

STUDY MODULE DESCRIPTION FORM		
Name of the module/subject Unmetallic Materials		Code 1010604121010611298
Field of study Aerospace Engineering	Profile of study (general academic, practical) general academic	Year /Semester 1 / 2
Elective path/specialty -	Subject offered in: Polish	Course (compulsory, elective) obligatory
Cycle of study: First-cycle studies	Form of study (full-time, part-time) part-time	
No. of hours Lecture: 9 Classes: - Laboratory: - Project/seminars: -		No. of credits 1
Status of the course in the study program (Basic, major, other) other		(university-wide, from another field) university-wide
Education areas and fields of science and art technical sciences		ECTS distribution (number and %) 1 100%
Responsible for subject / lecturer: dr hab. inż. Marta Paczkowska email: marta.paczowska@put.poznan.pl tel. 616475906 Wydział Inżynierii Transportu ul. Piotrowo 3 60-965 Poznań		
Prerequisites in terms of knowledge, skills and social competencies:		
1	Knowledge	The student should have knowledge of basic sciences, ie: physics and chemistry, and knowledge of subjects realized at the first level of study, ie: physical chemistry, thermodynamics, mechanics, strength of materials, machine construction.
2	Skills	The student should demonstrate the general ability to identify problems, create algorithms for solving them and the ability to solve engineering tasks. The student should understand the basic phenomena occurring in solid bodies, be able to identify and characterize them.
3	Social competencies	The student is ready to deepen knowledge in the field of interdisciplinary subjects. The student is open to learning about new technologies and engineering solutions.
Assumptions and objectives of the course: The aim of the subject: "Non-metallic materials" is to familiarize students with such materials as plastics, ceramics and composites. In particular, familiarization with their structure and properties.		
Study outcomes and reference to the educational results for a field of study		
Knowledge: 1. has basic knowledge of metal, non-metallic and composite materials used in machine construction, in particular about their structure, properties - [K1A_W06]		
Skills: 1. has the ability to self-study using modern teaching tools, such as remote lectures, websites and databases, didactic programs, e-books - [K1A_U03]		
Social competencies: 1. is aware of the social role of a technical university graduate, and especially understands the need to formulate and communicate to the public, in particular through mass media, information and opinions on the achievements of technology and other aspects of engineering activities; makes efforts to provide such information and opinions in a generally - [K1A_K07]		
Assessment methods of study outcomes		
- written verification		
Course description		
Classification of basic groups of engineering materials: metals and their alloys, plastics, ceramics and glass, composites. Construction of metal materials, metallic bonds, crystal structure, crystal lattice and its elements, crystallographic systems and		

spatial network types, crystalline structure defects, solid solutions and factors conditioning their formation, intermetallic phases, interstitial phases and complex structures, phase mixtures, balance diagrams , metal alloys, heat treatment, mechanical properties (tensile strength, tensile modulus, bending strength, impact resistance, hardness), types of metal alloys (ferrous, non-ferrous), examples of application.

Plastics, polymers construction, covalent and van der Waals bonds, crystalline and amorphous structure, methods of polymer processing, molding, properties, types (plastomers, elastomers), examples of application.

Construction of ceramic materials, covalent and ionic bonds, crystal and amorphous structure, methods of ceramic and glass processing, molding, properties, types (traditional, engineering), examples of application.

Construction of composites, types of composites, production methods, properties, examples of application

Basic bibliography:

1. L. A. Dobrzański: Podstawy nauki o materiałach i metaloznawstwo, WNT, Gliwice 2002
2. K. Przybyłowicz, J. Przybyłowicz, Metaloznawstwo w pytaniach i odpowiedziach, WNT, 2009
3. M. Ashby i in.: Inżynieria materiałowa tom I i II, Wydawnictwo Galaktyka, 2006
4. M. Ashby i in.: Materiały inżynierskie tom I i II, WNT, 1996
5. W. Domke: Vademecum metaloznawstwa, NT, 1997
6. L.A. Dobrzański, R. Nowosielski: Metody badania metali i stopów. Badania własności fizycznych. WNT, W-wa, 1987

Additional bibliography:

1. Mały poradnik mechanika, tom I i II, WNT, 2002
2. L. A. Dobrzański.: Metaloznawstwo z podstawami nauki o materiałach, WNT, 1998;

Result of average student's workload

Activity	Time (working hours)
1. Preparation for lectures	1
2. Participation of lectures	9
3. Preservation of content from classes	11
4. Consultation	1
5. Preparation for verification of knowledge	5
6. Participation of verification of knowledge	1

Student's workload

Source of workload	hours	ECTS
Total workload	25	1
Contact hours	11	0
Practical activities	0	0