Faculty of Metalurgy and Technology / CHEMICAL TECHNOLOGY / POWDER PROCESSING

Course:	POWDER PROCESSING							
Course ID	Course status	Semester	ECTS credits	Lessons (Lessons+Exer cises+Laboratory)				
12232	Optional	3	6	2+1+1				
Programs	CHEMICAL TECHNOLOGY							
Prerequisites	No mutual dependency							
Aims	the goals are oriented towards the knowledge adoption concerning the different concepts of powder production, characterization, densification as well as the final compaction and the characterization of compacts							
Learning outcomes	fter the completion of the course student should: 1. Differentiate the techniques for powder preparation in accordance of powders properties, 2. Be capable to analyze the results of powders characterization: size, size distribution, shape, porosity, macrostructure, density, 3. Be familiar with the theoretical fundamentals of different processes like densification by shaping and compaction, 4. Based on theoretical knowledge apply the consolidation without the binder and with binder 5. Identify technological problems in production, characterization and consolidation of powders and find the solution, 6. Be familiar with the theoretical aspects of sintering, 7. Be familiar with the techniques of final procession and characterization of compacted powder							
Lecturer / Teaching assistant	Prof. dr Mira Vukčević							
Methodology	Lectures, practical and theoretical exercises, colloquia							
Plan and program of work								
Preparing week	Preparation and registration of the semester							
I week lectures	powder production, mechanical methods							
l week exercises	Relation between the powder properties and the processing technique. Milling and mechanical alloying as the most primitive processing techniques							
II week lectures	Powder production, physico-chemical method							
II week exercises	precipitation from the metal salt solution							
III week lectures	Powder production, atomization techniques							
III week exercises	the rotation electrode process, examples, visualization							
IV week lectures	Characterization of powders, size, size distribution, shape, porosity							
IV week exercises	Microscopy, sieving							
V week lectures	Densification by shaping							
V week exercises	casting, extrusion							
VI week lectures	Densification by compaction							
VI week exercises	Density of the compacts as the function of applied pressure							
VII week lectures	First colloquium							
VII week exercises	Practical aspects of conventional pressing, experiment, result analysis							
VIII week lectures	Low-temperature and High-energy compaction							
VIII week exercises	Rolling of the powders, laboratory, explosive compaction							
IX week lectures	sintering, theoretical aspects of material transport during the sintering process							
IX week exercises	Densification in sintering, detection of contacts, laboratory							
X week lectures	Solidus sintering process							
X week exercises	Forming of the contacts, contacts growth, microscopy							
XI week lectures	Liquidus sintering							
XI week exercises	Development of the microstructure, dissolution and rearrangement, densification							
XII week lectures	Specific sintering processes in the presence of liquid phase							
XII week exercises	Super-solidus sintering, transition liquid phase, microscopy							

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XIII week lec	tures	High-temperature consolidation							
XIII week ex	ercises	Characteristics, deformation mechanism							
XIV week led	tures	Characterization of compacted materials							
XIV week ex	ercises	Characterization of surface, compressive strength, porosity							
XV week lec	tures	2nd Colloquium							
XV week exe	ercises	Corrective 2nd. colloquium							
Student wo	orkload								
Per week			Per semester						
 6 credits x 40/30=8 hours and 0 minuts 2 sat(a) theoretical classes 1 sat(a) practical classes 1 excercises 4 hour(s) i 0 minuts of independent work, including consultations 			Classes and final exam: 8 hour(s) i 0 minuts x 16 =128 hour(s) i 0 minuts Necessary preparation before the beginning of the semester (administration, registration, certification): 8 hour(s) i 0 minuts x 2 =16 hour(s) i 0 minuts Total workload for the subject: 6 x 30=180 hour(s) Additional work for exam preparation in the preparing exam period, including taking the remedial exam from 0 to 30 hours (remaining time from the first two items to the total load for the item) 36 hour(s) i 0 minuts Workload structure: 128 hour(s) i 0 minuts (cources), 16 hour(s) i 0 minuts (preparation), 36 hour(s) i 0 minuts (additional work)						
Student obligations			Active participation in the lectures, the exercises, colloquia, written exam						
Consultations			Mondays and Fridays after 12 a.m						
Literature			.M.Mitkov, D.Božić, Z. Vujović, Metalurgija praha, Naučna knjiga, Beograd 1998 2. R.German, Powder Metallurgy science, 2nd edition, 2005 3. R.German, Powder Metallurgy Science,3rd edition 2008						
Examination methods			Active participation in lectures and exercises (0-10 points) Colloquia up to 20 points Final exam up to 50 points						
Special remarks			-						
Comment			-						
Grade:	F		E	D	С	В	А		
Number of points	less than 50 points		greater than or equal to 50 points and less than 60 points	greater than or equal to 60 points and less than 70 points	greater than or equal to 70 points and less than 80 points	greater than or equal to 80 points and less than 90 points	greater than or equal to 90 points		