Program	Level of studies		Second cycle	
	Program name		**Physics**	
Course name	**MAGNETIC MATERIALS**			
Course ID	Semester	Course status	ECTS	L+E
PCM9631	**II**	**ELECTIVE**	**6**	**2+0**
Lecturer	**Prof. dr. Suada Sulejmanović**			
Aims and intended learning outcomes	Aim of the course is familiarising students with a quantum-mechanical explanation of magnetic phenomena, to enable them to follow recent researches on new magnetic phenomena and materials. After the completion of the course students will be expected to solve problems corresponding to the theoretical lectures and understand scientific papers regarding the newest magnetic materials and their applications.			

Course content

Interaction between two moving charges. Coulomb interaction. Vector model of a magnetic atom. Magnetic susceptibility. Hamiltonian of an electron in a magnetic field. Susceptibility of inner-shell electrons. Paramagnetism of inner-shell electrons. Diamagnetism of inner-shell electrons. Van Vleck paramagnetism. Valence electrons susceptibility. Valence electron paramagnetism due to spin. Valence electron magnetism due to orbital motion. Ferromagnetism. Ferromagnetic domains in a crystal. Brillouin function. Heisenberg Hamiltonian of exchange interaction. Antiferromagnetism. Energy absorption. Bloch equations. Spin system in a linearly polarized radio-frequency field. Complex magnetic susceptibility. Dispersion. Theoretical basics of dispersion. Effect of other molecules in a medium on dispersion. Quantum theory of dispersion. General magnetic susceptibility. Kramers-Krönig relations. Fluctuation-dissipation theorem. Spin waves. Quantization of spin waves. Examples of magnetic systems.

Student workload (hours)		Grading	
Lectures	30	Assessment method	Points
Exam preparation	45	Homework	10
Assignments	45	Midterm exam	30
Consultation	30	Seminar paper	20
		Final exam	40
Total	150	Total	100

Literature

1. S. Bikić:Uvod u teoriju magnetizma, univerzitetski udžbenik, Fakultet za metalurgiju i materijale, Zenica, 2005
2. Mathias Getzlaff: Fundamentals of magnetism, Springer, 2008.

Remarks

Midterm exam – 8th week of lectures