

MEHANSKE IN HIDRODINAMSKE OPERACIJE

UČNI NAČRT PREDMETA/COURSE SYLLABUS

Predmet:	Mehanske in hidrodinamske operacije
Course title:	Mechanical and Hydrodynamic Operations
Članica nosilka/UL Member:	UL FKKT

Študijski programi in stopnja	Študijska smer	Letnik	Semestri	Izbirnost
Kemijsko inženirstvo, prva stopnja, univerzitetni	Ni členitve (študijski program)	2. letnik, 3. letnik		izbirni

Univerzitetna koda predmeta/University course code:	0100306
Koda učne enote na članici/UL Member course code:	INSI34

Predavanja /Lectures	Seminar /Seminar	Vaje /Tutorials	Klinične vaje /Clinical tutorials	Druge oblike študija /Other forms of study	Samostojno delo /Individual student work	ECTS
45	15	15 LV			75	5

Nosilec predmeta/Lecturer: prof. dr. Igor Plazl

Vrsta predmeta/Course type: izbirni strokovni/Elective Professional

Jeziki/Languages:

Predavanja/Lectures:	Angleščina, Slovenščina
Vaje/Tutorial:	Angleščina, Slovenščina

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:

Uvod: Osnovne faze kemijskega procesa: priprava, kemijska pretvorba, izolacija in čiščenje produkta in osnovne operacije. Mehanske operacije: Karakteriziranje grobo disperznih sistemov, velikost delcev. Procesni večanja površin, mletje, drobljenje. Procesni manjšanja površin, aglomeriranje. Procesni razvrščanja po velikosti, sejanje. Primeri izbire in dimenzioniranja naprav. Hidrodinamske operacije: Posedanje v gravitacijskem polju. Stokesov zakon. Posedalne naprave. Fluidizacija. Posedanje v centrifugalnem polju. Naprave: centrifuga, ciklon. Ločevanje trdno tekočefiltracija. Klasična filtracija, načini obratovanja in naprave. Obtočna filtracija: mikrofiltracija, ultrafiltracija, reverzna osmoza. Osnovni principi, vrste membran in membranskih modulov.

Content (Syllabus outline):

Introduction: Basic steps of chemical process: Preparation, chemical conversion, isolation and cleaning of the product - basic operations. Mechanical operations: Characterization of coarse-grained disperse systems, particle size. Processes for increasing particle surface: crushing and milling. Processes for decreasing particle surface, agglomeration. Process of particle size classification, sieving. Equipment for crushing and grinding. Examples of apparatus dimensioning and its selection. Examples of selection and dimensioning of devices for crushing and grinding. Hydrodynamic operations: Settling under gravity. Stoke's law. Liquid-solid separation methods. Sedimentation, industrial thickeners and clarifiers. Fluidization. Settling in centrifugal field. Equipment:

Mešanje. Osnovni principi in naprave. Mešanje v sistemih tekoče, tekoče-plin in tekoče-trdno. Primeri izbire in dimenzioniranja posameznih naprav. Primeri sinteze posameznih mehanskih in hidrodinamskih operacij v tehnološki proces	centrifuge and cyclone separators. Filtrations: classical filtration – operation mode and devices, reflux filtration methods: microfiltration, ultrafiltration and reverse osmosis; basic principles, types of membranes and membrane modules. Mixing. Basic principles and mixing devices mixing in systems: liquid-liquid, liquid – gas and liquid solid. Examples of selection and dimensioning of devices for mixing. Examples of synthesis of individual mechanical and hydrodynamic operations in technological processes.
--	---

Temeljna literatura in viri/Readings:

- J.H.Harker, J.R.Backhurst, J.F.Richardson, Chemical Engineering, Volume 2, Elsevier, 2002. 1232 str (20%)

Cilji in kompetence:

Cilj predmeta je študente seznaniti pomenom mehanskih in hidrodinamskih operacij v kemijskem inženirstvu. Predmetno specifične kompetence:

- študent spozna posamezne operacije kot sestavni del kemijsko tehnološkega procesa,
- razume posamezne operacije in delovanje aparatov in zna napravo za določen tehnološki proces.

Objectives and competences:

Objective of the course is to acquaint students with the meaning of mechanical and hydrodynamic operations in chemical engineering. Subject specific competences:

- Student learns individual operations as an integral part of the chemical technological process
- Student understands particular operations and device operation for a certain technological process.

Predvideni študijski rezultati:

Znanje in razumevanje
Študent je po osvojitvi pojmov, zakonitosti, teorij in pojavov, ki jih podaja ta predmet, sposoben razumeti specifičnosti posamezne operacije in vloge v tehnološkem procesu.
Uporaba
Pridobljena znanja je sposoben uporabiti pri izbiri in dimenzioniranju posameznega aparata oziroma načrtovanju in vodenju posameznega tehnološkega procesa.
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
When student understands concepts, laws, theories and phenomena, which are subjects of presented course, he/her is capable to recognize the specifics of individual operations and the role in the technological process.
Application
By acquired knowledge student gains skill for selecting and dimensioning devices, and competences for planning and conduct of an individual technological process.
Analysis
The use of general knowledge and basic principles of chemical engineering; analysis and critical evaluation of technological process and/or specific procedure and device.
Skill-transference Ability
Evolved capability to identify and to solve problems, critical consideration and logical reasoning. The capability of collecting literature and data interpretation.

Metode poučevanja in učenja:

Predavanja in seminarji.

Learning and teaching methods:

Lectures, seminars and laboratory work.

Načini ocenjevanja:

- Pisni in ustni izpit

- poročila iz laboratorijskih vaj

- pisna seminarska naloga.

Delež/Weight

60,00 %

20,00 %

20,00 %

Assessment:

- Written and oral exam;

- Laboratory work : written report,

- Written seminar

Reference nosilca/Lecturer's references:

1. LUBEJ, Martin, PLAZL, Igor. Theoretical and experimental study of iron catalyst preparation by chemical vapor deposition of ferrocene in air. *The chemical engineering journal*, 2014, vol. 242, no. 1, pp. 306-312.
2. MILOŽIČ, Nataša, LUBEJ, Martin, NOVAK, Uroš, ŽNIDARŠIČ PLAZL, Polona, PLAZL, Igor. Evaluation of diffusion coefficient determination using a microfluidic device. *Chemical and biochemical engineering quarterly*, 2014, vol. 28, no. 2, pp. 215-223.
3. NOVAK, Uroš, LAKNER, Mitja, PLAZL, Igor, ŽNIDARŠIČ PLAZL, Polona. Experimental studies and modeling of [alpha]-amylase aqueous two-phase extraction within a microfluidic device. *Microfluidics and nanofluidics*, 2015, 19:75–83

ULB FERROVIA