

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet: OSNOVNE OPERACIJE V KEMIJSKEM INŽENIRSTVU
Course Title: UNIT OPERATIONS IN CHEMICAL ENGINEERING

Študijski program in stopnja Study Programme and Level	Študijska smer Study Field	Letnik Academic Year	Semester Semester
VSŠP Kemijska tehnologija, 1. stopnja	/	2.	4.
PSP Chemical Technology, 1 st Cycle	/	2 nd	4 th

Vrsta predmeta / Course Type:

obvezni / Mandatory

Univerzitetna koda predmeta / University Course Code:

KT119

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje Work	Druge oblike študija	Samost. delo Individual Work	ECTS
45	30	/	/	/	75	5

Nosilec predmeta / Lecturer:

prof. dr. Aleš Podgornik / Dr. Aleksander Pavko, Full Professor

Jeziki / Languages:

Predavanja / Lectures: slovenski / Slovenian

Vaje / Tutorial: /

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:

Uvod: Pomen kemijskega inženirstva v svetu tehnike, znanosti in gospodarstva. Domena in smeri razvoja kemijskega inženirstva. Področja aktivnosti kemijskega inženirja. **Proces in procesna shema.** Osnovne procesne spremenljivke. Osnovne faze kemijskega procesa: priprava, kemijska pretvorba, izolacija in čiščenje produkta. **Osnovne operacije.** Koncept in temeljni principi osnovnih operacij. **Mehanske in hidrodinamske operacije:** drobljenje in mletje, sejanje, mešanje, posedanje, centrifugiranje, filtracija. Osnovni principi in naprave. **Termodifuzijske operacije:** destilacija, ekstrakcija, absorpcija, adsorpcija, uparjanje, kristalizacija, sušenje. Osnovni principi in naprave. Primeri sinteze posameznih osnovnih operacij v tehnološki proces.

Content (Syllabus outline):

Introduction. The role of chemical engineering in the field of science and technology as well as economy. Directions of development of chemical engineering. Activity fields of a chemical engineer. **Process diagram.** Basic process variables. Phases in a chemical process: upstream, reaction and downstream. **Unit operations.** Concept and basic principles. **Mechanical and hydrodynamical unit operations:** grinding, screening, mixing, settling, centrifugation, filtration. Basic principles and equipment. **Thermodiffusional unit operations.** Distillation, extraction, absorption, adsorption, crystallization, evaporation, drying. Basic principles and equipment. Selected examples of integration

of unit operations into whole technological process.

Temeljna literatura in viri / Readings:

- E.Ignatowitz, Kemijska tehnika (prevedel Leon Čelik), Jutro, Ljubljana, 1996, 456 str. (50%)
- J.H.Harker, J.R.Backhurst, J.F.Richardson, Chemical Engineering, Volume 2, Elsevier, 2002.

Cilji in kompetence:

Cilj predmeta je študente seznaniti z značilnostmi in koncepti kemijsko inženirske stroke. Predmetno specifične kompetence:

- študent spozna osnovno in splošno vlogo ter pomen osnovnih operacij v kemijsko tehnološkem procesu,

razume in zna pripraviti procesno shemo iz osnovnih operacij oziroma aparatov za določen tehnološki proces.

Objectives and Competences:

The objective is to acquaint the student with characteristics and concepts of chemical engineering profession. Specific competences are:

- student recognizes basic and general role and significance of unit operations in a chemical process technology,

student understands and is able to prepare a process scheme containing unit operations and equipment for a particular process technology.

Predvideni študijski rezultati:

Znanje in razumevanje

Študent je po osvojitvi pojmov, zakonitosti, teorij in pojavov, ki jih podaja ta predmet, sposoben razumeti specifičnosti kemijsko inženirske stroke ter pomena osnovnih operacij v tehnološkem procesu.

Uporaba

Pridobljena znanja je sposoben uporabiti pri reševanju posameznih praktičnih primerov in problemov v industrijskih kemijsko tehnoloških procesih .

Refleksija

Uporaba splošnih znanj in osnovnih principov kemijskega inženirstva, analiza in kritično ovrednotenje tehnološkega procesa oziroma posameznega postopka in naprave.

Prenosljive spretnosti

Razvita sposobnost identifikacije in reševanja problemov, kritičnega razmišljanja in logičnega sklepanja. Sposobnost uporabe literature, zbiranja in interpretacije podatkov in njihove kritične evalvacije.

Intended Learning Outcomes:

Knowledge and Comprehension

After mastering notions, laws, theories and phenomenon presented by those course, student is able to understand the specifics of chemical engineering profession and the role of unit operations in the chemical process technology.

Application

Student is able to use the acquired knowledge in solving particular practical cases and problems from chemical process technology on industrial scale.

Analysis

Use of general knowledge and basic principles of chemical engineering as well as analysis and critical evaluation of chemical process technology and particular operation and equipment.

Skill-transference Ability

Developed skill to identify and solve problem, critical thinking and making logical conclusions. Ability of literature data using, data collection and interpretation as well as their critical evaluation.

Metode poučevanja in učenja:

Learning and Teaching Methods:

Predavanja in seminarji, laboratorijske vaje.

Lectures, seminars, laboratory exercises.

Delež (v %) /

Načini ocenjevanja:

Weight (in %) **Assessment:**

Pisni in ustni izpit	40 %	Written and oral exam
Pisna seminarska naloga (pogoj za pristop k izpitu)	20 %	Written seminar (mandatory before exam)
Ocene: 6-10 (pozitivno), 1-5 (negativno).	40 %	Marks: 6-10 (positive), 1-5 (negative).

Reference nosilca / Lecturer's references:

ANDREJČIČ, Miha, PODGORNIK, Aleš. Effect of pressure drop model implemented for description of pressure drop on chromatographic monolith on estimated adsorbed layer thickness. Chemical Engineering Science, ISSN 0009-2509. [Print ed.], Apr. 2017, vol. 161, str. 370-381, doi: 10.1016/j.ces.2016.12.011.

GAŠPERŠIČ, Jernej, PODGORNIK, Aleš, KRAMBERGER, Petra, JARC, Marko, JANČAR, Janez, ŽORŽ, Mirjan, LENDERO KRAJNC, Nika. Separation of pegylated recombinant proteins and isoforms on CIM ion exchangers. Journal of chromatography. B, Analytical technologies in the biomedical and life sciences, ISSN 1570-0232, Oct. 2016, vol. 1033/1034, str. 91-96, doi: 10.1016/j.jchromb.2016.07.020.

ISAKARI, Yu, KISHI, Yuhi, YOSHIMOTO, Noriko, YAMAMOTO, Shuichi, PODGORNIK, Aleš. Reaction-mediated desorption of macromolecules : novel phenomenon enabling simultaneous reaction and separation. Biotechnology journal, ISSN 1860-6768, 2018, vol. 13, iss. 7, str. 1-9, ilustr. doi: 10.1002/biot.201700738.