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, 1st Cycle	**/**	**1st**	**2nd**

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

Vsebina:	**Content (Syllabus Outline):**
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	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

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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.

Temeljni 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:	**Objectives and Competences:**
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.	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:	**Intended Learning Outcomes:**
<u>Znanje in razumevanje</u> 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;	<u>Knowledge and Comprehension</u> 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;

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ii. seznanjen z osnovnimi principi vgrajene varnosti; iii. seznanjen z osnovnimi postopki dimenzioniranja obravnavanih elementov; iiii. seznanjen z osnovnimi principi izbire ustreznega gradiva za izvedbo konstrukcije.	ii. familiar with the basic principles of the inherent safety; iii. familiar with the basic procedures for design calculations of the elements; iiii. familiar with the basic principles of the selection of suitable material for the execution of the construction.
Uporaba Predmet je usmerjen k reševanju varnostnih problemov, s katerimi se varnostni inženir srečuje v praksi. Slušatelj bo po opravljenem izpitu: i. usposobljen oceniti raven vgrajene varnosti; ii. usposobljen oceniti morebitno odstopanje od normalnega funkcioniranja posameznih elementov; iii. usposobljen oceniti ustreznost postopkov dimenzioniranja.	Application 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: i. qualified to assess the level of inherent safety; ii. qualified to assess any deviation from the normal functioning of individual elements; iii. qualified to assess the appropriateness of the design procedures.
Refleksija Spoznanja o principih dimenzioniranja predstavljajo trdni temelj za mnoge pomembne z varnostjo povezane odločitve v praksi.	Reflection Knowledge of the design principles represent a solid foundation for many important safety-related decisions in practice.
Prenosljive spretnosti 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.	Skill-transference Ability 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.

Metode poučevanja in učenja:	**Learning and Teaching Methods:**
Predavanja Vaje	Lectures, exercises

Načini ocenjevanja:	Delež (v %) / Weight (in %)	**Assessment:**
Izpit pisni in ustni. Ocene: 6-10 pozitivno	**70%**	Examination (written and oral) of theory and exercises. Grades from 6 to 10 are positive.
Vaje: Opravljen kolokvij Pri vajah predstavlja delež ocene (1/3) tudi uspešno laboratorijsko delo.	**30%**	Exercises: Positive graded colloquium. Successful laboratory work 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,

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		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. [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. [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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