

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

- 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, ...).

- protective equipment, the typical hazards of 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 upravljalcev) 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:

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.

Delež (v %) /

Weight (in %)

70%**30%****Assessment:**

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](https://www.cobiss.si/urn:nbn:si:coibis: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](https://www.cobiss.si/urn:nbn:si:coibis: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](https://www.cobiss.si/urn:nbn:si:coibis:12724251)]