Program	Level of studies		First cycle	
	Program name		Physics	
Course name	PHYSICS OF METALS II			
Course ID	Semester	Course status	ECTS	L+E
PCM8611	VIII	ELECTIVE	6	2+2
Lecturer	Prof. dr. Suada Sulejmanović			
Aims and intended learning outcomes	Aim of the course is introduction to phase, thermodynamic stability and phase transformations in metals and their alloys. After the completion of the course, students will be expected to understand the basic principles of phase equilibrium which enable the construction and interpretation of phase diagrams, the solubility and evolution of equilibrium and non-equilibrium microstructures, the theory of diffusion processes, the thermodynamics and kinetics of phase transformations.			

Course content

Equilibrium diagrams Types. Example 1: Equilibrium diagram of a binary system in which the components form a mixture of crystals in the solid state and are completely soluble in the liquid state. Example 2: Equilibrium diagrams for binary systems in which the components are completely soluble in the liquid state and partially soluble in the solid state. Example 3: Solid solutions with unlimited solubility. Binary alloys. Gibbs free energy as a function of temperature and concentration.
Chemical potential and activity. Raoult's law. Ideal, regular and real solid solutions. Equilibrium concentration of vacancies. Example of forming an equilibrium diagram for a binary system by drawing the curves of free energy.
Equilibrium diagrams for multi-component systems. Diffusion in metals. Atomic mechanisms of diffusion. Interstitial diffusion. Substitutional diffusion. Self-diffusion. Vacancy diffusion. Diffusion in substitutional alloys. Kirkendall effect. Grain boundary diffusion and surface diffusion. Amorphous metals – metallic glasses. Production methods and structure (models) Relaxation processes in amorphous metals.

Student workload (hours)		Grading	
Lectures and Exercises	60	Assessment method	Points
Exam preparation	40	Homework	10
Assignments	20	Seminar paper	10
Consultation	30	Midterm exam	40
Total	150	Final exam	40
		Total	100

Literature

1. T. Mihać: Fizika metala, nerecenzirana skripta
2. T. Mihać: Praktikum iz fizike metala, Univerzitetska knjiga, Sarajevo 2001.
3. Ch. Kittel: Uvod u fiziku čvrstog stanja, Savremena administracija, Beograd, 1970.
4. S. Tomašević, R. Zrilić, D. Ćubela: Nauka o materijalima, Apex, Zenica, 2000.
5. I. Vitez., M .Oruč., R .Sunulahpašić., Ispitivanje metalnih materijala: Mehanička i tehnološka ispitivanja, Fakultet za metalurgiju i materijale, Zenica, 2006.
6. D. A. Porter, K. E. Easterling: Phase transformations in metals and Alloys, Chapman&Hall 1984.

Remarks

Midterm exam – 9th week of lectures