

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet: PROCESNA VARNOST
Course Title: 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, 2 nd Cycle	/	1 st	1 st

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 Individual Work	ECTS
45	/	15 LV+15 SV	/	/	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:

Tipični industrijski procesi (znižana ali povišana temperatura in tlak, katalitski, elektrokatalitski procesi, elektrotermični). Analiza industrijskih procesov in priprava ocen tveganja. Zajemanje pomembnih in kritičnih parametrov ter pogojev procesa, ki vplivajo na njegovo varnost, možni scenariji izrednih dogodkov. Kvalitativna in kvantitativna ocena tveganja. Varnost pri delu v laboratoriju, kemijskih in drugih procesnih industrijah. Kompleksnost delovanja industrijskega procesa, tehnološki režim in standardni proizvodni postopki, ustreznega vzdrževanja posameznih naprav in celotnega sistema.

Content (Syllabus outline):

Typical chemical and industrial processes (reduced or elevated temperature, high pressure, catalytic, electrocatalytic, and electrothermal processes). Analysis of industrial processes and the preparation of risk assessments. Determinations of important and critical process parameters and conditions that affect the security of the possible scenarios of emergencies. Qualitative and quantitative risk assessment. Safety, Health and Loss Prevention at work in a laboratory, chemical and other process industries. The complexity of the operation of industrial processes, technological regime and the standard manufacturing procedures, proper

Ocena verjetnost za nastanek izrednih situacij v kemijskih procesih ter preprečevanje in ukrepanje.

Identifikacija potencialnih nevarnosti v procesu, začetni dogodki, razvoj nezgodnih scenarijev. Načrtovanje varnostnih sistemov za blaženje posledic izrednih dogodkov. Uporaba različnih metod za identifikacijo in oceno tveganj. Določitev procesnih, varnostnih indikatorjev.

Modeli in orodja za oceno posledic.

Modeliranje posledic različnih nezgodnih dogodkov za potrebe ocene tveganja in prostorskega načrtovanja.

Seminar: računska obravnava kemijskih procesov, predstavitev in poglobljena analiza večje industrijske nezgode. Uporaba modelov in orodij za napoved posledic, določitev vpliva posameznih vhodnih podatkov.

Vaje: Prašna eksplozija,

- karakterizacija gorljivega granulata (določevanje velikosti in porazdelitve velikosti delcev, termična analiza, določitev specifične površine, vrstična elektronska mikroskopija,
- priprava gorljivega prahu (sejanje, mletje, sušenje),
- Določevanje minimalne vžigne energije,
- Določevanje eksplozijskih kazalnikov.

maintenance of individual devices and the entire system.

Estimate the probability of accidents in chemical processes, prevention and response. Identification of potential risks in the chemical process, initiating events, the spread of incidents, reducing the consequences of exceptional events. Models and tools for assessment of the consequences.

Modeling certain accident scenarios and their consequences, simple and complex computer programs of individual physical phenomena:

Seminar: calculations in chemical processes, presentation and analysis of major industrial accident. The use of models and tools for predicting the consequences, determine the influence of input data.

Exercises: dust explosion,

- combustible granulate characterization (determination of size and particle size distribution, thermal analysis, the determination of the specific surface area, scanning electron microscopy,
- Preparation of combustible dust (sieving, grinding, drying)
- Determination of the minimum ignition energy,
- Determination of explosion indices.

Temeljna literatura in viri / Readings:

- Hauptmanns, U.: Process and plant safety,,: Springer, cop. (Heidelberg [etc.]) 2015 665 str. (40 %)
- Brauer, R., L.: Safety and health for engineers, 3rd Ed., Wiley, cop. Hoboken (New Jersey), 2016 765 str. (30 %)
- Ogle, R. A. .Dust explosion dynamics, Elsevier : Butterworth-Heinemann, cop. 2017 (Oxford [etc.]) 639 str. (30 %)

Cilji in kompetence:

Pri predmetu se študenti seznanijo z zagotavljanjem varnosti pri delu v kemijskih ter procesnih industrijah. Pridobljeno znanje omogoča razumevanje in presojanje nevarnosti oziroma stopnje tveganja ter določitev ukrepov za varno in zdravo delo.

Študentje spoznajo, da je za varno delo v

Objectives and Competences:

Students get knowledge to ensuring safety, health and loss prevention in chemical processes. The knowledge enables the students to understand and assess the level of danger or risk and to establish measures to ensure the safe handling of hazardous chemicals.

industriji osnovni pogoj natančno poznavanje vseh faz procesa in podrobna analiza delovanja na osnovi katere se izvede ocene tveganja. Spoznajo, da je varnost procesa pogojena z mnogo dejavniki in da je za njegovo varno obratovanje potrebno tako optimalno delovanje posameznih procesnih operacij kot tudi usklajeno delovanje sistema kot celote. Študentje se pri predmetu usposobijo za sistematičen pregled kemijskih in drugih sorodnih procesov, zaznavanje potencialnih kritičnih mest, priprave ocene tveganja in ukrepov za zmanjšanje tveganja.

Students learn that basic conditions for safe work in industry are exact knowledge of all phases of the process and the importance of a risk assessment. Students learn that process safety depends on many factors. For safe operation is necessary so optimize the performance of individual part of the process operation as well as the system as a whole. Students are trained for a systematic review of chemical and other related processes, identify potential critical points, preparation of risk assessment and risk reduction measures.

Predvideni študijski rezultati:

Znanje in razumevanje

Študentje se pri predmetu usposobijo za sistematičen pregled nevarnosti v kemijskih in sorodnih procesih, za zaznavanje potencialnih kritičnih mest, pripravo ocene tveganja in ukrepov za zmanjšanje tveganja.

Uporaba

Ocenjevanje tveganja kemijskih procesov. Analiza nazgod in določevanje ukrepov za preprečitev nezgod.

Refleksija

Teoretična in praktična znanja bo lahko študent uporabil za sistematičen in analitičen pregled posameznih faz kemijskih in drugih procesov, na osnovi pregleda ugotoviti kritična mesta ter določiti ukrepe za zmanjšanje tveganja,

Prenosljive spretnosti

Sistematičen, analitičen pristop do reševanja problema, več razumevanja in upoštevanja varnostne kulture.

Intended Learning Outcomes:

Knowledge and Comprehension

The subject makes students capable of a systematic review of the risks in the chemical and related processes for detecting potential critical points, risk assessment and risk reduction measures.

Application

Management and control of chemical processes. Risk assessment of chemical processes. Accident analysis and determination of measures to prevent accidents.

Analysis

Theoretical and practical knowledge will be used by the student for a systematic and analytical overview of the various stages of chemical and other processes, based on a review to identify critical points and determine risk reduction measures.

Skill-transference Ability

Systematic, analytical approach to problem solving, more understanding and taking into account safety culture.

Metode poučevanja in učenja:

- Predavanja,
- seminarji,
- praktične vaje

Learning and Teaching Methods:

- lectures,
- Seminars,
- Practical exercises

Načini ocenjevanja:	Delež (v %) / Weight (in %)	Assessment:
Seminarska naloga	20 %	Course work
Pisni izpit,	50 %	Written exam
Ustni izpit.	30 %	Oral examination.

Reference nosilca / Lecturer's references:

1. BALANTIČ, Janez, SKOBIR BALANTIČ, Danijela Anica, **NOVOSEL, Barbara**. Investigation of the explosion-related parameters and their influence on the severity of an explosion involving aluminum dust. Process safety progress. Dec. 2019, vol. 38, no. 4, str. 1-9, ilustr. ISSN 1547-5913. <https://onlinelibrary.wiley.com/doi/abs/10.1002/prs.12047>, DOI: 10.1002/prs.12047. [COBISS.SI-ID 1466794]
2. LU, Wei, RUAN, Gedeng, GENORIO, Boštjan, ZHU, Yu, **NOVOSEL, Barbara**, PENG, Zhiwei, TOUR, James M. Functionalized graphene nanoribbons via anionic polymerization initiated by alkali metal-intercalated carbon nanotubes. ACS nano. 2013, vol. 7, no. 3, str. 2669-2675, ilustr. ISSN 1936-0851. DOI: 10.1021/nn400054t. [COBISS.SI-ID 36526597]
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 chimica slovenica. [Tiskana izd.]. 2012, vol. 59, no. 2, str. 398-404. ISSN 1318-0207. <http://acta.chem-soc.si/59/59-2-398.pdf>. [COBISS.SI-ID 36027653]