Program	Level of studies		**First cycle**	
	Program name		**Physics**	
Course name	**PHYSICS OF METALS I**			
Course ID	Semester	Course status	ECTS	L+E
PCM7511	**VII**	**ELECTIVE**	**5**	**2+2**
Lecturer	**Suada Sulejmanović, Associate professor**			
Aims and intended learning outcomes	Aim of this course is the introduction with processes of forming, types and properties of pure metals and metallic systems, introduction to physical processes which control and dominate the forming of solid phases as well as the experimental methods for investigation of certain metallic properties. After the completion of this course students will be expected to have acquired a general knowledge concerning properties of metals and metallic systems, rules of formation of different solid phases during solidification, the process of solid phase growth out of melts, as well as their properties. Students should be able to understand the experimental techniques which enable the examination of physical properties of metals, their structures and phase transition points, and master some practical skills concerning sample preparation and metallographic analysis.			

Course content

Basics about metals. Properties of metallic elements and their position in the periodic table. Crystal structure of metals. Real crystals. Defects and their influence on metallic properties. Experimental methods for metal investigation. Microscopic methods. X-ray methods. Mechanical tests. Methods for determination of phase transition points.
Thermodynamics of phase transitions. Equilibrium. Gibbs free energy as a function of temperature for single-component systems. Solidification. Homogeneous nucleation. Homogeneous nucleation rate. Heterogeneous nucleation. Crystal growth. Continuous and lateral growth. Metallic alloys. Mechanical alloying. Types of solid solutions, rules of their formation. Substitutional solid solutions. Hume-Rothery rules. Interstitial solid solutions. Hägg's rules. Solid solutions. Solid solutions based on defects. Intermetallic compounds and superstructures. Binary alloy structure. Concept of phase. Gibbs' phase rule. Mutual solubility of metals. Solubility representation using phase diagrams. Rules for phase diagrams interpretation. Example of a simple phase diagram reading: components soluble in liquid state and insoluble in solid state.

Student workload (hours)		Grading	
Lectures and Exercises	60	Assessment method	Points
Exam preparation	30	Homework	10
Assignments	20	Seminar paper	10
Consultation	15	Midterm exam	40
Total	125	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. 5. D. A. Porter, K. E. Easterling: Phase transformations in metals and Alloys, Chapman&Hall 1984.

Remarks

Laboratory exercises: 1. Metallographic microscope, 2. Mechanical processing of samples for microscopic investigation, 3. Chemical etching of the sample surface, 4.Electrolytic polishing of samples, 5. Quantitative examination under a metallographic microscope, 6. Quantitative examination of complex systems
Midterm exam – 9th week of lectures