STUDY MODULE DESCRIPTION FORM

Name of the module/subject		Code
Composites		**1010702131010722585**
Field of study	Profile of study (general academic, practical)	Year /Semester
Chemical and Process Engineering	**(brak)**	**2 / 3**
Elective path/specialty	Subject offered in:	Course (compulsory, elective)
Bioprocesses and Biomaterials Engineering	**Polish**	**obligatory**
Cycle of study:	Form of study (full-time,part-time)	
Second-cycle studies	**full-time**	

No. of hours				No. of credits
Lecture: **2**	Classes: **-**	Laboratory: **1**	Project/seminars: **-**	**4**

Status of the course in the study program (Basic, major, other)	(university-wide, from another field)
(brak)	**(brak)**

Education areas and fields of science and art	ECTS distribution (number and %)
technical sciences	**4 100%**

Responsible for subject / lecturer:

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Responsible for subject / lecturer:

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Technologii Chemicznej
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Prerequisites in terms of knowledge, skills and social competencies:

1	**Knowledge**	Student knows basic principles of inorganic, oraganic and polymer chemistry. He or she knows the polymeric materials and inorganic composites.
2	**Skills**	Student knows and applies good practices of laboratory work, is able to operate the scientific equipment. He or she is able to search for information in scientific literature, databases and other properly chosen sources.
3	**Social competencies**	Student is conscious of the effects of engineering activity.

Assumptions and objectives of the course:

To gain the knowledge about inorganic and polymeric composites, their properties, materials for production, manufacturing methods and applications.

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Study outcomes and reference to the educational results for a field of study

Knowledge:

1. .Student knows the raw materials, products, and processes used in the technology of composite materials - [K_W06]
2. .Student knows the advanced techniques of production and processing of composite materials - [K_W07]
3. Student knows modern methods of investigation of the structure and properties of materials used for characterization of composite materials - [K_W08]

Skills:

1. Student has the ability of analyzing and interpreting of the results of experiments from the area of composite materials chemistry and technology - [K_U01]
2. Student haas the ability to assess the the usability of materials and processes for production of high quality goods. - [K_U07]

Social competencies:

1. Student understands the need for self-study and improve their professional competence - [K_K01]
2. Student is aware of the principles of engineering ethics in the wide range - [K_K02, K_K05]
3. Student is able to interact and work in a group playing various roles. - [K_K03]

Assessment methods of study outcomes

Written exam; laboratory activities assessment.

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Course description

Composites with inorganic matrices: general information on inorganic composite materials; preparation methods of inorganic composite materials; methods of surface modification and functionalization of inorganic hybrids; physical, chemical and dispersive-morphological properties of oxide-based composites and their derivatives; photocatalytic and barrier properties of titanium white and TiO2-SiO2 composite; application aspects of advanced powder materials.

Composites with polymer matrices: basic knowledge on polymer composites ? definition and components; methods of polymer reinforcement; production and types of composites; nanocomposites; differences in structure and properties of composites and nanocomposites; physical, chemical and mechanical properties of (nano)composites, their processing and recycling; application of polymer (nano)composites with special attention devoted to medicine and dentistry.

Basic bibliography:

1. 1. A. Boczkowska, J. Kapuściński, Z. Lindemann, D. Witemberg-Perzyk, S. Wojciechowski, Kompozyty, Oficyna Wydawnicza Politechniki Warszawskiej, 2003 2. G. Wypych, Handbook

2. G. Wypych, Handbook of fillers, ChemTec Publishing, Toronto 2010

3. G. Wilde, Nanostructured Materials, Elsevier, 2009

Additional bibliography:

1. Fiber Reinforced Composites, P.K.Mallick, CRC Press Taylor Francis Group 2008

2. Handbook of Composites, S. T. Peters, Chapman and Hall 1998

Result of average student's workload

Activity	Time (working hours)
1. Lecture + exam	30
2. Consultation to the lecture	6
3. Preparation of laboratory exercises	10
4. Laboratory exercises	15
5. . PrzygPreparation for exam	20

Student's workload

Source of workload	hours	ECTS
Total workload	81	4
Contact hours	51	3
Practical activities	15	1

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