Faculty of Metalurgy and Technology / /

Course:				
Course ID	**Course status**	**Semester**	**ECTS credits**	**Lessons** (Lessons+Exercises+Laboratory)
10800	Mandatory	1	8	3+2+0
Programs				
Prerequisites	No prerequisites			
Aims	Using the results of statistical thermodynamics, establish a connection between classical and molecular thermodynamics. Understanding the thermodynamics of processes and phenomena that occur in the solid phase and the interaction of the solid phase with other phases.			
Learning outcomes	After successful completion of this course, the student will be able to: - Thermodynamically analyses complex technological processes; - Solves thermodynamic problems by connecting classical and molecular approaches; - Adapt the technological project to new or changed thermodynamic conditions; - Interdisciplinary approaches to solving other physical and chemical problems; - Explain the properties of the material and plan the processing of the material to obtain the desired properties; - Innovatively combines knowledge in practical problem-solving.			
Lecturer / Teaching assistant	prof. dr Veselinka Grudić, prof. dr Vanja Asanović			
Methodology	Lectures, exercises, homework assignments, quizzes, project, consultation, midterm exams and final exam.			
Plan and program of work				
Preparing week	Preparation and registration of the semester			
I week lectures	Introduction to statistical thermodynamics. Intermolecular forces. Molecular theory.			
I week exercises	Examples: Intermolecular forces. Molecular theory.			
II week lectures	Fugacities in gas mixtures.			
II week exercises	Examples: Fugacities in gas mixtures.			
III week lectures	Fugacities in liquid mixtures.			
III week exercises	Examples: Fugacities in liquid mixtures.			
IV week lectures	Excess functions and partial miscibility. UNIFAC equation for calculation of activity coefficients.			
IV week exercises	Examples: Excess functions and partial miscibility. Consideration of project topics.			
V week lectures	Models and theories of solutions.			
V week exercises	Examples: Models and theories of solutions.			
VI week lectures	Polymers. Equations of state for polymer solutions.			
VI week exercises	Midterm exam 1.			
VII week lectures	Thermodynamics of emulsions.			
VII week exercises	Examples: Polymers. Equations of state for polymer solutions.			
VIII week lectures	Solubilities of gases in liquids. Solubilities of solids in liquids.			
VIII week exercises	Make-up Midterm exam 1.			
IX week lectures	High-pressure phase equilibria.			
IX week exercises	Examples: Solubilities of gases in liquids.			
X week lectures	Molecular simulation.			
X week exercises	Molecular simulation.			
XI week lectures	Thermodynamics of surfaces and interfaces. Anisotropy of surface energy. Internal boundaries - chemical discontinuity. Internal boundaries - structural discontinuity.			
XI week exercises	Midterm exam 2.			
XII week lectures	Stability of crystal disorder. Defect complexes in metals.			
XII week exercises	Examples: Solubilities of solids in liquids.			
XIII week lectures	Equilibrium constants for defect reactions.			

XIII week exercises	Make-up Midterm exam 2.
XIV week lectures	Defects in nonstoichiometric compounds.
XIV week exercises	Essay presentation.
XV week lectures	Preparation for final exam.
XV week exercises	Essay presentation.
Student workload	Per week: 8 credits x 40/30 hours = 10 hours and 40 minutes Total workload for the course: 8 x 30 = 240 hours

Per week	**Per semester**
8 credits x 40/30=10 hours and 40 minuts 3 sat(a) theoretical classes 0 sat(a) practical classes 2 excercises **5 hour(s) i 40 minuts** of independent work, including consultations	Classes and final exam: **10 hour(s) i 40 minuts x 16 =170 hour(s) i 40 minuts** Necessary preparation before the beginning of the semester (administration, registration, certification): **10 hour(s) i 40 minuts x 2 =21 hour(s) i 20 minuts** Total workload for the subject: **8 x 30=240 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) **48 hour(s) i 0 minuts** Workload structure: **170 hour(s) i 40 minuts (cources), 21 hour(s) i 20 minuts (preparation), 48 hour(s) i 0 minuts (additional work)**
Student obligations	Students are required to attend classes, do their homework, submit essays and take the midterm exams.
Consultations	Tuesday and Thursday, 9:00 - 11:00.
Literature	J. M. Prausnitz, R. N. Lichtenthaler, E. G. de Azevedo, Molecular Thermodynamics of Fluid-Phase Equilibria, 3rd ed., Prentice Hall, New Jersey, 1998. B.E. Poling, J.M. Prausnitz, J.P. OConnell, The Properties of Gases and Liquids, 5th ed., McGraw-Hill, New York, 2001. R. A. Swalin, Thermodynamics of Solids, ed. J. E. Burke, B. Chalmers, J. A. Krumhansl, Wiley-Interscience, John Wiley and Sons, New York, 1972.
Examination methods	Two essays (10 points each); Two Midterm exams (15 points each, total 30 points); Final exam (50 points); Passing grade is obtained if at least 50 points are collected.
Special remarks	-
Comment	-

Grade:	F	E	D	C	B	A
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