UČNI NAČRT PREDMETA / COURSE SYLLABUS	
Predmet:	VARNO PROJEKTIRANJE IN RANLJIVOST SISTEMOV
Course Title:	SAFETY ASPECTS IN PROJECT ASPECTS IN PROJECT DESIGN AND VULNERABILITY SYSTEMS

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

Vrsta predmeta / Course Type: obvezni/ Mandatory

Univerzitetna koda predmeta / University Course Code: TV203

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje Work	Druge oblike študija	Samost. delo Individual Work	ECTS
75	**30**	**30 SV**	**/**	**15**	**150**	**10**

Nosilec predmeta / Lecturer: prof. dr. Stojan Petelin / Dr. Stojan Petelin, Full Professor
doc. dr. Mitja Kožuh / Dr. Mitja Kožuh, 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):
1. UVOD in zahteve za varnost kemijsko-procesnih sistemov 2. Koncept analiz varnosti in ranljivosti (SVA) • Definicija SVA Terminologije • Protiukrepi in »Risk Management« varnosti in varovanja • SVA kriteriji in pripadajoče utemeljitve • Kriteriji analiz varnosti in ranljivosti • Postopki nadziranja podjetij • Inšpekcija postopkov analiz ranljivosti in delovodnikov 3. Metodologije analiz varnosti in ranljivosti (SVA)	1. Introduction and demands for chemical process systems 2. Concept of safety and vulnerability analysis Definition of SVA methodology Counter measures and Risk management safety and security Auditing of procedures and work orders 3. Methodologies of safety and vulnerability analyses 4. Management of chemical and process systems Integration of protection chemical-process systems and SVA activities with existing

4. Upravljanje varnosti kemijsko-procesnih sistemov • Integracija varovanja kemijsko-procesnih sistemov in SVA aktivnosti z obstoječimi okoljskimi, zdravstvenimi in varnostnimi programi • Sledenje SVA priporočil in revalidacija SVA analiz • Interface med varnostjo nevarnih snovi v fiksnih sistemih in med prevažanje 5. Zanesljivost sistemov • Namen in metodologije verjetnostnih varnostnih analiz • Načini odpovedi sistemov • Napake s skupnim vzrokom • Verjetnostni koncept analize odpovedi • Zanesljivost in modeli komponent • Analize zanesljivosti sistemov • Zanesljivost in razpoložljivost popravljivih sistemov • Zanesljivost in razpoložljivost sistemov v stanju pripravljenosti • Zanesljivost in gospodarnost • Modeli nepopravljivih sistemov • Zanesljivost, razpoložljivost, uporabnost ter sposobnost vzdrževanja posameznih sistemov • Zanesljivost in razpoložljivost sistema med popravilom, vzdrževanjem ali testiranjem • Koncept tveganja z upoštevanjem resnosti napake in verjetnosti odpovedi • Preventivno in korektivno vzdrževanje inženirskih sistemov: večkratno in neodvisno nadzorovanje 6. Varno projektiranje • Princip pasivno varnega projektiranja sistemov v gospodarstvu za zagotovitev čim večje zanesljivosti in kvalitete: redundanca, različnost, fizično ločevanje in zaščita sistemov, princip varne odpovedi (Failsafe), avtomatizacija. • Tehnične specifikacije: projektne osnove, mejni pogoji obratovanja z ukrepi, testiranje in vzdrževanje. • Korektivno in preventivno vzdrževanje	environmental, health and safety programs Following SVA recommendations and revalidation of SVA analyses Interface between safety of dangerous substances in fixed systems and during transportation 5. Reliability of the systems Purpose of probability safety assessment Failure modes of the systems Common cause failures Reliability and component models Reliability analyses of the systems Reliability and availability of the repairable systems Reliability and availability of stand-by systems Reliability and economy Models of unrepairable systems Reliability, availability, usability and ability for maintenance of each system Reliability and availability of systems during maintenance and testing Concept of risk with taking into account of failure seriousness of failure and probability of failure Preventive and corrective maintenance of engineering systems: multiple and independent control 6. Safety design Principle of passive safety design of systems for establishing high reliability and quality: redundancy, diversity physical separation and safety systems, fail safe principle and automation Technical specifications: design basis, limiting conditions of operation with measures, testing and maintenance Corrective and preventive maintenance

Temeljna literatura in viri / Readings:

- Dalton, Dennis. Security Management: Business Strategies for Success. Newton, MA: Butterworth-Heinemann Publishing, 1995.
- Guidelines for Chemical Process Quantitative Risk Analysis, Second Ed., Center for Chemical Process Safety, American Institute of Chemical Engineers, 2000.
- Layer of Protection Analysis, Simplified Process Risk Assessment, Center for Chemical Process Safety, American Institute of Chemical Engineers, 2001.
- Inherently Safer Chemical Processes – A Life Cycle Approach, Center for Chemical Process Safety, American Institute of Chemical Engineers, 1996
- Guidelines for Technical Management of Chemical Process Safety, Center for Chemical Process Safety, American Institute of Chemical Engineers, 1998.
- Guidelines for Technical Planning for On-Site Emergencies, Center for Chemical Process Safety, American Institute of Chemical Engineers, 1996.
- Bowers, Dan M., "Security Fundamentals for the Safety Engineer", Professional Safety, American Society of Safety Engineers, December, 2001, pgs. 31-33.
- Mohammad Modares: What every engineer should know about Reliability and Risk Analysis, Marcel Dekker, Inc. 1993.
- John X. Wang, Marvin L. Roush: What every engineer should know about Risk Engineering and Management, Marcel Dekker, Inc. 2000.
- Mohammad Modares: Reliability Engineering and Risk Analysis, Marcel Dekker, Inc. 1999.
- Igor Grabec, Janez Gradišek: Opis naključnih pojavov, Univerza v Ljubljani, Fakulteta za strojništvo, 2000.
- Risk-Based Methods for Equipment Life Management, CRTD Vol. 41, ASME International, 2003.
- Matthews C.: Handbook of Mechanical In-Service Inspection, Professional Engineering Publishing Limited, 2004

Cilji in kompetence:

Program predmeta usmerja študenta v kritično in logično presojo varnosti in ranljivosti posameznih sistemov v povezavi z vsemi napravami ter zahtevami. Študenti se usposabljajo za določanje pomembnosti posameznih komponent sistemov v smislu varnosti in stroškov za vzdrževanje načrtovanega nivoja varnosti.

Objectives and Competences:

Program of the course leads student to critical and logical assessment of safety and vulnerability in connection with all of devices and demands. Students are being thought for importance assessment od system components in sense of safety and maintenance costs.

Predvideni študijski rezultati:

Znanje in razumevanje

Teoretična znanja o zanesljivosti sistemov v povezavi s tveganjem. Razumevanje vplivnih pojavov na odpovedi sistemov in na nezgodne procese ob upoštevanju obnašanja človeka.

Uporaba

Varno in učinkovito uporabljanje z inženirskimi sistemi z namenom zmanjševati tveganje oz. upravljati s tveganjem ob spremljanju

Intended Learning Outcomes:

Knowledge and Comprehension

Theoretical knowledge about reliability of the systems in connection with risk. Understanding important phenomena on the risk of the systems and on accident processes by taking into account human behaviour.

Application

Safe and efficient management of engineering systems with aim to reduce risk or risk management in accordance with legislation

predpisov.	
Refleksija Interpretacija izrednih stanj sistemov v prometu (procesna industrija, ladje, terminali, pristanišča, skladišča itd.). Iznajdljivost v mednarodnem prostoru in komunikacija z nadrejenimi upravnimi organi.	Analysis Interpretation of incident events of the systems in transportation (process industry, ships, terminals, ports warehouses etc). Inventiveness on international level and communication with superior legislative bodies.
Prenosljive spretnosti S pridobljenim temeljnim znanjem in veščino uporabe domače in tuje tehnične literature, priročnikov ter standardov, pa tudi računalniških modelov pridobi študent zmožnost razumevanja in delnega obvladovanja sistemov. Pomembno je razumevanje tveganja, načini zmanjševanja tveganja ob upoštevanju stroškov, ki pri tem nastajajo.	Skill-transference Ability With gathered basic knowledge and skill to use domestic and foreign literature, handbooks and standards, as well as computer models student gets ability to understand and partially managing systems. Important is understanding the risks, reducing the risks by taking into account the costs the arise during the process.

Metode poučevanja in učenja:	**Learning and Teaching Methods:**
Na predavanjih pridobi študent temeljna teoretična znanja. S seminarsko nalogo samostojno pod mentorstvom visokošolskega učitelja rešuje problematiko teh sistemov v obliki seminarske ali projektne naloge.	Through the lectures student gather basic theoretical knowledge. With seminar work he solves problems of seminar or project work under supervision of professor.

Načini ocenjevanja:	Delež (v %) / Weight (in %)	**Assessment:**
Ocena seminarske-projektne naloge, ustnega znanja in vseh vaj se oceni ločeno od pisnega dela izpita. Pogoj za pristop k ustnemu izpitu so opravljene vaje, seminarska-projektna naloga in pozitivna ocena pisnega dela izpita. Znanje se vrednoti s sistemom; od 6-10 (pozitivno) oz. 1-5 (negativno).		Seminar/project work is graded separately from written exam. Prerequisite for exam are accomplished exercises, seminar/project work and positive written exam. Grades are 6-10 positive

Reference nosilca / Lecturer's references:

- **PETELIN, Stojan**, PERKOVIČ, Marko, VIDMAR, Peter, PETELIN, Katja. Ship's engine room fire modelling. V: *International joint power generation conference 2003*. New York: ASME International, 2003, 4 str.
-. **PETELIN, Stojan**, PERKOVIČ, Marko, VIDMAR, Peter. Požari v pomorstvu - ladijska strojnica. V: *Varstvo pri delu, varstvo pred požari in medicina dela : posvet z mednarodno udeležbo, Portorož, 13. - 14. maj 2003*. Ljubljana: Fakulteta za kemijo in kemijsko tehnologijo, 2003, 15 str.
- **PETELIN, Stojan**, KOŽUH, Mitja, VIDMAR, Peter. EU concept and activities on dangerous goods transportation. V: ANŽEK, Mario (ur.), MAHER, Tomaž (ur.), VERLIČ, Peter (ur.). 12. mednarodni - AL-MANSOUR, Fouad, **KOŽUH, Mitja**. Risk analysis for CHP decision making within the conditions of an open electricity market. *Energy*, ISSN 0360-5442. [Print ed.], 2007, vol. 32, no. 10, str. 1905-

1916. [COBISS.SI-ID 20987431]
- **KOŽUH, Mitja**, PETELIN, Stojan, PERKOVIČ, Marko. Can classification societies with their rules on redundancy propulsion improve statistics on oil spills and cleaning costs?. *Marine engineering*, ISSN 1346-1427, 2007, vol. 42, no. 3, str. 113-118, graf. prikazi. [COBISS.SI-ID 28861445]
- **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]