UČNI NAČRT PREDMETA / COURSE SYLLABUS	
Predmet:	VODENJE TVEGANJA IN PROCESNA VARNOST
Course Title:	RISK MANAGEMENT AND PROCESS SAFETY

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: TV202

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje Work	Druge oblike študija	Samost. delo Individual Work	ECTS
90	**30**	**30 SV**	**/**	**/**	**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. Sistemi vodenja tveganja, osnovni elementi vodenja tveganja. 2. Odgovornost: nameni in cilji, elementi odgovornosti: avtoriteta, odgovornost, podpora, informacije. 3. Vedenje o procesu in dokumentacija: definicija procesa, projektni kriteriji, načrtovanje procesa in opreme, varnostni sistemi. 4. Navodila za varnostni pregled velikih projektov: varnostni pregled, pregled projekta in varnostnih navodil, navodila za izvajanje projekta in nadzor 5. Vodenje procesnega tveganja: identifikacija nevarnosti, analiza tveganja med	1. Risk management systems, basic elements 2. Accountability: objectives and goals Elements of accountability: authority, responsibility, support and information 3. Process Knowledge and documentation Definition of process, design basis criteria Process and equipment design, safety systems 4. Process safety review procedures for capital projects: safety reviews process design and review procedures, process management procedures and controls 5. Process risk management: Hazard identification: HAZOP, residual risk

obratovanjem, upravljanje z ostalimi tveganji, vodenje procesa med nezgodami.
6. Vodenje sprememb v procesu: sprememba naprave, sprememba organizacije, sprememba navodil, stalne spremembe, začasne spremembe.
7. Integriteta procesa in opreme: zanesljivostno inženirstvo, obratovalna navodila, preventivno vzdrževanje in navodila.
8. Človeški faktor: analiza človeških napak
9. Usposabljanje in izvrševanje: izbira in razvoj programov za usposabljanje
10. Preiskava nezgod: velike nezgode, vključevanje zunanjih ekspertov, komunikacija, zbiranje podatkov in analiza.
11. Pregledi in popravne akcije: pregledi, ugotavljanje spoštovanja obveznosti, notranji in zunanji pregledovalci
12. Zahteve za varnost kemijsko-procesnih sistemov, predpisi in standardi za oceno varnostnih mej sistemov
13. Poenostavljene analize tveganja procesnih sistemov (LOPA)
- Uporaba, omejitve in prednosti LOPA
- Ocene posledic izrednih dogodkov
- Scenariji izrednih dogodkov in njihova pogostost
- Začetni dogodki in njihova pogostost
- Nivoji neodvisne zaščite
14. Modeliranje nekaterih scenarijev nesreč in njihovih posledic, enostavni in zahtevni računalniški programi posameznih fizikalnih pojavov:
- Modeli uparjanja
- Eksplozija parnega oblaka (UVCE)
- Eksplozija posode stisnjenih hlapov, ki so nastali iz uparele kapljevine v posodi (BLEVES) in goreča krogla " Fireballs".
- Izpusti v zrak ali v vodo
- Požar curka ali luže
- Toksičnost in izpostavljenost človeka v prostoru med izrednim dogodkom
- Odpovedi posod in cevovodov ter tlačna zaščita
- Izpostavljenost zgradb med izrednimi dogodki.
15. Modeli in orodja za oceno posledic

management Process management during emergencies
6. Management of change
Change of technology, change of organization, change of procedures, permanent changes, temporary changes
7. Process and Equipment integrity
Reliability engineering
Maintenance procedures
Testing procedures
8. Human factors
Human error analysis
9. Training and Performance
Selection and development of training programs
10. Accident investigation
Major accidents, inclusion of third party experts, communication, data acquisition and analysis
11. Audits and Corrective Actions
Compliance reviews
Internal /External Auditors
12. Requests for chemical process systems, codes and standards for safety boundary determination
13. Simplified risk assessment of process systems (LOPA)
Use, limitations and advantages of LOPA
Consequence analysis of incidents
Scenarios of incidents and their probability
Levels of independent protection
14. Modeling of some accident scenarios and their consequences, simple end sophisticated computer codes for different physical phenomena
Evaporation models
UVCE
BLEVE
Releases into water or air
Pool or jet fire
Toxicity and human exposure in area during the accident
Pressure vessel and pipeline failures and overpressure protection
Exposure of buildings during accidents
15. Models and tools for consequence analysis during normal operation and

normalnega delovanja in nezgod na okolje: - Izviri in modeli disperzije - Razlitja in razsutja - Emisije v ozračje - Prehodni pojavi emisij v ozračje, spreminjanje koncentracij in povprečenje - Modeli za analize posledic:Vhodni podatki, negotovosti in validacija modelov. 16. Obvladovanje izrednih razmer in omejevanje posledic (nivo varnosti sistemov, evakuacija, zaščita in reševanje)	during accidents to the environment Sources and dispersion models Spills and solid waste Emissions to the air Transition events for emissions to the air and changing concentrations and averaging Models of accidents: input data, uncertainty and model validation 16. Managing of accidents and limiting of consequences

Temeljna literatura in viri / Readings:

Glavna literatura:

- AIChE: Guidelines for Tecnical Management of Chemical Process Safety, New York 1989
- Ian Sutton: Process Reliability and Risk Mangement, Van Nostrand New York, 1992
- Guidelines for Chemical Process Quantitative Risk Analysis, Second Ed., Center for Chemical Process Safety, American Institute of Chemical Engineers, 2000.
- Guidelines for Analyzing and Managing the Security Vulnerabilities of Fixed Chemical Sites Center for Chemical Process Safety (CCPS), 240 pages, June 2003
- Layer of Protection Analysis, Simplified Process Risk Assessment, and Center for Chemical Process Safety, American Institute of Chemical Engineers, 2001, 292 pages.
- 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.
- Evaluating Process Safety in the Chemical Industry: A User's Guide to Quantitative Risk Analysis, J. S. Arendt, D K. Lorenzo, 104 pages, June 2000.
- Guidelines for Evaluating Process Plant Buildings for External Explosions and Fires, Center for Chemical Process Safety (CCPS), 189 pages, October 2005
- Guidelines for Technical Planning for On-Site Emergencies, Center for Chemical Process Safety, American Institute of Chemical Engineers, 1996.
- Advanced Consequence Analysis: Fluid Flow, Emergency Relief Systems Design, Thermal Hazards Assessment, Emission, Dispersion, Fire, and Explosion Dynamics, G. A. Melhem, ioMosaic Corporation, Copyright ioMosaic Corporation 2006, 878 pages.

Pomožna literatura:

- J.X.Wang, M.L.Roush: What Every Engineer should know about Risk Engineering and Management, Marcel Decker INC. , New York 2000
- ACSNI: Organizing For Safety, Health and Safety Commission, April 1993,
- Lloyd's Register The Engineering Council: Guidelines on Risk Issues, UK 1993
- Perrow C.: Normal Accidents, Living with High-Risk Technologies, Basic Books, New York, 1985
- Arendt et al:Evaluating Process Safety in the Chemical Industry, A Manager's Guide to Quantitative Risk Assessment, Chemical Manufacturers Association, Washington, USA, 1989

- Clemen, Reilly: Making Hard Decisions, PWS- Kent Publishing Company, 1991

Cilji in kompetence:	**Objectives and Competences:**
Študentje naj bi spoznali, kako informacije o tveganju lahko koristijo pri načrtovanju preventivnih ukrepov za zagotavljanje varnosti in kako lahko s pomočjo vedenja o tveganju optimiramo svoje dejavnosti, da bodo varne in da bodo tudi prijazne do okolja.	Students should learn how they can benefit by information on risk for designing preventive measures assuring safety and how we can optimize our activities to be safe and environmental friendly.

Predvideni študijski rezultati:	**Intended Learning Outcomes:**
Znanje in razumevanje Študentje naj bi pridobili osnovna teoretska in praktična znanja, ki so potrebna za vodenje tveganja. Spoznali bodo vse elemente vodenja tveganja in tudi kako se odloča v pogojih negotovosti.	Knowledge and Comprehension Student should gathered basic theoretical and practical skills needed for risk management and also how to make decisions in uncertainty.
Uporaba Znanja, ki jih bodo študentje osvojili jim bodo pomagala pri odločanju glede vseh vrst tveganj. Znali bodo uporabiti rezultate varnostnih analiz in jih tudi kritično oceniti ter se na njihovi osnovi tudi odločiti kako se nevarnostim izogniti in kako zmanjšati posledice.	Application Knowledge, which will students gather will help them when making decisions on variety of risks. They will be able to use the results of safety analyses in to judge them critically and to decide how to avoid the hazards and to reduce the consequences.
Refleksija Teoretska in praktična znanja bo lahko študent uporabil pri reševanju praktičnih in teoretskih problemov (študij in praksa). S pomočjo spoznanj o zmogljivostih in omejitvah posameznih metod za oceno tveganj bo lahko študent ocenil kaj v praksi pomenijo in to mu bo dalo osnovo za mnoge pomembne kasnejše odločitve.	Analysis Theoretical and practical knowledge will be used for solving theoretical and practical problems. With knowledge about the capabilities and limitations of the risk assessment methods students will find out their use in praxis which will enable them later making important decisions.
Prenosljive spretnosti Logično razmišljanje in logično povezovanje nepopolnih informacij v celoto na osnovi katere se vrši proces odločanja so spretnosti, ki bodo študentu koristile povsod.	Skill-transference Ability Logical thinking and logical linking imperfect information into the whole based on which decision process is taking place are skills from which will students benefit in all professional areas.

Metode poučevanja in učenja:	**Learning and Teaching Methods:**
Predavanja Laboratorijske vaje	Lectures Exercises

Načini ocenjevanja:	Delež (v %) / Weight (in %)	**Assessment:**

Izpit pisni in ustni. Ocene: 6-10 pozitivno Vaje: Opravljen kolokvij Pri vajah predstavlja delež ocene tudi uspešno laboratorijsko delo.		Exam written and oral. Grades 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 simpozij o elektroniki v prometu, 7. in 8. oktober 2004 = 12th International Symposium on Electronics in Traffic [also] ISEP 2004, October 7 and 8, 2004, Ljubljana. Harmonizacija prometnih sistemov v Evropski uniji : [znanstveno strokovni simpozij : zbornik referatov] : [scientific-technical symposium : proceedings]. Ljubljana: Elektrotehniška zveza Slovenije: = Electrotechnical Society of Slovenia, 2004, str. U6, ilustr.
- **KOŽUH, Mitja**, **PETELIN, Stojan**, PERKOVIČ, Marko. Can classification societies with their rules on redundancy propulsion improve statistics on oil spills and cleaning costs?. V: Proceedings of ISME. Tokyo: The Japan Institution of Marine Engineering, cop. 2005, 7 str.- 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]