UČNI NAČRT PREDMETA / COURSE SYLLABUS	
Predmet:	MEHANSKE IN HIDRODINAMSKE OPERACIJE
Course Title:	MECHANICAL AND HYDRODINAMIC OPERATIONS

Študijski program in stopnja Study Programme and Level	Študijska smer Study Field	Letnik Academic Year	Semester Semester
UŠP Kemijsko inženirstvo, 1. stopnja	**/**	**3.**	**5.**
USP Chemical Egineering, 1st Cycle	**/**	**3rd**	**5th**

Vrsta predmeta / Course Type: izbirni strokovni / Elective Professional

Univerzitetna koda predmeta / University Course Code: INSI34

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje Work	Druge oblike študija	Samost. delo Individual Work	ECTS
45	**15**	**15 LV**	**/**	**/**	**75**	**5**

Nosilec predmeta / Lecturer: prof. dr. Igor Plazl / Dr. Igor Plazl, Full 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):**
Uvod: Osnovne faze kemijskega procesa: priprava, kemijska pretvorba, izolacija in čiščenje produkta in osnovne operacije. Mehanske operacije: Karakteriziranje grobo disperznih sistemov, velikost delcev. Procesi večanja površin, mletje, drobljenje. Procesi manjšanja površin, aglomeriranje. Procesi 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 tekoče-filtracija.	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

UL FKKT

Klasična filtracija, načini obratovanja in naprave. Obtočna filtracija: mikrofiltracija, ultrafiltracija, reverzna osmoza. Osnovni principi, vrste membran in membranskih modulov. 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.	gravity. Stoke's law. Liquid-solid separation methods. Sedimentation, industrial thickeners and clarifiers. Fluidization. Settling in centrifugal field. Equipment: 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:	**Objectives and Competences:**
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.	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:	**Intended Learning Outcomes:**
<u>Znanje in razumevanje</u> Študent je po osvojitvi pojmov, zakonitosti, teorij in pojavov, ki jih podaja ta predmet, sposoben razumeti specifičnosti posamezne operacije in vloge v tehnološkem procesu.	<u>Knowledge and Comprehension</u> 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.
<u>Uporaba</u> Pridobljena znanja je sposoben uporabiti pri izbiri in dimenzioniranju posameznega aparata oziroma načrtovanju in vodenju posameznega tehnološkega procesa.	<u>Application</u> By acquired knowledge student gains skill for selecting and dimensioning devices, and competences for planning and conduct of an individual technological process.

UL FKKT

Refleksija Uporaba splošnih znanj in osnovnih principov kemijskega inženirstva, analiza in kritično ovrednotenje tehnološkega procesa oziroma posameznega postopka in naprave.	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.
Prenosljive spretnosti Razvita sposobnost identifikacije in reševanja problemov, kritičnega razmišljanja in logičnega sklepanja. Sposobnost uporabe literature, zbiranja in interpretacije podatkov in njihove kritične evalvacije.	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:	**Learning and Teaching Methods:**
Predavanja in seminarji.	Lectures, seminars and laboratory work.

Načini ocenjevanja:	Delež (v %) / Weight (in %)	**Assessment:**
- Pisni in ustni izpit - poročila iz laboratorijskih vaj - pisna seminarska naloga.	**60 %** **20 %** **20 %**	- 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

UL FKKT