

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet:	OSNOVE KEMIJSKEGA INŽENIRSTVA
Course Title:	PRINCIPLES OF CHEMICAL ENGINEERING

Študijski program in stopnja Study Programme and Level	Študijska smer Study Field	Letnik Academic Year	Semester Semester
UŠP Kemija, 1. stopnja	/	3.	6.
USP Chemisrty, 1 st Cycle	/	3 rd	6 th

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
60	15	/	/	/	75	5

Nosilec predmeta / Lecturer: prof. dr. Matjaž Krajnc / Dr. Matjaž Krajnc, 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.
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Vsebina:

Osnovni koncepti. Pomen snovne in energijske bilance pri razumevanju, analizi in načrtovanju kemijskih procesov. Koncept kontrolnega volumna. Snovna in energijska bilanca za diferencialni element Procesne sheme. Transportni pojavi. Viskoznost; karakteristike toka tekočin; tok tekočin in prvi zakon termodinamike; laminarni in turbulentni tok: hitrostna porazdelitev in izračun linijskih izgub v cevi; mešanje. Mehanizmi prenosa toplote; stacionarno prevajanje; nestacionarno prevajanje; konvektivni prenos toplote. Mehanizmi prenosa snovi; stacionarna difuzija; nestacionarna difuzija; konvektivni prenos snovi, prenos snovi med fazami. Kemijsko reakcijsko inženirstvo. Kinetika

Content (Syllabus outline):

Basic concepts. Importance of mass and energy balance for the understanding, analysis and design of chemical processes. Concept of the control volume. Differential mass and energy balance of the Process scheme. Transport phenomena. Viscosity; fluid flow characteristics; fluid flow and 1st law of thermodynamics; laminar and turbulent flow: velocity distribution and calculation of linear losses in the pipe flow; mixing. Mechanisms of heat transfer; steady state conductivity; transient conductivity; convective heat transfer. Mechanisms of mass transport; steady state diffusion; transient diffusion; convective mass transfer; interphase mass transfer. Chemical reaction engineering. Kinetics of homogeneous and heterogeneous

homogenih in heterogenih reakcij; hitrost kemijske reakcije; osnove načrtovanja kemijskih reaktorjev.
Primeri uporabe temeljnih kemijsko inženirskih znanj. Destilacijske metode; ekstrakcijski procesi; absorpcija; sušenje.

chemical reactions; rate of chemical reaction; fundamentals of chemical reactor design. Applications of fundamental chemical engineering principles. Distillation processes; extraction processes; absorption; drying

Temeljna literatura in viri / Readings:

- S. Simons, E. Sorensen, T. Elson, S. Brandani: Concepts of Chemical Engineering 4 Chemists. The Royal Society of Chemisrty, 2007, 350 str. (60%)

Dodatna literatura / Additional Readings:

T. Koloini: Prenos toplote in snovi, FNT, Ljubljana, 1994, 240 str. (60%).

H. S. Fogler: Elements of chemical reaction Engineering, Prentice Hall, Inc., 2006, 1120 str. (30%)

Cilji in kompetence:

Cilj predmeta je študente ob predhodnem poznavanju naravoslovnih ved seznaniti z osnovnimi koncepti v kemijsko inženirski stroki. Predmetno specifične kompetence: študent je z osvojenimi znanji sposoben

- prepoznavanja in ovrednotenja določnega procesa - nastavitve snovnih in energijskih bilanc
- izračuna linijskih izgub vodnikov
- dimenzioniranja osnovnih aparatov za prenos toplote in prenos snovi
- načrtovanja racionalnega eksperimentalnega dela v laboratoriju ali v industriji
- pravnega razumevanja in vrednotenja rezultatov eksperimentalnega dela

Objectives and Competences:

Objective of the course is to acquaint student, who already has knowledge of natural sciences, with basic concepts in chemical engineering. Subject specific competences:

- Identification and evaluation of a certain process,
- To define equations of mass and energy balances
- Evaluation of head loses in pipe flow
- Dimensioning and design of heat and mas transfer devices
- Planning of rational experimental work in laboratory and in industrial plant
- Proper understanding and evaluation of results obtained by experimental work

Predvideni študijski rezultati:

Znanje in razumevanje

Študent bo po osvojitvi pojmov, zakonitosti, teorij in pojavov, ki jih podaja ta predmet, sposoben razumeti specifičnosti kemijsko inženirske stroke ter pomena matematike, fizike, kemije, računalništva in osnovnih

Intended Learning Outcomes:

Knowledge and Comprehension

Understanding of basic principles of chemical engineering knowledge required in further courses and later, during employment. Ability for basic analysis, synthesis and quality evaluation of plain chemical technology

principov kemijskega inženirstva v kemijski procesni tehniki.	processes.
Uporaba Pridobljena znanja o kemijsko inženirskih zakonitostih in principih je sposoben uporabiti pri reševanju posameznih praktičnih računskih primerov in problemov v kemijski procesni tehniki in v nadaljnjem študiju.	Application Student is able to apply the knowledge of chemical engineering principles in solving specific practical calculation cases in chemical process technology problems. The acquired knowledge is necessary for further study.
Refleksija Študent bo razumel osnovne principe kemijskega inženirstva in razvil veščine za analizo in kritično ovrednotenje tehnološke sheme procesa oziroma posamezne naprave.	Analysis Student understands basic principles of chemical engineering and develops skills for analysis and critical evaluation of technological scheme or specific equipment.
Prenosljive spretnosti Pri predmetu se študent nauči sintetizirati vsebine znanj, pridobljene z različnih področij tehničnih in naravoslovnih segmentov, ter tako pridobi vzorec za inovativno delo na drugih področjih.	Skill-transference Ability By matter of this course student learns to connect knowledge of different technical and natural science segments and acquires mode for innovative work in different fields.

Metode poučevanja in učenja:

Predavanja in seminarji.

Learning and Teaching Methods:

Lectures and seminars.

Načini ocenjevanja:

Pisni in ustni izpit.
Ocene: 6-10 pozitivno.

Delež (v %) /

Weight (in %) **Assessment:**

Written and oral exam.
Grades: 6-10

Reference nosilca / Lecturer's references:

- ŠINKOVEC, Ervin, POHAR, Andrej, KRAJNC, Matjaž. Phase transfer catalyzed esterification : modeling and experimental studies in a microreactor under parallel flow conditions. *Microfluidics and nanofluidics*, ISSN 1613-4982, 2013, vol. 14, no. 3/4, str. 489-498. [COBISS.SI-ID [36262917](#)]
- LIKOZAR, Blaž, KRAJNC, Matjaž. Cross-linking of polymers : kinetics and transport phenomena. *Industrial & engineering chemistry research*, ISSN 0888-5885. [Print ed.], 2011, vol. 50, no. 3, str. 1558-1570. [COBISS.SI-ID [35022341](#)]
- LIKOZAR, Blaž, KRAJNC, Matjaž. Simulation of chemical kinetics of elastomer crosslinking by organic peroxides. *Polymer engineering and science*, ISSN 0032-3888, 2009, vol. 49, no. 1, str. 60-72. [COBISS.SI-ID [30003205](#)]

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