

# INŽENIRSTVO MATERIALOV

## UČNI NAČRT PREDMETA/COURSE SYLLABUS

<b>Predmet:</b>	Inženirstvo materialov
<b>Course title:</b>	ENGINEERING OF MATERIALS
<b>Članica nosilka/UL Member:</b>	UL FKKT

Študijski programi in stopnja	Študijska smer	Letnik	Semestri	Izbirnost
Kemijsko inženirstvo, druga stopnja, magistrski	Ni členitve (študijski program)	1. letnik		izbirni

<b>Univerzitetna koda predmeta/University course code:</b>	0100741
<b>Koda učne enote na članici/UL Member course code:</b>	IN2I04

Predavanja /Lectures	Seminar /Seminar	Vaje /Tutorials	Klinične vaje /Clinical tutorials	Druge oblike študija /Other forms of study	Samostojno delo /Individual student work	ECTS
45	30				75	5

**Nosilec predmeta/Lecturer:** prof. dr. Marjan Marinšek

**Vrsta predmeta/Course type:** izbirni strokovni/Elective Professional

**Jeziki/Languages:**

Predavanja/Lectures:	Angleščina, Slovenščina
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:

Razvoj sodobnih materialov zahteva od inženirja poznavanje področja vede o materialih. Na osnovi znanj vede o materialih bo inženirstvo materialov predstavljeno na način soodvisnosti priprave-strukture-lastnosti-kvalitete materiala. Predstavljeno bo inženirstvo izbranih in aktualnih materialov ter njihova praktična uporabnost. Težišče bo usmerjeno v:

- Inženirstvo kovinskih materialov: priprava izbranih kovinskih materialov; oblikovanje; toplotna in mehanska obdelava; kovinski prahovi, praškovna metalurgija, razvoj jekel, specialne zlitine in njihove lastnosti
- Inženirstvo keramike in stekel: oblikovanje keramičnih surovcev, sintranje, modifikacija keramičnih površin, zvišanje žilavosti

### Content (Syllabus outline):

Development of advanced materials requests from an engineer the knowledge of basic principles of materials science. Based on materials science the principle of materials engineering will be discussed in terms of processing-structure-properties-performance relationships. The engineering and practical application of selected materials will be presented and discussed. Focus will be given to:

- Engineering of Metals: manufacturing of metallic materials, shaping, heat and mechanical treatment of metals, powder metallurgy, development of steel, special alloys and their properties
- Engineering of Ceramics and Glasses:

keramike, razvoj inženirske keramike, perovskitna keramika • Inženirstvo polimernih materialov: oblikovanje polimernih izdelkov, recikliranje polimerov, razvoj polimernih materialov, specialni polimerni materiali • Inženirstvo kompozitnih materialov: razvoj betonov, specialni kompozitni materiali	green body shaping, sintering, modification of ceramic surfaces, toughening of ceramics, development of engineering ceramics, perovskites • Engineering of Polymers: polymer processing techniques, recyclability of polymers, development of polymers, special polymers • Engineering of Composites: development of concrete, special composites
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**Temeljna literatura in viri/Readings:**

1. The Principles of Materials Selection for Engineering Design, Pat L. Mangonon, Prentice Hall, 1999, 824 strani (50%) 2. Engineering Materials 2, An Introduction to Microstructures and Processing, 4th ed. M.F. Ashby, D.R.H. Jones, Elsevier, 2013, 553 strani (20%) 3. Engineering Design with Polymers and Composites 2nd ed. , J.C. Gerdeen, H.W. Lord, R.A.L. Rorrer, Taylor&Francis Group (CRC), 2011, 349 strani, (10%) 4. Nanostructures and Nanomaterials, Synthesis, Properties and Applications, 2nd ed., Guozhong Cao, Ying Wang, World Scientific, 2011, 581 strani (20%)
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**Cilji in kompetence:**

Načrtovanje materialov s specifičnimi lastnostmi, korelacija med procesom za pripravo materiala, dobljenimi karakteristikami in njihovo uporabnostjo.	<b>Objectives and competences:</b> Designing materials with specific properties, correlation between the materials' preparation process, resulting characteristics and material applications.
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**Predvideni študijski rezultati:**

Znanje in razumevanje Študent spozna osnovne principe o lastnostih materialov; kako so odvisni od mikrostrukture, kako se spreminjajo s pripravo, kako korozija spreminja (skrajša) čas uporabe in kako so komponente kompatibilne z drugimi materiali v kompleksnih strukturah. Uporaba Načrtovanje materialov s specifičnimi lastnostmi, izbor procesa za doseganje takega cilja. Refleksija Študenta znanja pridobljena v predhodnih študijskih letih uporablja za analizo kompleksnih problemov pri načrtovanju novih materialov ali takih s specifičnimi karakteristikami. Prenosljive spretnosti Razvita sposobnost kritičnega razmišljanja in logičnega sklepanja. Sposobnost študija domače in tuje literature ter predstavitve rezultatov.	<b>Intended learning outcomes:</b> Knowledge and Comprehension Students understand the relations of materials properties and microstructure, how processing parameters change the properties and how the corrosion influences material's applicability Application Design of materials with specific properties, selection of processing route to obtain requested properties. Analysis Students will integrate knowledge acquired in previous years to analyse complex problems in design of new materials or materials with specific properties. Skill-transference Ability Ability of critical thinking and deduction; Ability of studying relevant literature from the field of materials processing and ability of clear presentation to
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**Metode poučevanja in učenja:**

Predavanja, seminar, priprava seminarja.	<b>Learning and teaching methods:</b>
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**Načini ocenjevanja:**

Načini ocenjevanja:	Delež/Weight	Assessment:
Pisni in ustni izpit	50,00 %	Written and oral exam
Seminar	50,00 %	Seminar

**Reference nosilca/Lecturer's references:**

1. ZUPAN, Klementina, **MARINŠEK, Marjan**, PEJOVNIK, Stane, MAČEK, Jadran, ZORE, Karmen. Combustion synthesis and the influence of precursor packing on the sintering properties of LCC nanopowders. Journal of the European ceramic society, ISSN 0955-2219. [Print ed.], 2004, vol. 24, no. 6, str. 1935-1939
2. DIMITROVSKA-LAZOVA, Sandra, KOVACHEVA, D., ALEKSOVSKA, Slobotka, **MARINŠEK, Marjan**, TZVETKOV, P. Synthesis and structural details of perovskites within the series  $\text{PrCo}_{1-x}\text{Cr}_x\text{O}_3$  : ( $x = 0, 0.33, 0.67$  and  $1$ ). Bulgarian Chemical Communications, 2012, vol. 44, no. 1, str. 37-46
3. CRNJAK OREL, Zorica, MAČEK, Jadran, **MARINŠEK, Marjan**, PEJOVNIK, Stane. Coprecipitation of copper/zinc compounds in metal salt-urea-water system. V: MAČEK, Marjeta (ur.), SUVOROV, Danilo. Refereed reports of IX Conference & Exhibition of the European Ceramic Society : 19-23 June 2005, Portorož, Slovenia, (Journal of the European ceramic society, vol. 27, no. 2-3, 2007). Amsterdam: Elsevier, 2007, vol. 27, no. 2/3, str. 451-455