Course title: Physics of materials

Lecturers: Svetlana R. Lukić-Petrović, Dragoslav M. Petrović

Required Course: elective

Number of ECTS: 15

Course Objective:

Acquiring modern knowledge about models and physical properties of condensed matter and application of advanced materials

Course Outcome:

After completing and mastering of the syllabus student should be able enough to have:

1. Scientifically based understanding of physical processes and interpretation of physical phenomena in condensed matter physics
2. Capability for reading professional literature and preparation of scientific presentation
3. Capability to participate in teaching as a demonstrator in this area
4. The possibility to transfer the acquired knowledge to other individuals and groups

Course Content:

Theoretical instruction

Nature of chemical bonds. Principles of structural arrangements. Bond energy and parameters of phase transformations. Ordered systems. Influence of structural arrangements on material properties and examples of specific materials.

Imperfections in the crystal. Structural imperfections. Point, line and volume defects and their influence on the properties of materials. Burgers vector. Thermodynamic theory of imperfections. Mass transport in crystals. Chemical defects (color centers and electrical conductivity in ionic crystals).

Disordered systems.

Methods of obtaining, structure, physical and chemical properties and phenomenological physical processes of materials:

- Superconducting compounds and alloys. Exotic superconductors.
- Modern soft magnetic and hard magnetic materials.
- Special ceramic materials. Rutile and ferroelectric ceramics.
- Liquid crystals. Smectics, nematics and cholesteric. Mixtures of liquid crystals.
- Polymeric materials. Crystalline and amorphous polymers. Quasicrystals.
- Amorphous metals. Amorphous semiconductor materials. Glasses and thin films.

Application of selected experimental methods in characterization of materials.

Preparation and public presentation of seminars that accompany and supplement the course content.

Reading List:

1. D.M. Petrovic, S.R. Lukic, Eksperimentalna fizika kondenzovane materije, Edicija "Univerzitetski udžbenik", Univerzitet u Novom Sadu, Novi Sad, 2000.
2. W.A. Harison, Electronic Structure and Properties of Solids, W.H. Freeman & Company, San Francisco, 1980.
3. S.R. Elliott, Physics of Amorphous Materials, Wiley, New York, 1989.
4. M. Popescu, Non-Crysralline Chalcogenides, KLUWER ACADEMIC PUBLISHERS, New York, 2008.
5. Stephen Blundell, Magnetism in Condensed Matter, University Press, Oxford, 2004.
6. Mark Fox, Optical Properties of Solids, University Press, Oxford, 2005.
7. P. Hofman, Solid State Physics, Wiley-VCH, New York, 2008.
8. Charles Kittel, Introduction to Solid State Physics, Wiley-VCH, New York, 2005.

Total hours:			10
Lectures: 5	Practicals:	Other:	Student research work:5

Methods of instruction:

Theoretical classes are taught using modern methods of presentation, with the active participation of students and practical training includes laboratory exercises and preparation and presentation of a seminar paper.

Assessment (maximum number of points 100)

Requirements

Active participation in lectures 5 pts, Active participation in practicals 20pts, Seminar work 25pts
Oral exam 50pts