmerah prišlo do sprememb, ki povečajo tveganja do mere, nesprejemljive za varno obratovanje.

Refleksija

Študent bo sposoben predvideti in uspešno preprečiti kritične situacije povezane s tveganji v proizvodnem procesu.

Prenosljive spretnosti

Pri predmetu bo študent pridobil laboratorijske spretnosti, znal bo uporabljati podatke iz literature, izvajati kemijske in nekatere fizikalne meritve, eksperimentalne podatke bo znal ustrezno obdelati ter primerno interpretirati.

Intended Learning Outcomes:

Knowledge and Comprehension

Understanding of basic properties of various materials (chemical, physical, mechanical). Which properties of materials are not dependent on their preparation and which are tailored through the preparation path and correspond microstructure development. Knowledge about specific materials (metals, polymers, ceramics, composites) used in various industries or other applications. Collecting and understanding data about specific materials from handbooks. Using the collected data to understand behaviour of materials in various environments.

Application

Students get knowledge to discuss the selection of an appropriate material with other experts and to predict degradation of the chosen material under load or in an aggressive environment.

Reflection

Students are capable of predicting and preventing critical situations in production process.

Skill-transference Ability

General understanding of materials, developed laboratory skills, literature data collecting, modern analytical techniques, data analysis and interpretation.

Metode poučevanja in učenja:

Learning and Teaching Methods:

Predavanja
Laboratorijske vaje

Lectures, tutorial work

Delež (v %) /

Načini ocenjevanja:

Weight (in %) **Assessment:**

Pisni (40%) in ustni (60%) izpit Pozitivna ocena 6-10, negativna ocena 1-5. Opravljene laboratorijske vaje so pogoj za opravljanje izpita.	80% 20%	Written (40%) and oral (60%) exam Pass grades from 6 to 10, fail grades from 1 to 5. Tutorial work must be done before taking an exam.
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Reference nosilca / Lecturer's References:

1. Genorio, B. et al. Selective catalysts for the hydrogen oxidation and oxygen reduction reactions by patterning of platinum with calix [4] arene molecules. *Nat. Mater.* 9, 998–1003 (2010).
2. Genorio, B. et al. Synthesis of dispersible ferromagnetic graphene nanoribbon stacks with enhanced electrical percolation properties in a magnetic field. *ACS Nano* 6, 10396–10404 (2012).
3. Genorio, B. & Znidarsic, A. Functionalization of graphene nanoribbons. *J. Phys. D: Appl. Phys.* 47, 94012 (2014).
4. Strmcnik, D., Lopes, P. P., Genorio, B., Stamenkovic, V. R. & Markovic, N. M. Design principles for hydrogen evolution reaction catalyst materials. *Nano Energy* 29, 29–36 (2016).
5. Staszak-Jirkovský, J. et al. Design of active and stable Co-Mo-S_x chalcogels as pH-universal catalysts for the hydrogen evolution reaction. *Nat. Mater.* 15, 197–203 (2016).
6. Šest, E., Dražič, G., Genorio, B. & Jerman, I. Graphene nanoplatelets as an anticorrosion additive for solar absorber coatings. *Sol. Energy Mater. Sol. Cells* 176, (2018).

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet:	OSNOVE PROCESNE TEHNIKE
Course Title:	FUNDAMENTALS OF PROCESS ENGINEERING

Študijski program in stopnja Study Programme and Level	Študijska smer Study Field	Letnik Academic Year	Semester Semester
UŠP Tehniška varnost, 1. stopnja	/	2.	3.
USP Technical Safety, 1 st Cycle	/	2 nd	3 rd

Vrsta predmeta / Course Type

obvezni / Mandatory

Univerzitetna koda predmeta / University Course Code: TV111

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje Work	Druge oblike študija	Samost. delo Individ. Work	ECTS
45	/	30 LV	/	/	75	5

Nosilec predmeta / Lecturer:

prof. dr. Igor Plazl / Dr. Igor Plazl, Full Professor

Jeziki / Languages:

Predavanja / Lectures: Slovenski / Slovenian

Vaje / Tutorial: Slovenski / Slovenian

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:

Prerequisites:

Študent oz. kandidat mora imeti predmet opredeljen kot študijsko obveznost.

The course has to be assigned to the student.

Vsebina:

Kemijski procesi: od surovih materialov do kemijskega produkta. Načrtovanje kemijskih procesov in integracija. Kontinuirni in šaržni procesi. Osnovne operacije (mletje; mešanje filtracija; absorpcija, destilacija, sušenje). Nadzor procesov. Procesna varnost in modeliranje.

Termodinamske lastnosti in fazno ravnotežje. Termodinamski sistemi. Enačbe stanja. Zakoni termodinamike (prvi zakon o ohranitvi energije, drugi ali entropijski zakon). Specifična toplota, notranja energija, delo, entalpija, prosta energija in prosta entalpija. Fazni prehodi.

Uvod v kemijsko reakcijsko inženirstvo. Osnove reakcijske kinetike. Hitrost kemijske reakcije. Idealni reaktorji. Šaržni in polšaržni reaktorji.

Content (Syllabus Outline):

Chemical process: from raw materials to chemical product. Design and integration of chemical processes. Continuous and batch processes. Unit operations (milling, mixing, absorption, filtration, distillation, drying). Process control. Process safety and modeling.

Thermodynamic Properties and Phase Equilibrium. Thermodynamic systems. Equations of State. Thermodynamics laws (the first law of conservation of energy, entropy or the second law). Specific heat, internal energy, work, enthalpy, free energy and free enthalpy. Phase transitions.

Fundamentals of Chemical Reaction Engineering. Basics of Reaction Kinetics. Rate of reaction. Ideal reactors. Batch and semi batch reactors. Stirred reactors. Ideal tubular

Mešalni reaktor. Idealni pretočni reaktor. Uvod v katalitske reakcije.

Osnove transportnih pojavov. Prenos gibalne količine in tok tekočin. Uvod v mehaniko fluidov. Prenos toplote. Mehanizmi prenosa toplote: prevajanje, konvekcija, sevanje. Prenos snovi. Mehanizmi prenosa snovi: difuzija, konvekcija. Stacionarnost in nestacionarnost. Rešitev enodimenzijskih primerov.

Uvod v modeliranje procesov. Opredelitev problema: procesna shema, opredelitev odvisnih in neodvisnih spremenljivk, procesni parametri. Opredelitev mehanizmov procesa. Ohranitvene enačbe in razvoj modelnih enačb za preproste sisteme. Rešitev preprostih sistemov.

reactors. Basis of catalysis.

Introduction to transport phenomena. Momentum and fluid flow. Fundamentals of fluid mechanics. Heat transport. Mechanisms of heat transport: conduction, convection, radiation. Mass transport. Mechanisms of mass transport: diffusion, convection. Stationary and nonstationary systems. Solving of one dimension problems.

Introduction to process modeling. Problem definition: scheme of the process, process dependent and independent variables, process parameters. Definition of process mechanisms. Elementary balances and development of model equations. Solving of simple systems.

Temeljna literatura in viri / Readings:

- Z. Rant, Termodinamika: knjiga za uk in prakso, Ljubljana, Fakulteta za strojništvo, 2001, 607 str., (30%)

- T. Koloini, Prenos toplote in snovi, FKKT, Ljubljana, 1999, 273 str., (30%)

Dopolnilna literatura:

- Y. A. Cengel and M. A. Boles, Thermodynamics: An Engineering Approach, McGraw-Hill, Inc, USA 2005, 988 str.,

- R. Modic, Termične in difuzijske operacije, DDU Univerzum, Ljubljana, 1978, 148 str.,

- C.J. Geankoplis, Transport Processes and Unit Operations, Prentice Hall PTR, 1993, 921 str.,

- W. L. McCabe, J. Smith, P. Harriott, Unit Operations of Chemical Engineering, McGraw-Hill Professional, New York, 2004, 1152 str.,

- O. Levenspiel, Osnovi teorije i projektovanja hemijskih reaktorov, ICS i TMF, Beograd, 1979, 571 str.,

- O. Levenspiel, Chemical Reaction Engineering, 3-rd Edition, John Wiley and Sons, USA, 1998, 688 str.,

- Perry's Chemical Engineers' Handbook, 8-th Ed., Mc Graw-Hill Book Company, New York, 2007, 2400 str.,

- R. King, Safety in the Process Industries, New Ed., Butterworth-Heinemann Ltd. London, 1994, 762 str.

Cilji in kompetence:

Cilj predmeta je omogočiti globlje spoznavanje in razumevanje baznih znanj termodinamike, transportnih pojavov in kemijske tehnike, skupaj s poznavanjem osnovnih inženirskih konceptov.

Objectives and Competences:

Objective of the course is deeper knowledge and understanding fundamentals of thermodynamics, transport phenomena and chemical technology, on basis of chemical engineering concepts.

Predvideni študijski rezultati:

Intended Learning Outcomes:

<p><u>Znanje in razumevanje</u> Varnostni inženir je pri svojem delu soočen s potrebo po osnovnem razumevanju tehnoloških postopkov in raznovrstnih specifičnih procesov, ki ga usposablja za kvalitetno in inovativno delo na svojem področju.</p>	<p><u>Knowledge and Comprehensions:</u> Safety Engineer is faced at his/her work with the need to understand the basic techniques and understanding of specific processes, which qualify him/her for excellence and innovative work in his/her field</p>
<p><u>Uporaba</u> Tako izobražen profil je sposoben ustrezne strokovne komunikacije z ostalimi tehnično podkovanimi kadri, kar privede do uspešnih in rešitev konkretnih problemov. Pomemben vidik predmeta je študenta naučiti kritičnega pogleda na problem in na osnovi sintetiziranih znanj podati hitre in učinkovite rešitve v praksi.</p>	<p><u>Application</u> Such educated profile student is skilled for professional communication with other technically knowledgeable staffs which leads to successful solutions to concrete problems. Student learns to have critical view on the problem and on the basis of synthesized knowledge to provide quick and effective solutions in practice.</p>
<p><u>Refleksija</u> Kritična primerjava teoretskega znanja s praktično uporabo na področju pojava in širjenja požarov.</p>	<p><u>Analysis</u> Critical comparison of theoretical knowledge with practical application in candidate's working field.</p>
<p><u>Prenosljive spretnosti</u> Pri predmetu se študent nauči sintetizirati vsebine znanj, pridobljene z različnih področij tehničnih in naravoslovnih segmentov, ter tako pridobi vzorec za inovativno delo na drugih področjih.</p>	<p><u>Skill-transference Ability</u> By matter of this course student learns to connect knowledge of different technical and natural science segments and acquires mode for innovative work on different fields.</p>

Metode poučevanja in učenja:

Predavanja, seminarji (individualno delo predavatelj – študent)

Learning and Teaching Methods:

Lectures, seminars.

Delež (v %) /

Načini ocenjevanja:

Weight (in %) **Assessment:**

Izpit pisni in ustni.

Ocene: 6-10 pozitivno

Written and oral exam.

Reference nosilca / Lecturer's References:

- JOVANOVIĆ, Goran N., ATWATER, James E., ŽNIDARŠIČ PLAZL, Polona, **PLAZL, Igor**. Dechlorination of polychlorinated phenols on bimetallic Pd/Fe catalyst in a magnetically stabilized fluidized bed. The chemical engineering journal, ISSN 1385-8947. [Print ed.], 2015, vol. 274, str. 50-60
- LUBEJ, Martin, KALČÍKOVÁ, Gabriela, **PLAZL, Igor**, ŽGAJNAR GOTVAJN, Andreja. Feasibility of carbon nanofiber catalyst support for the heterogeneous Fenton process. Journal of environmental engineering, ISSN 0733-9372, str. 1-6
- MILOŽIČ, Nataša, LUBEJ, Martin, NOVAK, Uroš, ŽNIDARŠIČ PLAZL, Polona, **PLAZL, Igor**. Evaluation of diffusion coefficient determination using a microfluidic device. Chemical and biochemical engineering quarterly, ISSN 0352-9568, 2014, vol. 28, no. 2, str. 215-22.

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet: OSNOVE TEHNIŠKE IN POŽARNE VARNOSTI
Course Title: INTRODUCTION TO TECHNICAL AND FIRE SAFETY

Študijski program in stopnja Study Programme and Level	Študijska smer Study Field	Letnik Academic Year	Semester Semester
UŠP Tehniška varnost, 1. stopnja	/	1.	2.
USP Technical Safety, 1 st Cycle	/	1 st	2 nd

Vrsta predmeta / Course Type

obvezni / Mandatory

Univerzitetna koda predmeta / University Course Code:

TV105

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje Work	Druge oblike študija	Samost. delo Individ. Work	ECTS
90	/	60 SV	/	/	150	10

Nosilec predmeta / Lecturer:

doc. dr. Klementina Zupan / Dr. Klementina Zupan, Assistant Professor

Jeziki / Languages:

Predavanja / Lectures: Slovenski / Slovenian
Vaje / Tutorial: Slovenski / Slovenian

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:

Študent oz. kandidat mora imeti predmet opredeljen kot študijsko obveznost.

Prerequisites:

The course has to be assigned to the student.

Vsebina:

Osnovni pojmi varnosti: varnost, nevarnost, ogrožanje; nezgoda, požari, tveganje, mejno tveganje; preventiva, zaščita, škoda.
 Varnost in merila varnosti: merjenje tveganja, mere za oceno tveganja, evidence, ekonomski učinki varstva pri delu, usposabljanje za varno delo.
 Nezgode in požari: potek nezgode ali požara, analiza, preprečevanje, preventiva.
 Analiza varnosti in požarne varnosti: načini in orodja za analizo, metode.
 Zagotavljanje varnosti: tehnika, usposabljanje, predpisi.
 Zakonodaja: veljavni domači predpisi na področju varnosti, ustrezni evropski in ostali

Content (Syllabus Outline):

Basic concepts of safety: safety, danger, threat, accident, fire risk, limit risk, prevention, protection, damage.
 Safety and safety criteria: the measurement of risk, the measures of risk assessment, records, the economic effects of occupational safety, training for safe work.
 Accidents and fires: the structure of an accident or fire, analysis of accidents, prevention.
 Analysis of safety and fire safety: methods and tools for the safety analysis.
 Ensuring safety: engineering, training regulations.
 Legislation: applicable domestic legislation in the field of safety, the relevant European and

tuji predpisi. Statistični pregled: vzroki za nastanek nezgode ali požara (čas, stanje obratovanja itd.), požari na industrijskih objektih, požari na objektih, kjer se zbira večje število ljudi, požari na stanovanjskih hišah, požari na prometnih sredstvih, požari v naravi. Študija požarne varnosti: pregled glavnih točk, vloga študije pri zagotavljanju požarne varnosti. Telesa nadzora: Republiški inšpektorat za delo, Republiška uprava za zaščito in reševanje, Inšpektorat RS za varstvo pred naravnimi in drugimi nesrečami.

other foreign regulations. Statistical Review: the causes of accidents or fire (time, operating status, etc.), fires at industrial facilities, fires at facilities where large numbers of people gather, fire houses, fires on means of transport, wildfires. The study of fire safety: a review of the main points of the role of studies in the provision of fire safety. Supervisory authorities: Labor Inspectorate, the National Administration for Protection and Rescue, the Inspectorate for protection against natural and other disasters.

Temeljni literatura in viri / Readings:

- Gspan, P., Analiza in presoja varnosti pri delu, ZVD, Ljubljana, 1996, 238 str., (70%)

Dopolnilna literatura:

- Drusany, V., Osnove varstva pri delu, VTVŠ, Ljubljana, 1995, 95 str., (10%)
- Zakon o varstvu pred požarom (Ur.l. RS, št. 3/2007);
- Zakon o gasilstvu (Ur.l. RS, št. 113/2005);
- Površine predpisane za intervencijo gasilcev, SIST DIN 14090;
- Pravilnik o metodologiji za ugotavljanje ocene požarne ogroženosti, Ur. l. RS, št. 70/96,
- Pravilnik o požarnem redu Ur.l. RS, št. 52/07;
- Pravilnik o študiji požarne varnosti Ur.l. RS št. 28/05;

Cilji in kompetence:

Pri predmetu študent dobi znanje o sistemu zagotavljanja požarne varnosti v republiki Sloveniji, spoznal bo temeljno zakonodajo na omenjenem področju in službe ter ustanove, ki bdijo nad izvajanjem zakonodaje.

Objectives and Competences:

The students obtain knowledge of the system to provide fire safety in the Republic of Slovenia, met the basic legislation in this area and services, and institutions that watch over the implementation of the legislation.

Predvideni študijski rezultati:

Znanje in razumevanje

Študent bo pridobil osnovna znanja o principih varstvu pri delu in požarni varnosti.

Uporaba

S pridobljenimi znanji bo kasneje lažje spremljal predavanja pri strokovnih predmetih varnosti.

Refleksija

Kritična presoja dogodkov povezanih z varnostjo.

Intended Learning Outcomes:

Knowledge and Comprehension

Students will gain basic knowledge of the principles of safety at work and fire safety.

Application

Reflection

Reflection

A critical review of safety-related events.

Prenosljive spretnosti

Pri predmetu bo študent pridobil osnovna znanja, uporabna tudi na drugih področjih.

Skill-transference Ability

In this course, the student will acquire basic skills useful in other areas.

Metode poučevanja in učenja:

Predavanja
Vaje
Strokovna ekskurzija

Learning and Teaching Methods:

Lectures
Tutorials
Excursion

Načini ocenjevanja:

3 kolokviji s pozitivnimi ocenami nadomestijo izpit.
Izpit pisni in ustni. Ocene: 6-10 pozitivno.

Delež (v %) /

Weight (in %) /

Assessment:

3 tests positive assessment of the remuneration exam.
Written and oral exam. Marks: 6-10 positive

Reference nosilca / Lecturer's References:

- **ZUPAN, Klementina**, MARINŠEK, Marjan. Combustion-derived La [sub] (1-x)Sr [sub] xMn [sub] 0.5Cr [sub] 0.5O [sub] (3[plus minus][delta]) (x = (0.20, 0.25)) perovskite : preparation, properties, characterization = Z zgorevalno sintezo pridobljen perovskit La [spodaj] (1-x)Sr [spodaj] xMn [spodaj] 0,5Cr [spodaj] 0,5O [spodaj] (3[plus minus][delta]) (x = (0,20, 0,25)) : priprava, lastnosti, karakterizacija. *Materiali in tehnologije*, ISSN 1580-2949. [Tiskana izd.], no. 6, 2014, str. 885-891, ilustr. [COBISS.SI-ID 1536154563]
- **ZUPAN, Klementina**, MARINŠEK, Marjan, NOVOSEL, Barbara. Combustible precursor behaviour in the lanthanum chromite formation process = Termične lastnosti reakcijskega gela za pripravo lantanovega kromita. *Materiali in tehnologije*, ISSN 1580-2949. [Tiskana izd.], 2011, vol. 45, no. 5, str. 439-445. [COBISS.SI-ID 35456261]
- MARINŠEK, Marjan, **ZUPAN, Klementina**. Microstructure evaluation of sintered combustion-derived fine powder NiO-YSZ. *Ceramics international*, ISSN 0272-8842. [Print ed.], 2010, vol. 36, no. 3, str. 1075-1082, doi: 10.1016/j.ceramint.2009.12.014. [COBISS.SI-ID 34080773]

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet: OSNOVE ZDRAVSTVENEGA VARSTVA
Course Title: INTRODUCTION TO HEALTH CARE

Študijski program in stopnja Study Programme and Level	Študijska smer Study Field	Letnik Academic Year	Semester Semester
UŠP Tehniška varnost, 1. stopnja	/	1.	1.
USP Technical Safety, 1 st Cycle	/	1 st	1 st

Vrsta predmeta / Course Type

obvezni / Mandatory

Univerzitetna koda predmeta / University Course Code:

TV104

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje Work	Druge oblike študija	Samost. delo Individ. Work	ECTS
45	30	/	/	/	75	5

Nosilec predmeta / Lecturer:

Izr. dr. Alenka Franko / Dr. Alenka Franko, Associate professor

Jeziki / Languages:

Predavanja / Lectures: Slovenski / Slovenian

Vaje / Tutorial: /

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:

Študent oz. kandidat mora imeti predmet opredeljen kot študijsko obveznost.

Prerequisites:

The course has to be assigned to the student.

Vsebina:

Zgodovina medicine dela pri nas in v svetu, organiziranost MD v Sloveniji
 Obremenitev – obremenjenost
 Naloge aktivnega zdravstvenega varstva, zakonodaja AZV
 Kazalci negativnega zdravja, tehnična dinamičnega ravnovesja
 Medicina prometa
 Epidemiologija delovnega okolja
 Večji javno zdravstveni problemi: - alko
 Večji javno zdravstveni problemi: - kajenje
 Večji javno zdravstveni problemi: - droge
 Promocija zdravja
 Deontološki problemi ocenjevanja delazmožnosti
 Inštitut za varovanje zdravja

Content (Syllabus Outline):

History of occupational medicine in Slovenia and internationally, organization of OM in Slovenia
 Strain – stress
 Tasks of active healthcare, legislation pertaining to AHC
 Negative health indicators, the scales of dynamic equilibrium
 Traffic medicine
 Epidemiology of the work environment
 Major public health issues: - alcohol
 Major public health issues: - smoking
 Major public health issues: - drugs
 Health promotion
 Deontological problems in the assessment of working ability

Urad za varnost in zdravje pri delu
 Zdravstvena inšpekcija
 Delovna inšpekcija
 Ekonomski učinki varstva pri delu
 Medicina športa (rekreativni in kategorizirani šport)
 Poklicna orientacija, selekcija, rehabilitacija
 Ocenjevanje delazmožnosti
 Preventivni zdravstveni pregledi
 Bolniški stalež invalidnost
 Poškodbe pri delu
 Poklicne bolezni in bolezni v zvezi z delom
 Analiza tveganja
 Vidne informacije (vid)
 Slušne informacija (sluh)
 Kinetosa (vibracije)
 Energija pri delu
 Srčno-žilni sistem
 Dihala
 Mišičje
 Seminar
 Predstavitve seminarjev

National Institute of Public Health
 Office of Occupational Health and Safety
 Health Inspection
 Labor Inspection
 Financial effects of workplace safety
 Sports medicine (recreation and registered sports)
 Occupational orientation, selection, rehabilitation
 Assessment of working ability
 Preventive medical examinations
 Sick leave, disability
 Work-related injuries
 Occupational and work-related diseases
 Risk analysis
 Visual information (sight)
 Auditory information (hearing)
 Kinetosis (vibrations)
 Energy at work
 Cardiovascular system
 Respiratory system
 Muscular system
 Seminar
 Introduction to seminars

Temeljna literatura in viri / Readings:

- Bilban M., Medicina dela ZVD 1999, 605 str., (30%)

Additional literature:

- Sušnik J., Ergonomska fiziologija, položaj in gibanje, pri delu termoregulacija, Knjižnica UZZSV št. 3, 1992, 352 str.,
- Derganc: Osnove prve pomoči za vsakega, Rdeči križ

Cilji in kompetence:

Namen predmeta je dati študentom osnovna znanja o človeku in medicini, ter tako postaviti izhodišča za spremljanje predmetov v kasnejših letnikih.

Objectives and Competences:

The course is intended to impart students with basic knowledge about man and medicine and thus create a starting point for the attendance to other courses in the following years.

Predvideni študijski rezultati:

Znanje in razumevanje

- organizacija dela v medicini dela;
- človek in tveganja za njegovo zdravje,
- zakonodaja;
- povezava zdravstvenega varstva z varstvom pri delu;
- spoznavanje z osnovnimi zahtevami za zagotavljanje zdravega dela,

Intended Learning Outcomes:

Knowledge and Comprehension

- organization of work in occupational medicine;
- people and risks to their health;
- legislation;
- collaboration between public healthcare and occupational healthcare;
- familiarization with the basic requirements to ensure occupational health;

- spozna zahteve in posebnosti rizičnih skupin delavcev; - spozna in zna vrednoti osnove tehničnega varstva pri delu...	- requirements and specifics of categories of at-risk workers; - evaluation of the basics of technical occupational safety measures ...
<u>Uporaba</u> Varovanje in izboljšanje zdravja zaposlenih; Preprečevanje in obvladovanje poklicnih bolezni, poškodb pri delu... Odpravljanje poklicnih tveganj in pogojev dela, ki ogrožajo varnost in zdravje pri delu; Razvoj in napredek varstva pri delu, organizacije dela, pogojev dela... Izboljšanje poklicnega in socialnega statusa zaposlenih, fizičnega in materialnega statusa zaposlenih; Ohranjanje in razvoj delazmožnosti zaposlenih; Omogočanje socialno in ekonomsko produktivnega življenja...	<u>Application</u> Protection and improvement of employee health; prevention and management of occupational diseases, work-related injuries ... mitigation of occupational hazards and working conditions that present a danger to occupational health and safety; development and advancement of occupational safety, work organization, work conditions ... improvement of the occupational, social, physical and material status of employees; protection and development of the employees' ability to work; fostering a socially and financially productive life ...
<u>Refleksija</u> Spoznati osnove zdravstvenega varstva, ki jih bo kot bodoči diplomant redno uporabljal pri delu z ljudmi.	<u>Reflection</u> To know the basics and the importance of researching risks and the effect they have on a person's overall capacities.
<u>Prenosljive spretnosti</u> Sposobnost iskanja po medicinski literaturi, komuniciranja z zdravstvenimi delavci.	<u>Skill-transference Ability</u> Ability to search medical literature, communicate with healthcare workers.

Metode poučevanja in učenja:

Predavanja
Vaje – obvezna prisotnost in sodelovanje, ter izdelava poročila

Learning and Teaching Methods:

Lectures
Practical work – required attendance and participation, preparation of a report

Načini ocenjevanja:

Pisno preverjanje znanja 80 %.
Izdelava in predstavitev seminarja 20 %
Pozitivna ocena 6 - 10, negativna ocena 5.

Delež (v %) /

Weight (in %) **Assessment:**

	80%	Written examination
	20%	Seminar work

Reference nosilca / Lecturer's References:

- GORIČAR, Katja, KOVAČ, Viljem, **FRANKO, Alenka**, DODIČ-FIKFAK, Metoda, DOLŽAN, Vita. Serum survivin levels and outcome of chemotherapy in patients with malignant mesothelioma. Disease markers, ISSN 1875-8630, 2015, vol. 2015, str. 1-8.
<http://www.hindawi.com/journals/dm/2015/316739/>, doi: 10.1155/2015/316739. [COBISS.SI-ID 32176857], [JCR, SNIP, WoS do 24. 10. 2015: št. citatov (TC): 0, čistih citatov (CI): 0, Scopus do 10. 10. 2015: št. citatov (TC): 0, čistih citatov (CI): 0]
- KOVAČ, Viljem, DODIČ-FIKFAK, Metoda, ARNERIĆ, Niko, DOLŽAN, Vita, **FRANKO, Alenka**. Fibulin-3 as a biomarker of response to treatment in malignant mesothelioma. Radiology and

oncology, ISSN 1318-2099. [Print ed.], Sep. 2015, vol. 49, no. 3, str. 279-285, doi: 10.1515/raon-2015-0019. [COBISS.SI-ID 2427564], [JCR, SNIP, WoS do 19. 4. 2017: št. citatov (TC): 3, čistih citatov (CI): 2, Scopus do 30. 3. 2017: št. citatov (TC): 3, čistih citatov (CI): 2]

3. **FRANKO, Alenka**, DOLŽAN, Vita, ARNERIĆ, Niko, DODIČ-FIKFAK, Metoda. The influence of gene-gene and gene-environment interactions on the risk of asbestosis. *BioMed research international*, ISSN 2314-6141, 2013, vol. 2013. <http://www.hindawi.com/journals/bmri/2013/405743/>, doi: 10.1155/2013/405743. [COBISS.SI-ID 30775769], [JCR, SNIP, WoS do 3. 4. 2015: št. citatov (TC): 1, čistih citatov (CI): 1, Scopus do 3. 7. 2015: št. citatov (TC): 2, čistih citatov (CI): 2]

4. **FRANKO, Alenka**, DOLŽAN, Vita, KOVAČ, Viljem, ARNERIĆ, Niko, DODIČ-FIKFAK, Metoda. Soluble mesothelin-related peptides levels in patients with malignant mesothelioma. *Disease markers*, ISSN 0278-0240, 2012, vol. 32, no. 2, str. 123-131, doi: 10.3233/DMA-2011-0866. [COBISS.SI-ID 29611737], [JCR, SNIP, WoS do 19. 4. 2017: št. citatov (TC): 7, čistih citatov (CI): 4, Scopus do 25. 4. 2017: št. citatov (TC): 8, čistih citatov (CI): 5]

5. ERČULJ, Nina, KOVAČ, Viljem, HMEJAK, Julija, **FRANKO, Alenka**, DODIČ-FIKFAK, Metoda, DOLŽAN, Vita. DNA Repair Polymorphisms and Treatment Outcomes of Patients with Malignant Mesothelioma Treated with Gemcitabine-Platinum Combination Chemotherapy. *Journal of thoracic oncology*, ISSN 1556-0864, October 2012, vol. 7, no. 10, str. 1609-1617. [COBISS.SI-ID 512300345], [JCR, SNIP, WoS do 17. 11. 2016: št. citatov (TC): 6, čistih citatov (CI): 2, Scopus do 5. 2. 2016: št. citatov (TC): 7, čistih citatov (CI): 4]

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet: POŽARNA VARNOST V OBJEKTIH
Course Title: FIRE SAFETY IN BUILDINGS

Študijski program in stopnja Study Programme and Level	Študijska smer Study Field	Letnik Academic Year	Semester Semester
UŠP Tehniška varnost, 1. stopnja	/	3.	6.
USP Technical Safety, 1 st Cycle	/	3 rd	6 th

Vrsta predmeta / Course Type

izbirni / Elective

Univerzitetna koda predmeta / University Course Code:

TV162

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje Work	Druge oblike študija	Samost. delo Individ. Work	ECTS
45	15	15 SV	/	/	75	5

Nosilec predmeta / Lecturer:

doc. dr. Domen Kušar / Dr. Domen Kušar, Assistant Professor

Jeziki / Languages:

Predavanja / Lectures: Slovenski / Slovenian

Vaje / Tutorial: Slovenski / Slovenian

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:

Študent oz. kandidat mora imeti predmet opredeljen kot študijsko obveznost.

Prerequisites:

The course has to be assigned to the student.

Vsebina:

- Koncept požarne zaščite v objektih (osnovna načela in cilji, bistvene zahteve, ki jih morajo izpolnjevati objekti v primeru požara, skupine ukrepov, načini projektiranja). Normativno varstvo pred požarom v objektih.
- Ukrepi za preprečevanje širjenja požara z objekta na objekt (odmiki, izvedba zunanjih sten in streh,).
- Ukrepi za preprečevanje širjenja požara po objektu (ukrepi pasivne požarne zaščite - požarna ločitev objekta, ukrepi za preprečitev širjenje dima in toplote, ukrepi aktivne požarne zaščite).
- Požarni sektorji in požarno bolj nevarni

Content (Syllabus Outline):

- The concept of fire protection in buildings (the basic principles and objectives, essential fire safety requirements, fire safety measures. Fire protection engineering in building design, fire codes.
- Measures to prevent fire spread outside of buildings/structures (building separation, wall and roof implementation).
- Measures to prevent fire spread within of buildings/structures (passive fire safety measures - fire separation facility, measures to prevent the spread of smoke and heat, active fire safety).
- Fire compartment and dangerous areas

prostori (razdelitev objekta v požarne sektorje, izvedba požarnih sten in stropov, izvedba požarno odpornih zapor, odprtih ter prehodov prezračevalnih kanalov, električnih in drugih napeljav, izvedba sten in stropov požarno bolj nevarnih prostorov).

- Preventivni in zaščitni ukrepi zaradi nevarnosti eksplozivnega gorenja (ukrepi za preprečitev in zaščito pred eksplozijami prahu, vnetljivih tekočin in plinov, ukrepi za zmanjševanje posledic eksplozije – mehanizmi za razbremenjevanje tlaka).
- Evakuacijske poti in izvedba (obnašanje ljudi v požaru, elementi evakuacijskih poti, zaščiteni in nezaščiteni deli, dolžina evakuacijskih poti, višina in širina evakuacijskih poti, dimenzioniranje števila in širine evakuacijskih poti in izhodov, izvedba požarnih stopnišč, izvedba dvigal, lastnosti obložnih materialov, oznake za smer evakuacije in izhode, varnostna razsvetljava na evakuacijskih poteh).

Vzroki večjih nezgod v proizvodnji s primeri; kaj nas ti primeri učijo.

Identifikacija nevarnosti za požar za izbrane primere po različnih metodah (kontrolni listi, preliminarna analiza nevarnosti, drevo dogodkov, drevo napak in posledic, HAZOP).

Ocene požarnega tveganja za izbrane objekte po metodah: DOW, SIA.

Prednosti in slabosti posamezne metode v določenem primeru.

Glede na ocenjeno nevarnost za požar se prikaže izbor ustreznih preventivnih in zaščitnih ukrepov zaradi posebnih nevarnosti v nekaterih okoljih:

- industrijskih panogah in okoljih (lesna industrija, živilska industrija, papirniška industrija, proizvodnja in predelava plastike, nanašanje premaznih sredstev, "vroča" dela, kemijski

(division of buildings into compartments, compartment walls, floors and ceilings, cavity barriers (ventilation systems, service ducts, vertical shafts, electrical and other installations, implementation of walls and ceilings in dangerous areas)

- Prevention and control of fire and explosion (measures to prevent and protect dust explosion, flammable gases, liquid or solids, measures to reduce the effects of an explosion - mechanisms for decreasing pressure).
- Evacuation and implementation (human behaviour in fire emergencies, elements of evacuation routes, protected and unprotected parts, length, height and width of evacuation routes, dimensioning the number and width of evacuation routes and exits, fire stairs design, elevator fire safety, reaction to fire of construction materials, evacuation signs, emergency lighting).

The causes of major accidents in industrial production with examples and learning from these examples.

Identification of fire hazards for selected cases by different methods (checklist, preliminary hazard analysis, event tree, tree failure consequences, HAZOP).

The Fire risk assessment method for selected buildings: DOW, SIA.

Advantages and disadvantages of each method in a particular case.

The appropriate preventive and protective measures for specific hazards in certain environments are selected according to estimated risk of starting the fire:

- industries (wood industry, food industry, paper industry, the production and processing of plastics, coating application, "hot" work, chemical laboratories, computer centres)
- warehouses (goods, flammable liquids,

laboratoriji, računalniški centri)

- med skladiščenjem (blaga, vnetljivih tekočin, industrijskih plinov)
- v javnih zgradbah (bolnice, hoteli, gledališča, športne dvorane).

Pri vajah se obravnavajo praktični računski primeri. Spoznajo izračune za oceno časa do vžiga, maksimalnega dopustnega toplotnega toka na sosednje objekte. Glede na predvideni razvoj požara ocenijo varne odmike med objekti.

industrial gases)

- In public buildings (hospitals, hotels, theatres, sports halls).

The tutorials consist of practical numerical examples. Students become familiar with the calculations of time to ignition, the maximum amount of radiant heat flux from a fire to the neighbouring buildings. According to the expected fire, we determined the distance between a building and its relevant boundary, which is dictated by the amount of heat that is likely to be generated in the event of fire.

Temeljna literatura in viri / Readings:

- Fire Protection Handbook, NFPA, 18. Izdaja, 1997, 1 zv. (loč. pag.) (10%)
- The SFPE Handbook of Fire protection Engineering, 2. Izdaja, 1995, 1 zv. (loč. pag.) (10%)
- Industrial Fire Hazards Handbook, NFPA, 3. Izdaja, 2006, 528 str. (15%)
- Glavnik, A., Jug, A., 2010: Priročnik o načrtovanju požarne varnosti. IZS, Ljubljana (20%)
- Spittank, J. in sod., 2010: Priročnik požarnovarnostnih ukrepov za visoke stavbe (prevod). IZS, Ljubljana. (15%)
- TSG -1-001-2010 Požarna varnost v stavbah. SZPV, Ljubljana. (20%)

Dopolnilna literatura:

- Zakoni in pravilniki veljavni v RS/ Slovenian fire protection laws and regulations
- NFPA, ISO in DIN standardi
- IBC - International Building Codes
- strokovne revije/Journals: Požar, Journal of Loss Prevention in the Process Industries

Cilji in kompetence:

Študent mora povezati pridobljena znanja z različnih področij požara, razvoj požara, odkrivanje, javljanje in alarmiranje, principi gašenja in uporaba vgrajenih naprav za gašenje. Osnovno znanje razširijo s spoznavanjem koncepta požarne zaščite v objektih. Na koncu se posvetijo izboru ustreznih preventivnih in zaščitnih ukrepov na nekaterih primerih iz industrijskega okolja, skladiščenja in javnih zgradb. V seminarski nalogi za izbrani primer samostojno ocenijo nevarnosti za požar in/ali eksplozijo v izbranem okolju in predlagajo izvedbo ustreznih požarno-preventivnih in zaščitnih ukrepov. Namen je pripraviti študente, da bodo sposobni sami oz. v sodelovanju z drugimi strokovnjaki reševati probleme požarne varnosti v praksi.

Objectives and Competences:

Student integrate acquired knowledge from the field of fire safety, the development of fire, detection and alarm systems, fire extinguishing principles and use of firefighting devices. The concept of fire protection in buildings is learned in addition to basic knowledge. On selected building (industry, public building, warehouse) the case study is made in the end. The fire preventive and protective measures are proposed for selected building according to the risk of fire and /or explosion. Students will be able to work individually or in team with other professionals to solve and propose measures of fire safety in practice.

Predvideni študijski rezultati:

<u>Znanje in razumevanje:</u> Študent bo pridobil osnovna teoretska in praktična znanja, ki so potrebna za razumevanje različnih sistemov in komponent za zagotavljanje požarne varnosti v objektu. Razen teoretskih temeljev bodo pridobili tudi praktična znanja o obnašanju materialov in konstrukcij ob požaru.
<u>Uporaba</u> Študent bo spoznal temeljne osnove pasivne požarne zaščite, ki je temelj zagotavljanja ustrezne požarne varnosti v objektih.
<u>Refleksija</u> Kritična presoja učinkovitosti posameznih sistemov v praksi.
<u>Prenosljive spretnosti</u> Potrebno je predznanje predmetov: Osnove tehniške in požarne varnosti, Gorenje in dinamika požarov, Odkrivanje in gašenje požarov, Analize tveganja, Termodinamika in prenos toplote, Nevarne snovi, Materiali, Kemijska procesna varnost, Procesna varnost.

Intended Learning Outcomes:

<u>Knowledge and Comprehension</u> Students will gain basic theoretical and practical knowledge needed to understand the various systems and components to ensure fire safety in the facility. Also will gain practical knowledge about the behaviour of materials and structures in case of fire.
<u>Application</u> The student will learn the fundamentals of passive fire protection, which is the foundation of providing adequate fire safety in buildings.
<u>Reflection</u> A critical assessment of the effectiveness of systems that are used in practice.
<u>Skill-transference Ability</u> Required knowledge: Basic engineering and fire safety, Burning and fire dynamics, Detecting and extinguishing systems, Fire risk analysis, Thermodynamics and heat transfer, Dangerous Materials, Chemical process safety, and process safety.

Metode poučevanja in učenja:

Predavanja Vaje Individualno delo Timsko delo
--

Learning and Teaching Methods:

Lectures Exercises Individual work Teamwork
--

Načini ocenjevanja:

Izpit pisni in ustni. Ocene: 6-10 pozitivno

Delež (v %) /

Weight (in %)

Assessment:

Oral and written exam. Grades 6-10.

Reference nosilca / Lecturer's References:

<ol style="list-style-type: none"> 1. KOMAC, Blaž, ZORN, Matija, KUŠAR, Domen. New possibilities for assessing the damage caused by natural disasters in Slovenia : the case of the real estate record. V: ZORN, Matija (ur.), CIGLIČ, Rok (ur.), PERKO, Drago (ur.). <i>Geographical tidbits from Slovenia : special issue on the occasion of the 32nd International Geographical Congress in Cologne</i>, (Geografski vestnik, 84, 1). Ljubljana: Association of Slovenian Geographers: = Zveza geografov Slovenije, 2012, str. 113-127. 2. KILAR, Vojko, KUŠAR, Domen. Assessment of the earthquake vulnerability of multi-residential buildings in Slovenia = Ocena potresne ogroženosti večstanovanjskih zgradb v Sloveniji. Acta geogr. Slov., 2009, letn. 49, št. 1, str. 89-118, ilustr., zvd., graf. prikazi. http://giam.zrc-sazu.si/sites/default/files/ags49103.pdf, doi: 10.3986/AGS49103.
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[COBISS.SI-ID 30593837]

3. **KUŠAR, Domen**, KILAR, Vojko. Statistična ocena protipožarne varnosti večstanovanjskih zgradb v Sloveniji = Statistical assessment of fire safety in multi-residential buildings in Slovenia. Urbani izziv (Tisk. izd.). [Tiskana izd.], 2009, letn. 20, št. 2, str. 45-57, 115-127, ilustr. [COBISS.SI-ID 2381700]
4. **KUŠAR, Domen**, KILAR, Vojko. Požarna varnost starejših večstanovanjskih zgradb. AR, Arhit. razisk. (Tisk. izd.). [Tiskana izd.], 2010, [Št.] 1, str. 68-69, ilustr.

UL
ELEKT

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet: PRAKTIKUM I
Course title: PRACTICAL COURSE I

Študijski program in stopnja Study Programme and Level	Študijska smer Study Field	Letnik Academic Year	Semester Semester
UŠP Tehniška varnost, 1. stopnja	/	3.	6.
USP Technical Safety, 1 st Cycle	/	3 rd	6 th

Vrsta predmeta / Course Type

obvezni / Mandatory

Univerzitetna koda predmeta / University Course Code:

TV124

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje Work	Druge oblike študija Other study forms	Samost. delo Individ. Work	ECTS
/	/	75 LV	/	/	/	5

Nosilec predmeta / Lecturer:

Prof. dr. Marija Bešter Rogač /
 Dr. Marija Bešter Rogač, Full Professor

Jeziki / Languages:

Predavanja / Lectures: /

Vaje / Tutorial: Slovenski / Slovenian

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:

Študent oz. kandidat mora imeti predmet opredeljen kot študijsko obveznost.

Prerequisites:

The course has to be assigned to the student.

Vsebina:

1. Merjenje temperature
2. Merjenje tlaka
3. Umerjanje merilnikov pretoka
4. Merjenje pretokov
5. Prevajanje toplote
6. Toplotne razmere
7. Hrup
8. Vibracije
9. Merjenje koncentracije prahu v zraku
10. Ocena razmer v delovnem okolju

Content (Syllabus Outline):

1. Measuring of the temperature.
2. Measuring of the pressure.
3. Calibration of the flow rate meters.
4. Flow rate determination.
5. Heat transfer: conduction.
6. The thermal environment.
7. Noise.
8. Vibrations.
9. Concentration determination of the particulate matter samples.
10. Working environment: surveying and assessment

Temeljni literatura in viri / Readings:

- M. Bešter Rogač, P. Gspan, A. Jug, I. Košir, M. D. Puc, M. Tomšič: Praktikum, FKKT; Ljubljana 2007, 130 str. (100%)
- In tam navedena dopolnilna literatura./

Cilji in kompetence:

Pri Praktikumumu si študent z meritvami in lastnimi poskusi poglobi znanje, ki ga je pridobil na predavanjih. Seznan se z metodami ocenjevanja delovnega okolja, zato se tudi meritve nanašajo v glavnem na oceno razmer v delovnem okolju z vidika varstva pri delu. Študent naj bi tudi dobil občutek o oceni točnosti oz. zanesljivosti izmerjenega podatka. Predmet je praktično nadaljevanje predmeta delovno okolje.

Objectives and Competences:

At Practical course students deepen the knowledge obtained at lectures through practical measurements and experiments. Ability to apply basic concepts and facts to assessment of the working environment is obtained together with skills in the determination of measurement accuracy in analytical approach and problem solving. The course is the continuation of the course entitled working environment.

Predvideni študijski rezultati:

Znanje in razumevanje

Študent se pri predmetu seznanja z merilniki, izvedbo meritev, ocenjevanjem napak. V laboratorijskem okolju se nauči meriti parametre, ki se sicer merijo v delovnem okolju.

Uporaba

Razumevanje instrumentalnih tehnik in različnih raziskovalnih metod.

Refleksija

Študent se seznanja s povezovanjem teoretičnega in eksperimentalnega dela ter kritičnim vrednotenjem eksperimentalnih podatkov (statistika, ocena napake)

Prenosljive spretnosti

- reševanje problemov,
- timsko delo,
- zbiranje in interpretiranje eksperimentalnih podatkov,
- kritična analiza in sinteza le-teh,
- podajanje poročil o izvedenem delu

Intended Learning Outcomes:

Knowledge and Comprehension

The students get some experience with measuring instruments, measurements and errors assessment. Parameters, which are measured in the working environment, are established in the laboratory.

Application

Understanding of experimental technique and different research methods.

Reflection

The student becomes insight in the connection between theoretical and experimental work and to the critical assessment of experimental data (statistic, error evaluation)

Skill-transference Ability

- solving of problems
- team work (at laboratory work)
- gathering and interpreting the experimental data
- critical analysis and synthesis of them
- work report

Metode poučevanja in učenja:

- A) laboratorijske vaje z vodenjem laboratorijskega dnevnika
- B) izvedba meritev v delovnem okolju s presojo razmer

Learning and Teaching Methods:

- A) laboratory work with reports
- B) measurements in the real working environment with assessments of conditions.

Delež (v %) /

Načini ocenjevanja:

Weight (in %) **Assessment:**

pisni kolokvij od 6-10 (pozitivno) oz. 1-5 (negativno) oz. opravi / ni opravi; ob upoštevanju Statuta UL in fakultetnih pravil.		written exam 6-10 positive, 1-5 negative; passed or failed considering the Statute of UL and faculty rules.
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Reference nosilca / Lecturer's References:

1. **BEŠTER-ROGAČ, Marija**, HABE, Dušan. Method and apparatus for determination of relative permittivity of solvents. *Acta chim. slov.*. [Tiskana izd.], 2012, vol. 59, no. 3, str. 609-614. [COBISS.SI-ID [36170757](#)].
2. **BEŠTER-ROGAČ, Marija**, HABE, Dušan. Modern advances in electrical conductivity measurements of solutions. *Acta chim. slov.*. [Tiskana izd.], 2006, vol. 53, no. 3, str. 391-395. [COBISS.SI-ID [27955717](#)]
3. **BEŠTER-ROGAČ, Marija**, GSPAN, Primož, JUG, Aleš, KOŠIR, Iztok, PUC, Miha Dominik, TOMŠIČ, Matija. *Praktikum*. Ljubljana: Fakulteta za kemijo in kemijsko tehnologijo, Oddelek za tehniško varnost, 2007. 130 str., ilustr. ISBN 978-961-6286-76-3. [COBISS.SI-ID [229928192](#)]

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet: PRAVNE OSNOVE VARNOSTI
Course Title: LEGAL CONCEPTS OF SAFETY

Študijski program in stopnja Study Programme and Level	Študijska smer Study Field	Letnik Academic Year	Semester Semester
UŠP Tehniška varnost, 1. stopnja	/	2.	3.
USP Technical Safety, 1 st Cycle	/	2 nd	3 rd

Vrsta predmeta / Course Type

obvezni / Mandatory

Univerzitetna koda predmeta / University Course Code:

TV115

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje Work	Druge oblike študija	Samost. delo Individ. Work	ECTS
30	/	45 SV	/	/	75	5

Nosilec predmeta / Lecturer:

izr. prof. dr. Grega Strban / Dr. Grega Strban, Associate Professor

Jeziki / Languages:

Predavanja / Lectures: Slovenski / Slovenian

Vaje / Tutorial: Slovenski / Slovenian

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:

Študent oz. kandidat mora imeti predmet opredeljen kot študijsko obveznost.

Prerequisites:

The course has to be assigned to the student.

Vsebina:

Uvod v pravo: Temeljni pojmi, država, pravo, pravna načela in pravna pravila, pravni subjekti, pravice in obveznosti, pravna razmerja, kazniva dejanja –prekrški, sankcije – kazni, pravni postopki za uveljavljanje pravic in obveznosti. Pravni viri pomembni za varnost in zdravje pri delu. Uvod v mednarodno pravo: pravni akti OZN, MOD, Sveta Evrope in EU na področju varnega in zdravega dela. Državni pravni akti: ustava, zakoni, izvršilni predpisi. Avtonomni pravni akti: kolektivne pogodbe, pogodbe o zaposlitvi, akti delodajalca. Praktični prikaz kako poiskati veljavne pravne akte. Delo po skupinah pri pregledu posameznih podzakonskih pravnih aktov.

Varnost in zdravje pri delu: Pozitivno-pravna

Content (Syllabus Outline):

Introduction to Law: Basic concepts, the State, Law, Legal Principles and Rules, legal subjects, rights and obligations, legal relations, criminality- offences- sanctions-penalties, legal procedures for enforcing rights and obligations. Legal sources important in the field of health and safety at work. Introduction into international law: legal acts of the UN, ILO, Council of Europe, EU in the field of safe and healthy work. State's legal acts: constitution, legislative acts, executive regulation. Autonomous legal acts: collective labour agreements, employment contract, employers' acts. Practical demonstration of searching legal acts in force. Work in groups at studying specific regulations.

ureditev: zakoni in pomen pravilnikov. Obseg in namen sistema varnosti in zdravja pri delu. Temeljna načela. Poškodba pri delu, poklicna bolezen. Obveznosti delodajalcev. Izjava o varnosti s prikazom praktičnih primerov. Pravice in obveznosti delavcev. Pravice in obveznosti pooblaščenih strokovnih oseb in pooblaščenega zdravnika. Kazni za kršitev obveznosti.

Delovna razmerja: Pojem delovnih razmerij. Pogodba o zaposlitvi. Pravice in obveznosti delavcev v delovnem razmerju povezane z varnostjo in zdravjem pri delu: delovni čas, odmori, počitki, dopusti, odsotnost delavcev z dela, izobraževanje delavcev, varstvo materinstva in pravice delavcev, ki skrbijo za otroka, varstvo mladine in invalidov, disciplinska odgovornost, odškodninska odgovornost, varstvo pravic delavcev, delo na domu, začasno in občasno delo, nadzor nad izvajanjem predpisov s področja delovnih razmerij.

Inšpekcija dela: Pravni temelji. Funkcije inšpekcije dela. Pogoji za kvalitetno in učinkovito delo. Pravice inšpektorja za delo v zvezi z inšpekcijskim pregledom. Zapisnik o opravljenem inšpekcijskem nadzorstvu. Ukrepi inšpektorja. Pravice delodajalca v zvezi s pritožbo na odločitev inšpektorja.

Požarna varnost: Pravni temelji. Temeljna načela. Organizacija požarne varnosti. Obveznosti posameznih subjektov. Organizacija gasilstva.

Upravni postopek: Načela upravnega postopka. Stranke v postopku. Postopek na prvi stopnji. Odločba. Pritožba. Obnova postopka. Odprava, razveljavitev in sprememba odločbe. Izvršba. Sodno varstvo.

Socialna varnost: Osnovni prikaz sistema socialne varnosti. Pravice v primeru poškodbe pri delu ali poklicne bolezni.

Safety and Health at work: Positive legal regulation: laws and the aim of regulations. Scope and purpose of the Safety and Health at work System. Basic principles. Work injury, Occupational disease. Employers' obligations. Statement of safety. Workers' rights and obligations. Rights and obligations of authorised competent person and a physician. Sanctions for breaching the obligations.

Employment relations: The notion of employment relationship, rights and obligations of workers related to safety and health at work: working time, breaks, rest periods, absence from work, education of workers, maternity protection and rights of the workers, taking care of their children, protection of youth and disabled, disciplinary responsibility, protection of workers' rights, home work, occasional and temporary work, monitoring of application of the labour legislation.

Labour inspectorate: Legal foundations. Functions of the labour inspectorate. Conditions for quality and effective work. Inspectors' rights performing their work. Record of the exercised inspection. Measures of an inspector. Employers' rights to appeal against inspectors' decision.

Fire safety: Legal foundation. Basic principles. Organisation of fire safety. Obligations of specific subjects. Organisation of the fire fighting.

Administrative procedure: Principles. Parties in a procedure. Procedure in the first instance. Administrative decisions. Complaint. Renewal of the procedure. Abolition, annulment and modification of the decision. Execution. Judicial protection.

Social security: basic features of the social security system. Rights in case of Work injury or Occupational disease.

Temeljni literatura in viri / Readings:

- prof. dr. Grega Strban: Pravne osnove varnosti, učbenik, Univerza v Ljubljani, Fakulteta za kemijo in kemijsko tehnologijo, Ljubljana, 2012, 193 str. (90%)

Dopolnilna literatura:

- Kalčič M.; Lozar A.: Uvodna pojasnila k ZVZD-1, GV Založba, ZVD Zavod za varstvo pri delu, Ljubljana 2011
- Tičar L., Uvod, Zakon o delovnih razmerjih in Zakon o urejanju trga dela, GV Založba, Ljubljana 2013
- Bubnov Škoberne, A.; Strban G., Pravo socialne varnosti, GV Založba, Ljubljana 2010 (izbrana poglavja)
- Veljavni zakoni in drugi predpisi s področja varnosti in zdravja pri delu, delovnih razmerij, požarne varnosti.

Cilji in kompetence:

Namen predmeta je pridobitev osnovnih znanj o:

- pomenu pravne ureditve,
- vsebini predpisov s področja varnosti in zdravja pri delu, delovnih razmerij, požarne varnosti,
- pravicah in obveznostih delodajalcev in delavcev pri izvajanju varnosti in zdravja pri delu,
- nadzoru inšpekcije dela.

Objectives and Competences:

Objective of the course is to gain the basic knowledge of:

- The meaning of the legal regulation,
- Content of the legislation in the field of safety and health at work, employment relations and fire safety
- Rights and obligations of the employers, workers exercising safety and health at work,
- Control of labour inspectorate

Predvideni študijski rezultati:

Znanje in razumevanje:

Študent spozna in razume pravno ureditev varnosti in zdravja pri delu ter požarne varnosti. Prav tako spozna pomen obravnavanega področja za različne pravne subjekte (delavce, delodajalce in državo).

Uporaba

Študent je sposoben poiskati veljavno zakonodajo in uporabiti relevantne pravne norme v konkretni situaciji.

Refleksija

Študent je sposoben kritično ovrednotiti pridobljeno znanje in njegovo uporabo v konkretnih primerih.

Prenosljive spretnosti

Poznavanje pravnega sistema in vrste pravnih virov. Reševanje konkretnih primerov z metodami prava.

Intended Learning Outcomes:

Knowledge and Comprehension

Student gets familiar and understands legal regulation of the health and safety at work and fire safety. Student gets familiar with the meaning of the issue for different participles (workers, employers, state) as well.

Application

Student is capable to search legislation in force and use the relevant legal norms in concrete situation.

Reflection

Student is capable of critical evaluation of a conquered knowledge and its usage in practise.

Skill-transference Ability

Familiarity of legal system and different legal sources. Solution of practical cases using the legal methods.

Metode poučevanja in učenja:

Learning and Teaching Methods:

Predavanja, seminarsko delo, reševanje konkretnih primerov, analiza in uporaba pravnih besedil.

Lectures, seminar work, solving of the concrete cases, analyses and usage of legal texts.

Delež (v %) /

Načini ocenjevanja:

Weight (in %)

Assessment:

Dva pozitivno ocenjena kolokvija Ustni izpit Ocene: nzd (5) do odl (10), pri čemer so pozitivne ocene od zd (6) do odl (10).	50% 50%	Two successfully passed preliminary exams. Oral exam Marks: insufficient (5) up to excellent (10), while marks from 6 up to 10 are positive.
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Reference nosilca / Lecturer's References:

1. **STRBAN, Grega.** Pravne osnove varnosti, učbenik, Univerza v Ljubljani, Fakulteta za kemijo in kemijsko tehnologijo, Ljubljana, 2012
2. BUBNOV ŠKOBERNE, A.; **STRBAN G.**, Pravo socialne varnosti, GV Založba, Ljubljana 2010
3. **STRBAN, Grega:** GRADIŠEK Anton; BALAŽIC Jože: Izmenjava medicinske dokumentacije med izbranimi osebnimi zdravniki in pooblaščenimi zdravniki delodajalca, Zdravniški Vestnik (Slovenian Medical Journal), letn. 80, 2011, št. 10, str. 775-784.

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet: PSIHOLOGIJA DELA
Course title: OCCUPATIONAL PSYCHOLOGY

Študijski program in stopnja Study Programme and Level	Študijska smer Study Field	Letnik Academic Year	Semester Semester
UŠP Tehniška varnost, 1. stopnja	/	3.	5.
USP Technical Safety, 1 st Cycle	/	3 rd	5 th

Vrsta predmeta / Course Type

obvezni / Mandatory

Univerzitetna koda predmeta / University Course Code:

TV121

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje Work	Druge oblike študija	Samost. delo Individ. Work	ECTS
60	15	/	/	/	75	5

Nosilec predmeta / Lecturer:

doc. dr. Marija Molan / Dr. Marija Molan, Assistant Professor

Jeziki / Languages:

Predavanja / Lectures: Slovenski/ Slovenian

Vaje / Tutorial: /

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:

Študent oz. kandidat mora imeti predmet opredeljen kot študijsko obveznost.

Prerequisites:

The course has to be assigned to the student.

Vsebina:

Snov predmeta "Psihologija dela" vsebuje temeljne informacije in znanja o človeku v delovnem sistemu. Vključene so naslednje teme:

- predmet, razvoj in cilji psihologije dela
- delo in značilnosti dela
- človek in njegove sposobnosti
- osebnostne lastnosti
- motivacija v delovnem okolju
- vloga človeka v delovnem procesu sistema
- identifikacija povezave dejavnikov dela in delovnega okolja s človekom
- vpliv tehnološkega dela sistema na človekovo razpoložljivost in vedenje
- vpliv delovnih pogojev na človekovo

Content (Syllabus outline):

Course "Occupational psychology" contains basic information and knowledge about worker in the working system. Following topics are included:

- The subject, the development and objectives of occupational psychology
- Work and job characteristics
- Worker and his ability
- Personal traits
- Motivation in the workplace
- The role of man in the workflow system
- Identification of the connection factors and working environment with human
- The impact of the technological part of the system on human availability and behaviour
- The impact of working conditions on human

razpoložljivost in vedenje

- vpliv organizacijskih dejavnikov na človekovo razpoložljivost in vedenje
- vpliv človekovih zmogljivosti na razpoložljivost in vedenje
- vpliv človekove razpoložljivosti na učinkovitost in varnost delovanja sistema
- negativni pojavi v delovnem okolju
- vedenjski vzorci in delovne situacije
- humanizacijski ukrepi kot način intervencije v delo in zmanjševanje teže dela
- zagotavljanje učinkovitega vedenja človeka v sistemu
- oblikovanje varnostne kulture
- psihoaktivne snovi in vpliv na razpoložljivost
- obrambno reagiranje človeka in vpliv na razpoložljivost
- varno, zdravo in učinkovito vedenje človeka v delovnem procesu
- obvladovanje obremenitev
- psihosocialne obremenitve in tveganja v delovnem okolju

Vsebina seminarske naloge:

Na osnovi znanj iz predavanj in znanj in drugih predmetov (Ocena tveganja) si študenti izberejo problem iz prakse. Izdelajo oceno psihosocialnih in psihičnih obremenitev za delo, ki ga zelo dobro poznajo (izdelajo oceno tveganja). Izbrani problem obdelajo in predlagajo najučinkovitejše humanizacijske ukrepe za zagotavljanje varnosti in zdravja. Seminarsko nalogo predstavijo pred avditorijem študentov in oddajo poročilo v pisni obliki v obsegu 15 strani.

availability and behaviour

- The impact of organizational factors on human availability and behaviour
- The impact of human abilities on availability and behaviour
- Impacts of human availability on performance and system safety
- Negative occurrence in the workplace
- Behaviour patterns and work situations
- Implementation of humanization measures for reduction of work loads
- Ensuring effective human behaviour in the system
- Creating a safety culture
- Psychoactive substances and their impacts on human availability
- Defensive reaction of the individual and their impacts on human availability
- Safe, healthy and effective human behaviour in the work process
- Load management
- Psychosocial loads and risks in the workplace

The seminar:

Students should select a problem from a real work; it should be based on skills and knowledge from this and other lectures (risk assessment). Risk assessment of psychosocial loads of the selected workplace is made. They suggest reduction of risk and introduction of the most tailored humanization measures to assure health and safety.

A paper should be presented in front of the audience of students. Written report should also be submitted - 15 pages.

Temeljni literatura in viri / Readings:

- Molan M.; 10 Zapovedi humanizacije dela, DELO IN VARNOST, L. 41, št. 3, 4, 5, 6 in L. 42 št. 1 in 2. (70%)
- Paul M. MUCHINSKY; Psychology Applied to Work: An introduction to industrial and organizational psychology, Sixth edition, 1999, 560 str. (20%)
- Molan M., Človekovo vedenje v Priročnik za varno in zdravo delo, Koselj V. (ur), Tehniška založba Slovenije, 2002, 378-386 str. (10%)

Cilji in kompetence:

Pri predmetu "Psihologija dela" bodo študentje dobili temeljna znanja o človeku v delovnem sistemu, o identifikaciji vloge človeka in njegovih lastnosti v sistemu ter se seznanili z ukrepi za zagotavljanje varnosti in zdravja v delovnem okolju s posebnim poudarkom na obvladovanju psihosocialnih tveganj in stabilnega delovanja sistema z zagotavljanjem ustrezne vloge človeka v sistemu.

Objectives and Competences:

Students will get basic knowledge about human behavior in the work place. They will be able to identify human role in the system. They will get information about safety and health protection measures implementation with special emphasis on psychosocial risk management. Information of stable efficiency of the system with assurance of human role in the system.

Predvideni študijski rezultati:Znanje in razumevanje

Študent bo pridobil osnovna teoretska in praktična znanja, ki so potrebna za razumevanje vloge človeka v sistemu, ki jih varnostni inženir nujno potrebuje pri vsakodnevem delu. Študent bo razumeli povezavo tehnološkega dela sistema s človekom in njuno povezanost v varnem delovanju sistema kot celote s posebnim poudarkom na prepoznavanju psihosocialnih tveganj.

Uporaba

Študenti bodo znali identificirati temeljne vedenjske vzorce človeka, ki so nujno potrebni za zagotavljanje varnosti v delovnem okolju. Pridobili bodo temeljna znanja o psihičnem funkcioniranju človeka in medsebojnemu vpliva dela in delavca v procesu dela. Naučili se bodo povezovati človekovo razpoložljivost z varnim in učinkovitim vedenjem. Naučili se bodo uporabljati nekatere metode za razbremenitev človeka v delovnem sistemu in implementirati osnovne humanizacijske ukrepe. Praktično se bodo usposobili za vgraditev mehanizmov (humanizacijskih ukrepov), ki zagotavljajo varnost in zdravje v delovnem okolju.

Refleksija

Znanje bo študentu omogočilo iskanje zvez in razlik med obnašanjem človeka in tehnološkim delovnim okoljem.

Intended Learning Outcomes:Knowledge and Comprehension

Students will get basic theoretical and practical knowledge, necessary for comprehensive understanding of human role in the system. Future safety engineers will understand relation between technical and human part of the system as unique effective and safe system. Special interest will be focused to the psychosocial risk.

Application

Students will be able to identify basic human behaviour patterns necessary for safety assurance. They will get basic knowledge about psychological functions and interrelation between work and worker. They will be able to relate human availability with safety and performance. They will be able to use some methods for reduction of work load and implementation of humanisation measures. They will be able to implement humanization measures at work place to assure health and safety.

Reflection

Students will be able to identify mutual impacts and differences between human and technological part of the system.

Prenosljive spretnosti

Pri predmetu bodo študentje pridobili osnovna znanja o človekovem vedenju, zagotavljanju varnega vedenja in spoznali bodo osnovne humanizacijske ukrepe za zagotavljanje varnega vedenja.

Skill-transference Ability

Students will get basic knowledge about human behaviour, safe behaviour assurance, and basic humanization measures to assure safety at the work place.

Metode poučevanja in učenja:

- Predavanja
- Seminar

Learning and Teaching Methods:

- Lectures
- Seminars

Načini ocenjevanja:

Izpit pisni
Ocena seminarske naloge (1/3)

Pozitivna ocene: 6,7,8,9,10

Delež (v %) /
Weight (in %)

70%
30%

Assessment:

Written exam
Project

Passing rate: 6,7,8,9,10

Reference nosilca / Lecturer's References:

- **MOLAN, Marija**, MOLAN, Gregor. Model ocenjevanja tveganja v delovnem okolju = Model of risk assessment in the working environment. V: ČRNIVEC, Rajko (ur.), DODIČ-FIKFAK, Metoda (ur.). Ocena tveganja, (Sanitas et labor, letn. 7, št. 1). Ljubljana: Univerzitetni klinični center, Klinični inštitut za medicino dela, prometa in športa: = University Medical Centre, Institute of Occupational, Traffic and Sports Medicine, 2008, str. 31-44, ilustr. [COBISS.SI-ID 30028037]

- **MOLAN, Marija**, MOLAN, Gregor. Psihična obremenjenost na delovnem mestu - pojavljanje, prepoznavanje in obvladovanje : prikaz preverjanja modela rh v realnem delovnem okolju = Workplace - related mental overload - occurrence, identification and management : RH-model verification in real work environment. Zdravstveno varstvo. [Tiskana izd.], 2008, letn. 47, št. 1, str. 37-46. <http://www.ivz.si/>. [COBISS.SI-ID 1973733]

- **MOLAN, Marija**, MOLAN, Gregor. Availability humanization - the semantic model in occupational health. V: JARM, Tomaž (ur.), KRAMAR, Peter (ur.), ŽUPANIČ, Anže (ur.). 11th Mediterranean Conference on Medical and Biological Engineering and Computing 2007, 26-30 June, 2007, Ljubljana, Slovenia, (IFMBE proceedings, vol. 16). New York: Springer: International Federation for Medical and Biological Engineering, 2007, str. 162-165.

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet: STATISTIKA VARNOSTI
Course Title: SAFETY STATISTICS

Študijski program in stopnja Study Programme and Level	Študijska smer Study Field	Letnik Academic Year	Semester Semester
UŠP Tehniška varnost, 1. stopnja	/	3.	5.
USP Technical Safety, 1 st Cycle	/	3 rd	5 th

Vrsta predmeta / Course Type

obvezni / Mandatory

Univerzitetna koda predmeta / University Course Code:

TV130

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje Work	Druge oblike študija	Samost. delo Individ. Work	ECTS
45	/	30 SV	/	/	75	5

Nosilec predmeta / Lecturer:

prof. dr. Tomaž Urbič / Dr. Tomaž Urbič, Full Professor

Jeziki / Languages:

Predavanja / Lectures: Slovenski / Slovenian

Vaje / Tutorial: Slovenski / Slovenian

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:

Študent oz. kandidat mora imeti predmet opredeljen kot študijsko obveznost.

Prerequisites:

The course has to be assigned to the student.

Vsebina:

Snov predmeta zajema znanja iz področja statistike in aplikacije v varnostna znanja.

- Boolova algebra, kombinatorika.
- Verjetnostni račun: klasična in statistična definicija verjetnosti, Bayesova formula, zaporedje neodvisnih poskusov, slučajne spremenljivke, številske karakteristike in porazdelitve v varnosti.
- Statistika: naloge statistike, faze raziskovanja, zbiranje podatkov, vrste podatkov, prikazi podatkov.
- Statistična opisovanja: grupiranje, frekvenčna distribucija, relativna števila (strukturni deleži, koeficienti, indeksi), mere srednjih vrednosti in mere variacije.
- Statistična analiza: Vzorčenje in vzorčne

Content (Syllabus Outline):

This material includes the object of knowledge in the field of statistics and the application of safety knowledge.

- Boolean algebra, combinatorics.
- Probability theory: classical and statistical definition of probability, Bayes formula, a sequence of independent trials, random variables, numeric characteristics and distribution in safety science.
- Statistics: Statistics tasks, phases of statistical research, data collection, data types, data displays.
- Statistical describe of grouping, frequency distribution, relative numbers (proportions, ratios, indices), rates of mean values and the extent of variation.
- Statistical analysis: Sampling and sampling

porazdelitve, ocene parametrov, testiranje hipotez, časovne vrste in njihov grafični prikaz, regresije, analiza variance.

- Evidence, statistika nezgod in požarna statistika.

VSEBINA VAJ :

Računske vaje in izdelava projektne seminarske naloge – praktičnega primera statistične raziskave od vzorca do deduktivne statistične analize.

distribution, parameter estimation, hypothesis testing, time series and their graphical representation, regression, analysis of variance.

- The records statistics of accidents and fire statistics.

CONTENTS EXERCISES:

Tutorial and seminar preparation of project tasks - a practical example of statistical surveys of a sample of deductive statistical analysis.

Temeljna literatura in viri / Readings:

- Šrekl J., Študijski materiali (predavanja, prosojnice, izpitne naloge in vprašanja, seminarske naloge) – dostop na internetu <http://www.fkkt.uni-lj.si/si/?82> (70%)
- Montgomery D. C., Applied Statistics and Probability for Engineers, JW, New York 2002. (30%)
- DeCoursey W. J., Statistics and Probability for Engineers Applications (With Microsoft Excel), Elsevier Science (USA), 2003 (15%)

Dopolnilna literatura:

- Johnson R. A., Bhattacharya G. K., Statistics, JW, New York, 2001,
- McKaber M. A., West J. K., Johnson Excel Manual, JW, 2006

Cilji in kompetence:

Uvajanje statističnih metod dela v varnost pri delu in požarno varnost.

Predmetno specifične kompetence:

- Študent pozna in zna uporabljati metode zbiranja, urejevanja, prikazovanja ter vrednotenja rezultatov meritev na objektivni in deduktivni način.
- Pozna strokovno izrazoslovje statistike in statistične računske metode vrednotenja ene, dveh ali več temeljnih skupnosti. Prav tako pozna osnovne teoretičnih modelnih porazdelitev, ki služijo za statistične analize.
- Predmet navaja študente na kritično presojo rezultatov s preverjanjem veljavnosti ničelne in alternativne hipoteze ter omogoča sprejemanje razumnih odločitev v praksi na osnovi deduktivne statistične analize in s tem presojo vrednosti pokazateljev in cenilk stanja varnosti.
- Študent zna interaktivno uporabljati statistično programsko opremo.

Objectives and Competences:

The introduction of statistical methods in occupational safety and fire safety.

Subject-specific competencies:

- The student knows and is able to use the methods of collecting, editing, presenting and evaluating the results of measurements in an objective and deductive manner.
- Is familiar with the technical terminology of statistics and statistical calculation methods of valuation of one, two or more fundamental community. It is also aware of the underlying theoretical model distribution serving for statistical analysis.
- The student is declared upon critical assessment of the results of the validation null and alternative hypotheses and to make sound decisions in practice based on deductive statistical analysis and by assessing the indicators and estimators security status.
- The student can interactively use statistical software.

Predvideni študijski rezultati:

<u>Znanje in razumevanje</u> Študent bo pridobil osnovna znanja iz statistike, aplikativne metode za področje varnosti in požarne varnosti. Pridobi tudi sposobnost in znanja za presojanje merjenih rezultatov ter dela z množičnimi podatki.
<u>Uporaba</u> Pridobljena znanja bo lahko študent uporabil v praksi pri zbiranju in obdelavi podatkov ter ocenjevanju tveganj in nevarnosti.
<u>Refleksija</u> Presojanje vrednosti rezultatov, ki jih prinašajo različni statistični podatki.
<u>Prenosljive spretnosti</u> Uporaba računalnika za potrebe statističnega računanja in programov za obdelavo podatkov (Excel, Access, Matlab, SSPS, Statistika, LISREL, PRELIS, itd.). Timsko delo in projektne naloge v seminarju.

Intended Learning Outcomes:

<u>Knowledge and Comprehension</u> Students will gain basic knowledge of statistics, applied methods for security and fire safety. Also, acquire the ability and knowledge to assess the measured results and work with the mass data.
<u>Application</u> The student to practice for collecting and processing data and assessing risks and hazards will use the acquired knowledge.
<u>Reflection</u> Assessing the value of the results yielded by various statistics.
<u>Skill-transference Ability</u> Using the computer for the purposes of statistical computation and data processing programs (Excel, Access, Mat lab, SSPS, Statistics, LISREL, trick, etc.). Teamwork and project work in the seminar.

Metode poučevanja in učenja:

Predavanja Računske vaje

Learning and Teaching Methods:

Lectures Tutorials

Delež (v %) /

Načini ocenjevanja:

Weight (in %)

Assessment:

Izpit pisni in ustni. Ocene: 6-10 pozitivno Projektna naloga (1/4 ocene).	75% 25%	Written and oral exam. Marks: 6-10 positive Project course work (1/4 of assessment)
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Reference nosilca / Lecturer's References:

- URBIČ, Tomaž. Ions increase strength of hydrogen bond in water. Chemical Physics Letters, 2014, vol. 610/611, no. 1, str. 159-162
- HUŠ, Matej, URBIČ, Tomaž. Strength of hydrogen bonds of water depends on local environment. J. chem. phys., 2012, vol. 136, no. 14, art. no. 144305
- HUŠ, Matej, URBIČ, Tomaž. Quantum chemical tests of water-water potential for interaction site water models. Acta chim. slov.. 2012, vol. 59, no. 3, str. 541-547

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet:	STROJNI IN GRADBENI ELEMENTI
Course Title:	MACHINE AND CONSTRUCTION ELEMENTS

Študijski program in stopnja Study Programme and Level	Študijska smer Study Field	Letnik Academic Year	Semester Semester
UŠP Tehniška varnost, 1. stopnja	/	2.	3.
USP Technical Safety, 1 st Cycle	/	2 nd	3 rd

Vrsta predmeta / Course Type obvezni / Mandatory

Univerzitetna koda predmeta / University Course Code: TV109

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje work	Druge oblike študija	Samost. delo Individ. work	ECTS
45	/	30 SV	/	/	75	5

Nosilec predmeta / Lecturer: doc. dr. Boris Jerman / Dr. Boris Jerman, Assistant Professor

Jeziki / Languages: Predavanja / Lectures: Slovenski / Slovenian
Vaje / Tutorial: Slovenski / Slovenian

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti: **Prerequisites:**

Študent oz. kandidat mora imeti predmet opredeljen kot študijsko obveznost.	The course has to be assigned to the student.
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Vsebina:

Osnove tehniškega risanja. Predstavitev osnovnih mednarodnih in domačih standardov ter tehniške prakse, ki obravnavajo varnostne zahteve za strojne in gradbene elemente. S stališča varstva pri delu so predstavljeni materiali, ki se za te elemente uporabljajo. Vključene so ustrezne teoretične osnove, na katerih posamezne zahteve temeljijo. Vključene so naslednje teme:

- varjenje: postopki varjenja, kakovost in kontrola zvarov, materiali;
- vezni elementi: žičnik, vijaki in matice, vrste navojev, drugi vezni elementi;
- elementi gonil: osi in gredi, ležaji, sklopke, zobniki, verižna gonila, torna gonila;
- gradiva in polizdelki v gradbeništvu (beton, jeklo, keramika, les)

Content (Syllabus Outline):

Fundamentals of technical drawing. Presentation of basic international and domestic standards and technical practices that address the safety requirements for mechanical and structural elements. From the standpoint of safety at work materials used for these elements are presented. The relevant theoretical bases are included on which separate requirements are based. The following topics are included:

- Welding: welding processes, weld quality control, materials;
- Fasteners: nails, bolts and nuts, thread types, other fasteners;
- transmission elements: axles and shafts, bearings, couplings, gears, chain drives, friction drives;

- stavbarstvo: temelji, stebri, zidovi, nosilci, plošče, ostrešja, kritine, stopnice, okna, vrata.

- materials and semi-finished products for construction (concrete, steel, ceramics, wood)
- building parts: foundations, columns, walls, beams and columns, slabs, roofing, stairs, windows, doors.

Temeljni literatura in viri / Readings:

- I. Prebil, Tehnična dokumentacija, Tehniška založba Slovenije, Ljubljana, 1995, 435 str., (25%)
 - J. Krobe, Strojni elementi, Tehniška fakulteta v Mariboru, VTO Kemijska tehnologija, 1986, 225 str., (60%)
 - A. Berdajs, Gradbeniški priročnik, 3., predelana in razširjena izd., Tehniška založba Slovenije, Ljubljana, 2004, 2006, 560 str. (10%)
- Dopolnilna literatura / Additional literature:**
- B. Kraut, Krautov strojniški priročnik 10. slovenska izd., predelana in izpopolnjena, Tehniška založba Slovenije, Ljubljana, 1993, 694 str.,

Cilji in kompetence:

Cilj predmeta je predstavitev osnov strojne in gradbene stroke. Slušatelji se seznanijo s principi uporabe strojnih in gradbenih elementov ter z uporabo koncepta vgrajene varnosti. Slušatelji se seznanijo s posameznimi strojnimi in gradbenimi elementi in njihovo uporabo.

Objectives and Competences:

The objective of the course is to introduce the basics of mechanical and civil engineering field. The principles of the use of mechanical and structural elements are introduced to students, as well as the concept of inherent safety. Students get familiar with the various machine and structural elements and their use.

Predvideni študijski rezultati:

- Znanje in razumevanje
Pri predmetu bo slušatelj pridobil osnovna teoretska in praktična znanja za oceno varnosti posameznih obravnavanih strojnih in gradbenih elementov. Slušatelj bo po opravljenem izpitu:
- seznanjen z osnovnimi principi delovanja obravnavanih strojnih in gradbenih elementov;
 - seznanjen z osnovnimi principi vgrajene varnosti;
 - seznanjen z osnovnimi postopki dimenzioniranja obravnavanih elementov.
- Uporaba
Predmet je usmerjen k reševanju varnostnih problemov, s katerimi se varnostni inženir srečuje v praksi. Slušatelj bo po opravljenem izpitu:
- usposobljen oceniti raven vgrajene

Intended Learning Outcomes:

- Knowledge and Comprehension
In this course students will acquire basic theoretical and practical knowledge to assess the inherent safety of the individual mechanical and structural elements. Students will be after the final exam:
- familiar with the basic principles of operation of the present mechanical and structural elements;
 - familiar with the basic principles of the inherent safety;
 - familiar with the basic procedures for the design of the elements.
- Application
The course is oriented to solve machine inherent safety problems which the safety engineers experience in practice. Students will be after the final exam:
- qualified to assess the level of inherent

<p>varnosti;</p> <p>ii. usposobljen oceniti morebitno odstopanje od normalnega delovanja posameznih elementov;</p> <p>iii. usposobljen oceniti ustreznost postopkov dimenzioniranja;</p> <p>iv. usposobljen oceniti ustreznost zamenjave, popravila oz. rekonstrukcije.</p>	<p>safety;</p> <p>ii. qualified to assess any deviation from the normal operation of individual element;</p> <p>iii. qualified to evaluate the adequacy of design procedures;</p> <p>iv. qualified to assess the adequacy of replacement, repair or reconstruction.</p>
<p><u>Refleksija</u></p> <p>Spoznanja o principih dimenzioniranja predstavljajo trdni temelj za preverjanje odločitve, povezanih z varnostjo strojev in naprav ter stavb, v praksi.</p>	<p><u>Reflection</u></p> <p>Knowledge of the design principles represent a solid basis for practical verification of the decisions related to the safety of machinery and buildings.</p>
<p><u>Prenosljive spretnosti</u></p> <p>V okviru predmeta si bo slušatelj pridobil oz. utrdil sledeča znanja oz. spretnosti: razbiranje tehniških risb, ki so osnova tehniškega sporazumevanja, razumevanje zahtevnejših strokovnih tekstov, kot so tehniški standardi, uporaba standardov v tujih jezikih, razvoj analitičnega načina mišljenja.</p>	<p><u>Skill-transference Ability</u></p> <p>During the course students will acquire the following knowledge or skills: interpretation of engineering drawings, which are the basis of technical communication, understanding of complex texts such as technical standards, the use of standards in foreign languages, development of analytical thinking.</p>

Metode poučevanja in učenja:

Predavanja, teoretske vaje, laboratorijske vaje, domače delo – izdelava seminarske naloge (seminarska naloga je praktičen primer ocenjevanja vgrajene varnosti – primer konkretnega sklopa v neki proizvodnji – obisk p, pridobitev podatkov in rešitev).

Learning and Teaching Methods:

Lectures, exercises, lab work, domestic work - seminars (seminar is a practical example of assessment of inherent safety - case study of parts of an existing machine in real world company - visit of the company, gaining the information, solution).

Načini ocenjevanja:	Delež (v %) / Weight (in %)	Assessment:
Izpit (pisno in/ali ustno) iz teorije in vaj. Možnost opravljanja pisnega dela izpita s kolokviji.	70%	Examination (written and/or oral) of theory and exercises. Optionally the written examination can be replaced by colloquiums. Seminar work and effectiveness of cooperation in exercises presents a part (1/3) of the exercise grade. The grades rate from 1 to 10. Grades 1 to 5 are negative, grades 6 to 10 are positive as follows: 6-sufficient, 7-good, 8 and 9-very good, 10-excellent.
Del ocene iz vaj predstavlja ocena seminarske naloge in uspešnost sodelovanja pri vajah (1/3). Lestvica ocen od 1 do 10. Ocene 1 do 5 so negativne, ocene 6 do 10 pa pozitivne in sicer: 6-zadostno, 7-dobro, 8 in 9-prav dobro, 10-odlično.	30%	

Reference nosilca / Lecturer's References:

1. HLADNIK, Jurij, RESMAN, Franc, **JERMAN, Boris**. Torsion stiffness of a racing cross-country ski boot. *Proc. Inst. Mech. Eng., Part P, sports eng. technol. (Print)*, 2013, doi: [10.1177/1754337113485349](https://doi.org/10.1177/1754337113485349). [COBISS.SI-ID [12936475](https://www.cobiss.si/id/12936475)]

2. VUJIČIĆ, Andrija, ZRNIĆ, Nenad Đ., **JERMAN, Boris**. Ports sustainability : a life cycle assessment of zero emission cargo handling equipment. *Stroj. vestn.*, Sep. 2013, vol. 59, no. 9, str. 547-555, ilustr., doi: [10.5545/sv-ime.2012.933](https://doi.org/10.5545/sv-ime.2012.933). [COBISS.SI-ID [13112859](#)]
3. **JERMAN, Boris**, HRIBAR, Anton. Dynamics of the mathematical pendulum suspended from a moving mass. *Teh. vjesn. - Stroj. fak.*, 2013, vol. 20, no. 1, str. 59-64, ilustr. http://hrcak.srce.hr/index.php?show=clanak&id_clanak_jezik=143490. [COBISS.SI-ID [12724251](#)]

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UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet:	VARNOST V STROJNIŠTVU
Course Title:	SAFETY IN MECHANICAL ENGINEERING

Študijski program in stopnja Study Programme and Level	Študijska smer Study Field	Letnik Academic Year	Semester Semester
UŠP Tehniška varnost, 1. stopnja	/	1.	2.
USP Technical Safety, 1 st Cycle	/	1 st	2 nd

Vrsta predmeta / Course Type obvezni / Mandatory

Univerzitetna koda predmeta / University Course Code: TV106

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje work	Druge oblike študija	Samost. delo Individ. work	ECTS
45	/	30 SV	/	/	75	5

Nosilec predmeta / Lecturer: doc. dr. Boris Jerman / Dr. Boris Jerman, Assistant Professor

Jeziki / Languages:

Predavanja / Lectures:	Slovenski / Slovenian
Vaje / Tutorial:	Slovenski / Slovenian

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:

Študent oz. kandidat mora imeti predmet opredeljen kot študijsko obveznost.	Prerequisites: The course has to be assigned to the student.
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Vsebina:

Strokovno izrazje. Pomembni vidiki pri snovanju. Kriteriji dimenzioniranja. Kovinska gradiva in njihove mehanske lastnosti. Kvalitete konstrukcijskih jekel in njihov izbor. Sile. Redukcija sil, moment dvojice sil, sile v podporah zunanje statično določenih sistemov, sestavljeni sistemi teles. Težišča. Konstrukcijski elementi: nosilci, paličje, mešani sistemi, vrvi. Trenje na kolutih. Napetosti in deformacije, Hookov zakon. Osnovne obremenitve: tlak in vlek, upogib, torzija, uklon. Porušne hipoteze. Kombinirane obremenitve: vlek in upogib, poševni upogib, strig simetričnih in nesimetričnih prerezov, strig in torzija, upogib in strig, upogib in torzija, upogib zelo zakrivljenih nosilcev. Trdnost

Content (Syllabus Outline):

Terminology. Important aspects of the design. Criteria for design calculations. The metal materials and their mechanical properties. Qualities of the structural steels and their selection. Forces. Reduction of forces, torque of pair of forces, constrains forces in statically determined systems, compound body systems. Centre of gravity. Structural elements: beams, trusses, mixed systems, rope. Friction of rope on disc. Stress and strain, Hooke's law. Base loads: tension and compression, bending, torsion, buckling. Failure criteria. Combined loading: tension and bending, oblique bending, shear of symmetric and asymmetric cross sections, shear and torsion, bending and shear, bending and

valjev (cev, palica, disk, obroč). Energijska metoda: statično določeni primeri in statično nedoločeni primeri (nosilec na treh podporah, konzola z dodatno oporo, obojestranska konzola, okvirji in loki, statično nedoločeno paličje). . Zmanjšanje tveganja z načrtovanjem. Izdelava strojev z vgrajeno varnostjo. Upoštevanje načrtovalskih pravil, podatkov o lastnostih materiala. Uporaba tehnologij, postopkov z vgrajeno varnostjo.

torsion, bending of curved beams. The strength of the cylinders (tube, rod, disk, ring). Energy method: statically determined and statically indeterminate cases (beam with three supports, console with extra support, mutual console, frames and arches, statically indeterminate trusses). Reduction of the risk by the design. Machines and inherent safety measures. Consideration of design rules and material data. The use of technologies and processes with inherent safety.

Temeljna literatura in viri / Readings:

1. A. Alujevič, B. Harl, Mehanika I, FS UM, 2006, 201 str., (50%)
2. I. Gubenšek, Rešene naloge iz trdnosti, FS, UM, 2005, 2. ponatis, 245 str., (50%)
3. I. Gubenšek, Rešene naloge iz statike, FS, UM, 2006, 2. ponatis., 179 str., (45%)
4. B. Derby, D. A. Hills, C. Ruiz, Materials for engineering - A fundamental design approach, London, 1992, 300 str., (5 %)

Dopolnilna literatura / Additional literature:

5. R.C. Hibbeler, Mechanics of Materials, 6th edition, 2005, Pearson, 896 str.,
6. R.C. Hibbeler Statics and Dynamics 10th Edition, 2004, Pearson 1314 str.,
7. J.M. Gere, Mechanics of Materials, 2004, sixth edition, Thomson 926 str.,
8. Drusany: Varnostno tehnični priročnik, VZA grafično oblikovanje, Logatec, 1999, 718 str.

Cilji in kompetence:

Podati osnove varnosti v strojništvu študentom tehniške varnosti in pri njih vzbuditi razumevanje za povezanost izbranih gradiv, zasnove konstrukcij in obremenitvenih stanj konstrukcij s tehniško varnostjo. Študent spozna nevarnosti in tveganja povezana z delovnimi napravami in pripravami ter se nauči analizirati elemente vgrajene varnosti.

Objectives and Competences:

To provide the basic information to the students about the safety in mechanical engineering and to promote the understanding of the connection among the selected materials, the design of structures and loading conditions of the constructions with technical safety.

Students learn about the hazards and risks associated with occupational appliances and apparatus, and learn to analyse the elements of the inherent safety.

Predvideni študijski rezultati:

Znanje in razumevanje

Pri predmetu bo slušatelj pridobil osnovna teoretska in praktična znanja za oceno vgrajene varnosti posameznih obravnavanih strojnih in gradbenih elementov. Slušatelj bo po opravljenem izpitu:

- i. seznanjen z osnovnimi principi funkcioniranja obravnavanih elementov;

Intended Learning Outcomes:

Knowledge and Comprehension

In this course students will acquire basic theoretical and practical knowledge to assess the inherent safety of the individual mechanical and structural elements. Students will be after the final exam:

- i. familiar with the basic principles of functioning of the handled elements;

<p>ii. seznanjen z osnovnimi principi vgrajene varnosti;</p> <p>iii. seznanjen z osnovnimi postopki dimenzioniranja obravnavanih elementov;</p> <p>iiii. seznanjen z osnovnimi principi izbire ustreznega gradiva za izvedbo konstrukcije.</p>	<p>ii. familiar with the basic principles of the inherent safety;</p> <p>iii. familiar with the basic procedures for design calculations of the elements;</p> <p>iiii. familiar with the basic principles of the selection of suitable material for the execution of the construction.</p>
<p><u>Uporaba</u></p> <p>Predmet je usmerjen k reševanju varnostnih problemov, s katerimi se varnostni inženir srečuje v praksi. Slušatelj bo po opravljenem izpitu:</p> <p>i. usposobljen oceniti raven vgrajene varnosti;</p> <p>ii. usposobljen oceniti morebitno odstopanje od normalnega funkcioniranja posameznih elementov;</p> <p>iii. usposobljen oceniti ustreznost postopkov dimenzioniranja.</p>	<p><u>Application</u></p> <p>The course is oriented toward solving safety problems, with which a safety engineer faces on a daily basis in practice. Students will be after the final exam:</p> <p>i. qualified to assess the level of inherent safety;</p> <p>ii. qualified to assess any deviation from the normal functioning of individual elements;</p> <p>iii. qualified to assess the appropriateness of the design procedures.</p>
<p><u>Refleksija</u></p> <p>Spoznanja o principih dimenzioniranja predstavljajo trdni temelj za mnoge pomembne z varnostjo povezane odločitve v praksi.</p>	<p><u>Reflection</u></p> <p>Knowledge of the design principles represent a solid foundation for many important safety-related decisions in practice.</p>
<p><u>Prenosljive spretnosti</u></p> <p>V okviru predmeta si bo slušatelj pridobil oz. utrdil sledeča znanja oz. spretnosti: razumevanje zahtevnejših strokovnih tekstov, kot so tehniški standardi, uporaba standardov v tujih jezikih, razvoj analitičnega načina mišljenja.</p>	<p><u>Skill-transference Ability</u></p> <p>During the course students will acquire and deepen the following skills or knowledge respectively: understanding of complex texts such as technical standards, the use of standards written in foreign languages, development of analytical thinking.</p>

Metode poučevanja in učenja:

Predavanja
Vaje

Learning and Teaching Methods:

Lectures,
exercises

Načini ocenjevanja:

Delež (v %) /

Weight (in %) **Assessment:**

<p>Izpit pisni in ustni. Ocene: 6-10 pozitivno</p>	<p>70%</p>	<p>Examination (written and oral) of theory and exercises. Grades from 6 to 10 are positive.</p>
<p>Vaje: Opravljen kolokvij Pri vajah predstavlja delež ocene (1/3) tudi uspešno laboratorijsko delo.</p>	<p>30%</p>	<p>Exercises: Positive graded colloquium. Successful laboratory work presents a part (1/3) of the exercise grade.</p> <p>(The grades rate from 1 to 10. Grades from 1 to 5 are negative, grades from 6 to 10 are positive as follows: 6-sufficient,</p>

		7-good, 8 and 9-very good, 10-excellent.)
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Reference nosilca / Lecturer's References:

1. HLADNIK, Jurij, RESMAN, Franc, **JERMAN, Boris**. Torsion stiffness of a racing cross-country ski boot. *Proc. Inst. Mech. Eng., Part P, sports eng. technol. (Print)*, 2013, doi: [10.1177/1754337113485349](https://doi.org/10.1177/1754337113485349). [COBISS.SI-ID [12936475](#)]
2. VUJIČIĆ, Andrija, ZRNIĆ, Nenad Đ., **JERMAN, Boris**. Ports sustainability : a life cycle assessment of zero emission cargo handling equipment. *Stroj. vestn.*, Sep. 2013, vol. 59, no. 9, str. 547-555, ilustr., doi: [10.5545/sv-jme.2012.933](https://doi.org/10.5545/sv-jme.2012.933). [COBISS.SI-ID [13112859](#)]
3. **JERMAN, Boris**, HRIBAR, Anton. Dynamics of the mathematical pendulum suspended from a moving mass. *Teh. vjesn. - Stroj. fak.*, 2013, vol. 20, no. 1, str. 59-64, ilustr. http://hrcak.srce.hr/index.php?show=clanak&id_clanak_jezik=143490. [COBISS.SI-ID [12724251](#)]

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet: VARSTVO OKOLJA I
Course title: ENVIRONMENTAL PROTECTION I

Študijski program in stopnja Study Programme and Level	Študijska smer Study Field	Letnik Academic Year	Semester Semester
UŠP Tehniška varnost, 1. stopnja	/	2.	3.
USP Technical Safety, 1 st Cycle	/	2 nd	3 rd

Vrsta predmeta / Course Type

obvezni / Mandatory

Univerzitetna koda predmeta / University Course Code:

TV112

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje work	Druge oblike študija	Samost. delo Individ. work	ECTS
45	15	15 LV	/	/	75	5

Nosilec predmeta / Lecturer:

prof. dr. Andreja Žgajnar Gotvajn /
Dr. Andreja Žgajnar Gotvajn, Full Professor

Jeziki / Languages:

Predavanja / Lectures: Slovenski / Slovenian

Vaje / Tutorial: Slovenski / Slovenian

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:

Študent oz. kandidat mora imeti predmet opredeljen kot študijsko obveznost.

Prerequisites:

The course has to be assigned to the student.

Vsebina:

Uvod, nekatere definicije in pojmi, ekologija, varstvo okolja, vrste ekosistemov, zakonitosti rasti populacij, mehanizmi kroženja snovi (hidrosfera, litosfera, atmosfera). Vrste onesnaženja, vplivi onesnaženja na okolje, transport in pretvorbe onesnaženja v okolju, hrup, elektromagnetno valovanje, svetlobno onesnaževanje. Globalni okoljski problemi. Povezava med okoljem in delovnim okoljem. Industrija in okolje. Posegi v okolje. Zakonodaja na področju okolja. Stanje okolja v Sloveniji.

Zrak: sestava atmosfere, procesi v atmosferi, omejevanje in nadzor emisij in imisij, zrak v

Content (Syllabus Outline):

Introduction, terms and definitions, ecology, environmental protection, functioning of ecosystems, population growth, environmental transport of substances (hydrosphere, lithosphere, atmosphere). Different types of pollution, environmental impact of pollutants, transportation pathways and environmental fate, noise, electromagnetic radiation, light pollution. Global environmental problems. Working and natural environment. Environmental impact of industry, environmental legislation. Current status of environment in Slovenia.

Air: Composition and processes in atmosphere,

zaprtih prostorih, čistilne naprave.

Vode: vodni cikel, zaloge vode, površinske vode, podtalnice, nadzor vodotokov, pitna voda, nadzor in priprava pitne vode, najpogostejši onesnaževalci vod, industrijski onesnaževalci. Odpadne vode: čiščenje odpadnih vod, čistilne naprave, varčevanje z vodo, ponovna uporaba.

Odpadki: vrste odpadkov, komunalni odpadki, biorazgradljivi odpadki, inertni odpadki, nevarni odpadki, jedrski odpadki, postopki ravnanja z odpadki, recikliranje, obdelava, energetska izraba odpadkov, odlaganje odpadkov, sežiganje odpadkov.

Energetika in onesnaževanje. Obnovljivi in neobnovljivi viri, učinkovita raba energije, problemi.

Obisk objektov, kjer študenti na praktičnih primerih utrjujejo teoretično znanje.

reduction of emissions, indoor air pollution, treatment systems.

Water: Hydrological cycle, surface waters, underground water, monitoring and control of surface and drinking water, typical important pollutants, wastewater treatment, reuse and recovery.

Solid wastes: Sources and types of wastes, municipal and industrial wastes, management and processing of inert, biodegradable, hazardous and radioactive waste, recycling, reuse and recovery concepts and approaches, materials and energy recovery of solid wastes, landfilling.

Energy and environment: conventional and renewable energy sources, efficient energy use, local and global environmental problems related to energy consumption.

Field trips to connect theoretical to practical knowledge.

Temeljna literatura in viri / Readings:

- Masters, G., Introduction to environmental engineering and science, 3rd Edition, Prentice Hall, 2008, 708 str. (60%).
- Worrell, W.A., Vesilind, P.A., Solid Waste Engineering, 2nd Edition, Cengage Learning, 2012, 401 str. (20%).
- Zagorc-Končan, J., Žgajnar Gotvajn, A., Zbirka nalog iz ekološkega inženirstva, UL, FKKT, 2008, 46 str (20%).

Cilji in kompetence:

Predmet bo študentom dal osnovne informacije o definicijah in principih varstva okolja. Študentje se bodo temeljna znanja iz naravoslovnih predmetov naučil uporabljati pri varstvu okolja in se spoznali s problemi onesnaževanja zemlje, vode in zraka. Spoznali in razumeli bodo osnovne globalne probleme.

Objectives and Competences:

Knowledge on basic definitions and concepts of environmental protection. Basic knowledge on basic sciences will be upgraded to understand problems related to water, air and soil pollution. Knowledge and understanding of fundamental global problems will be acquired.

Predvideni študijski rezultati:

Intended Learning Outcomes:

<p><u>Znanje in razumevanje</u> Študent pridobi osnovna teoretična znanja, ki so potrebna za razumevanje različnih procesov v okolju. Spoznal bo osnovne okoljske probleme na lokalni in globalni ravni, načine in pristope k obravnavanju in reševanju okoljskih problemov. Poznal bo sodobne pristope k varovanju okolja, ki temeljijo na trajnostnih principih in soodvisnost procesov in dejavnikov. Razumel bo pomen etičnih, pravnih in ekonomskih načel na področju varstva okolja. Spoznal se bo z okoljskimi problemi in stanjem v Sloveniji.</p>	<p><u>Knowledge and Comprehension</u> Advanced theoretical knowledge and deeper understanding of environmental processes. Knowledge on basic local and global environmental problems and fundamentals of basic environmental problems solving approaches. Modern trends in environmental remediation and protection. Understanding of ethical, legal and economy aspects of environmental protection. Awareness of important environmental problems in Slovenia.</p>
<p><u>Uporaba</u></p>	<p><u>Application</u></p>
<p><u>Refleksija</u> Z pridobljenimi znanji bo kritično presojal lokalne in globalne okoljske probleme. Sposoben bo poiskati povezavo med teorijo in problemi v lastni okolici.</p>	<p><u>Reflection</u> Ability to discuss and assess local and global environmental problems. Ability to connect theoretical knowledge and actual local and regional environmental problems.</p>
<p><u>Prenosljive spretnosti</u> Pri predmetu bo študent razširil temeljna znanja, znal bo uporabljati tujo in domačo literaturo, izračunati in primerno interpretirati ter ovrednotiti različne osnovne okoljske probleme. Razvil bo spretnosti uporabe ustnega in pisnega načina poročanja.</p>	<p><u>Skill-transference Ability</u> Ability to search, select and apply different types of literature. Ability to apply theoretical knowledge to understand environmental problems. Development of oral and literate skills.</p>

Metode poučevanja in učenja:

<p>Predavanja Seminarji Seminarske vaje: Ekskurzije: jedrski reaktor in razstava o ravnanju z jedrskimi odpadki, predelava odpadkov, čistilne naprave Laboratorijske vaje</p>

Learning and Teaching Methods:

<p>Lectures Seminars Field trips: nuclear reactor, recycling center and landfill, conventional wastewater treatment plant Laboratory work</p>

Delež (v %) /

Načini ocenjevanja:

Weight (in %)

Assessment:

<p>Pisni in ustni izpit Laboratorijske vaje Opravljene laboratorijske vaje in projektna naloga so pogoj za opravljanje izpita</p>	<p>80% 20%</p>	<p>Written and oral exam Laboratory work Accomplished laboratory work and project work are a prerequisite to exam attendance.</p>
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Reference nosilca / Lecturer's References:

1. ŽGAJNAR GOTVAJN, Andreja, BISTAN, Mirjana, TIŠLER, Tatjana, ENGLANDE, A. J., ZAGORC-KONČAN, Jana. The relevance of bisphenol A adsorption during Fenton's oxidation. Int. j.

environ. sci. technol. (Tehran), str. 1-8, 2013.

2. **ŽGAJNAR GOTVAJN, Andreja**, KALČÍKOVÁ, Gabriela, ZUPANČIČ, Marija, ZAGORC-KONČAN, Jana. Determination of impact of landfill leachate to nitrification. *Fresenius environ. bull.* [Print ed.], 2012, vol. 21, no. 8c, str. 2447-2452.
3. KALČÍKOVÁ, Gabriela, ZAGORC-KONČAN, Jana, ŽNIDARŠIČ PLAZL, Polona, **ŽGAJNAR GOTVAJN, Andreja**. Assessment of environmental impact of pyridinium-based ionic liquid. *Fresenius environ. bull.* [Print ed.], 2012, vol. 21, no. 8b, str. 2320-2325.

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