Course Syllabus

I. General Information

Course name	Inorganic and composite materials in biotechnology
Programme	Biotechnology
Level of studies (BA, BSc, MA, MSc, long-cycle MA)	MSc
Form of studies (full-time, part-time)	part-time
Discipline	Biological sciences
Language of instruction	English

Course coordinator/person responsible	Dr Ludomir Kwietniewski

Type of class *(use only the types mentioned below)*	Number of teaching hours	Semester	ECTS Points
lecture	30	II	6
tutorial			
classes	30	II	
laboratory classes			
workshops			
seminar			
introductory seminar			
foreign language classes			
practical placement			
field work			
diploma laboratory			
translation classes			
study visit			

Course pre-requisites	General, inorganic and physical chemistry, physics and solid state chemistry.

II. Course Objectives

Introducing students to the problems of inorganic and composite materials.
Familiarization with selected methods of the characterization of inorganic and composite materials.
Practical familiarization of students with laboratory work and suport for specialized laboratory equipment. To make students aware of the correlation of theoretical knowledge with practical laboratory work.

III. Course learning outcomes with reference to programme learning outcomes

Symbol	Description of course learning outcome	Reference to programme learning outcome
KNOWLEDGE		
W_01	has knowledge of the principles of research techniques for testing inorganic and composite materials	K_W05
W_02	plans experiments to determine the properties and structure of inorganic and composite materials	K_W05
SKILLS		
U_01	Uses vocabulary and concepts in the field of solid-state physicochemistry to describe inorganic and composite materials	K_U02
U_02	Prepares a multimedia presentation based on literature on inorganic and composite materials	K_U02
U_03	Indicates the use of inorganic and composite materials	K_U11
SOCIAL COMPETENCIES		
K_01	Realizes both the benefits and environmental risks of using new inorganic and composite materials	K_K02

IV. Course Content

The essence of a solid. Division of inorganic materials. Inorganic oxide materials, methods of preparation, properties and applications. Silica gels, types of silica gels, surface properties, thermal modifications. Aluminum oxides, varieties, surface properties. Natural silicates and aluminosilicates. Clay materials. Natural and synthetic zeolites (type A, X and Y). Molecular Sievers of the MCM-41 type. Carbon materials. Activated carbons. Carbon nanoporous materials (carbon nanotubes, fullerenes, graphene, carbin). Organic biomaterials (biozeolites, starch, alginates) and biomimetic materials (titanium alloys, gold and silver implants). Composites, division, preparation and properties. The use of composites in automotive and aerospace industries. Determination of the molar mass of polymers by viscometric method.

V. Didactic methods used and forms of assessment of learning outcomes

Symbol	Didactic methods *(choose from the list)*	Forms of assessment *(choose from the list)*	Documentation type *(choose from the list)*
KNOWLEDGE			
W_01	Laboratory classes Conventional lecture	Report Exam	Report printout / Report file Evaluated written paper
W_02	Conventional lecture Laboratory classes	Exam Test/written tes Report	Evaluated written paper Evaluated test/written test Report printout / Report file

SKILLS			
U_01	Laboratory classes	Report	Report printout / Report file
U_02	Laboratory classes	Presentation	Rating card
U_03	Laboratory classes Conventional lecture	Report Exam	Report printout / Report file Evaluated written paper
SOCIAL COMPETENCIES			
K_01	Conventional lecture Laboratory classes	Exam Test/written tes	Evaluated written paper Evaluated test/written test

VI. Grading criteria, weighting factors.....

Lecture: Grade from the written exam (100 %).
Classes: Written tests in the form of colloquia and / or tests on issues from the main chapters (70%), preparation of written reports on the classes (10%), assessment of student's activity during classes (theoretical preparation for classes, practical exercises, activity, ability to work in a group, compliance with health and safety rules) (5%), presentation (15%).

Mark	Evaluation criteria	
verygood (5)	the student realizes the assumed learning outcomes at a very good level	the student demonstrates knowledge of the education content at the level of 91-100%
overgood (4.5)	the student accomplishes the assumed learning outcomes an over good level	the student demonstrates knowledge of the education content at the level of 86-90 %
good(4)	the student accomplishes the assumed learning outcomes at a good level	the student demonstrates knowledge of the education content at the level of 71-85%
quitegood(3.5)	the student accomplishes the assumed learning outcomes at a quite good level	the student demonstrates knowledge of the education content at the level of 66-70%
sufficient (3)	the student accomplishes the assumed learning outcomes at a sufficientlevel	the student demonstrates knowledge of the education content at the level of 51-65%
insufficient (2)	the student accomplishes the assumed learning outcomes at an insufficientlevel	the student demonstrates knowledge of the education content below the level of 51%

VII. Student workload

Form of activity	Number of hours
Number of contact hours (with the teacher)	60
Number of hours of individual student work	90

VIII. Literature

Basic literature
1. C.N.R. Rao, A. Muller, A.K. Cheetham, The chemistry of nanomaterials, Villey-VCH, 2004. 2. G. Cao, Nanostructures and nanomaterials: synthesis, properties and applications, Imperial College Press, 2004. 3. P.-I. Gouma, Nanomaterials for chemical sensors and biotechnology, Pan Stanford Publishing, 2010.