Description of an Individual Course Unit

Study program	All, except Chemistry		
Module			
Type and level of studies	PhD studies		
Course title	Thermodynamics of the Solid State		
Professor (for lectures)	Jelena Miladinović		
Professor/assistant (for practice)			
Professor/assistant (for LAB)			
Number of ECTS	5	**Type of the course (mandatory/elective)**	mandatory/elective
Prerequisit			
Objective of the course	The main course goal is for students to master the knowledge and skills referring to thermodynamics of processes and phenomena that do appear in the solid state and to train the student in the application of the basic concepts to problems that are commonly encountered by the materials scientist.		
Learning outcomes of the course	Students are capable to connect, interrelate and apply the laws of Thermodynamics and relations that exist between thermodynamic potential with material properties and parameters of technological processes and this way to influence the conditions in order to obtain certain properties. Students are introduced to various fields of solid state thermodynamics enabling to model and analyze increasingly complex systems.		
Course Contents			
Theoretical contents	Students gain knowledge about: Fundamental equations of the chemical thermodynamics for the systems subjected to constant or variable external field (electrical, magnetic and gravitational) taking into account surface effects; Irreversible thermodynamics : entropy generation, flux-force interrelationship, coupled processes, thermoelectric effects: Seebeck and Peltier effects; Thermodynamics of surfaces and interfaces: surface tension and surface energy, anisotropy of surface energy, internal boundaries-chemical discontinuity; Phase transformations:first order transition, higher order change of phase, with samples: superconducting phase change, superfluid transition in liquid helium; Diffusion in the solid state: the influence of concentration and temperature on diffusion coefficient; Defects, basics of defects, defect reactions, defects in nearly stoichiometric compounds and in non stiochiometric compounds. ;		
Practical part (practices, LAB, study research work)			
Literature			
1	R. A. Swalin, Thermodynamic of Solids, Ed. J.E. Burke, B. Chalmers, J.A. Krumhansl, Wiley-Interscience, John Wiley and Sons, N.York-London-Toronto, 1972.		
2	S. I. Sandler, Chemical and Engineering Thermodynamics, John Wiley and Sons, 1989.		
3	C. H. P. Lupis, Chemical Thermodynamics of Materials, North Holland, 1989.		
4	B. S. Bokstein, M. I. Mendelev, D. J. Srolovitz, Thermodynamics and Kinetics in Materials Science, Oxford University Press, 2005.		
5	. C. J. Adkins, Equilibrium Thermodynamics, Cambridge Univer. Press. 1986.		

Lessons per week				
Lectures	**Practices**	**LAB**	**Study research work**	**Other activities**
2				

Teaching Methods	Lectures

Grading methods (max. number of points is 100)			
Pre-exam assesments	**points**	**Final examination**	**points**
activity during lectures		**written exam**	
practical assesments		**oral exam**	60
mid-term exams	2x20		
seminars			