Syllabus		
Faculty:	Of Geosciences	
Name of study program:	Materials with Metallurgy	
Department:	Materials with Metallurgy	
Level:	Master	
The code of subject:	5	
Subject:	**Nanomaterials**	
Subject Status:	Compulsory	
Semester:	II	
Total hours:	2+2	
ECTS:	4	
Schedule / Hall		
Academic year:		
Professor:	Prof.Asoc.Dr. Nazmi Hasi	
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BRIEF CONTENT OF SUBJECT	The course addresses the high achievements of Physics, Electrical Engineering, Chemistry and Bioengineering based on the field of nanotechnology with extraordinary potential of the technical revolution, which consists in the production of superior materials in the near future, discoveries that would be used for the good of mankind.
AIMS	The aim of the course is for students to acquire knowledge, understand, evaluate and identify: achievements from the science of nanomaterials which would enable the creation of new structures of materials. Expected learning outcomes: 1. The student to make the classification of nanomaterials 2. To gain knowledge on the structure and bonds in nanomaterials 3. Identify their properties and their dependence on dimensions 4. To do the Synthesis of nanomaterials 5. To define the techniques of description of nanomaterials 6. The acquired knowledge enables the student to apply nanomaterials in technique

EXPECTED LEARNING OUTCOMES	Upon completion of this course the student will be able to: 1. Evaluate the use of discoveries from Nanometry and nanotechnology, which enable the creation of any machine, apparatus, instrument, etc. special, which would be very qualitative. 2. To be determined for the process, method, apparatus, instrument, machine, etc. in which the application of scientific achievements by physics takes place, which is the basis for the development of technique. 3. To follow and determine the quality of the technological process in technology, based on the knowledge of phenomena, methods, laws, theories, etc., which are found in the subject of physics, technical subjects and other subjects of natural sciences. 4. Finally, one can see from many examples, that there is a mutual connection between Nanotechnology and Nanomaterials, physics and technology, and hence the importance of physics, as a subject which takes place in the first year of studies in all faculties technical.	
PROGRAM	**Weeks**	
	Week - I	The nature of the study of nanoscience. Application of nanoscience.
	Week - II	Principles on which nanoscience is based.
	Week- III	Systematics of doing small things.
	Week - IV	Limitation of doing small things.
	Week - V	Quantum nature of nanobots: Boron model for atom, wave and particle nature of matter, wave function and Maxwell equations, Principles of indeterminacy.
	Week - VI	The quantum nature of the nanobot: The Schringerdinger equation
	Week- VII	I intermediate evaluation.
	Week - VIII	Quantum nature of nanobots: Hydrogen atom; Fermions, Bosons and selection rules
	Week - IX	Quantum consequences for the macrobot: Nanosymmetry, di-atoms and ferromagnets, forces exhibiting pure nanophysical properties
	Week - X	Quantum consequences for the macrobot: Free electrons in metals, Kronig-Penney periodic structure
	Week - XI	Physical Basics of disk memory. The thickness of the Schottky barrier
	Week - XII	II intermediate evaluation
	Week- XIII	Self-collection of nanostructures in nature and industry
	Week - XIV	Tools used for the construction (making) of nanostructures.
	Week - XV	Tools for measuring the properties of nanostructures and their manipulations.

LITERATURE	Basics Literature: 1. F.J.Owens, Ch.P.Poole „The Physics and Chemistry of Nanosolids", Wiley-Interscience, 2008 2. E.L.Wolf „Nanophysics and Nanotechnology", Reprint 2005 3. „Nanomaterials-Synthesis, Properties and Aplication", A.S.Edelstein and R.C. Cammarata. Institute of Physics, London 1998 4. Edward L. Wolf: Nanophysics and Nanotechnology: An introduction to modern concepts in nanoscience, Wiley-VCH-2006 5. S.M. Lindsay: Introduction to nanoscience, Oxford, 2010
TEACHING METHODOLOGY	Lectures, numerical exercises, individual work, experimental work, seminar papers, colloquia,

Contribution to student workload (which should correspond to student learning outcomes 1 ECTS credit = 25 hours)

Activity	**Hours**	**Day/Week**	**Total**
Lectures	2	15	30
Exercise sessions - theoretical	2	15	30
Field exercises			
Practical work			
Consultation with the professor / assistant	1	15	15
Colloquiums / seminars	2	2	4
Independent tasks (work)	1	4	4
Student self study time (in library or at home)	2	15	30
Final exam preparation	2	1	2
Time spent in assessment (tests, quizzes, final exams)	2	3	6
Projects, presentations, etc.	2	2	4
Total			**125**

<table>
<tr><td>EVALUATION</td><td>
<table>
<tr><td colspan="2">Evaluation methods
[according to the Statute and Regulation of UMIB Studies]</td></tr>
<tr><td>Tests</td><td>20%</td></tr>
<tr><td>Practical test during exercises</td><td></td></tr>
<tr><td>Seminary work (in word)</td><td>20%</td></tr>
<tr><td>Interpretation and presentation of seminary work</td><td>20%</td></tr>
<tr><td>Tasks and essays during the semester</td><td></td></tr>
<tr><td>Final exam</td><td>40%</td></tr>
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<tr><td>ACADEMIC POLICIES</td><td>• To give students an understanding of the fundamental principles of physics and their application to everyday life and technology
• To develop an appreciation of physics as a human endeavour, thereby enriching the students' experience of life
• To provide a reasonably broad perspective of physics, thus developing an understanding of the physical environment and of how human beings interact with it
•To provide a general education in physics for all students, whether or not they proceed to further studies in physics
• To develop the ability to observe, to think logically, and to communicate effectively
• To develop an understanding of the scientific method
• To develop an appreciation of physics as a creative activity, using informed intuition and imagination to create an understanding of the beauty, simplicity and symmetry in nature.</td></tr>
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