

STUDY MODULE DESCRIPTION FORM		
Name of the module/subject Unmetallic Materials		Code 1010621151010611298
Field of study Mechanical Engineering	Profile of study (general academic, practical) (brak)	Year /Semester 3 / 5
Elective path/specialty Virtual Design Engineering	Subject offered in: Polish	Course (compulsory, elective) obligatory
Cycle of study: First-cycle studies	Form of study (full-time, part-time) full-time	
No. of hours Lecture: 1 Classes: - Laboratory: 1 Project/seminars: -		No. of credits 3
Status of the course in the study program (Basic, major, other) (brak)		(university-wide, from another field) (brak)
Education areas and fields of science and art technical sciences		ECTS distribution (number and %) 3 100%
Responsible for subject / lecturer: dr hab. inż. Leszek Małdziński, prof. nadzw. email: leszek.maldzinski@put.poznan.pl tel. +4861 665-2238 Wydział Maszyn Roboczych i Transportu ul. Piotrowo 3 60-965 Poznań		
Prerequisites in terms of knowledge, skills and social competencies:		
1	Knowledge	Basic knowledge of polymers, ceramics and composites: definitions, classification, structural features, properties and application in practice.
2	Skills	The ability to acquire information from the literature and databases, making interpretation and justification reviews
3	Social competencies	The student is aware of the validity of technical activities, understands the need for the development and training
Assumptions and objectives of the course: Basic knowledge of polymers, ceramics and composites: definitions, classification, structural features, properties and application in practice		
Study outcomes and reference to the educational results for a field of study		
Knowledge: 1. Students know the characteristics of selected non-metallic materials can indicate the possibility of their use in engineering practice. The student can obtain information from literature and databases, to interpret and justify opinions - [K1A_W10]		
Skills: 1. Conducting some research in the field of metallurgy and heat treatment and study the properties of alloy steels: annealing, hardening and tempering, nitriding and carburizing, metallographic examination (determination of hardness, thickness of diffusion layers etc.). The student can obtain information from literature and databases, to interpret and justify opinions - [K1A_U03]		
Social competencies: 1. Consciousness of responsibility for their own work, willingness to comply with the rules of working in a team and take responsibility for collaborative tasks - [K1A_K04]		
Assessment methods of study outcomes		
Written and oral assessment		
Course description		

Polymer materials - general characteristics, chemical structure, the structure of the chains. Technical significance of polymeric materials. Ceramic engineering - general classification and characterization. Cermets Engineering. Porous ceramics. Refractory materials. Glass and glass ceramics. Carbon materials. Composite materials - Definition and classification. General characteristics of composite materials. Concrete and asphalt as composite materials. Reinforcing fiber composite materials. Composite materials with a polymer matrix reinforced with fibers. Composite materials with a metallic matrix reinforced with fibers. Composite materials of ceramic matrix and carbon fiber reinforced. Layered composite materials. Wood as a natural composite material.

Basic bibliography:

1. M. Blicharski: Wstęp do inżynierii materiałowej, WNT, 2003.
2. M.F. Ashby, D.R.H. Jones: Materiały inżynierski, t2. WNT, 1996
3. L. A. Dobrzański: Podstawy nauki o materiałach i metaloznawstwo, WNT, Gliwice 2002
4. D. Żuchowska: Polimery konstrukcyjne, WNT, Warszawa, 2000
5. J. Nowacki: Spiekane metale i kompozyty z osnową metaliczną
6. Leszek. A. Dobrzański, ?Podstawy nauki o materiałach?, WNT, Gliwice 2006
7. Karol Przybyłowicz, Janusz Przybyłowicz, ?Materiałoznawstwo w pytaniach i odpowiedziach? , WNT, 2004
8. Mały Poradnik Mechanika, NT, 1988

Additional bibliography:

1. Michael Ashby i in.: ?Inżynieria materiałowa? tom I i II, Wydawnictwo Galaktyka, 2006
2. Michael Ashby i in.: ?Materiały inżynierskie? tom I i II, WNT, 1996
3. Poradnik Inżyniera: ?Obróbka cieplna metali?, WNT, 1979
4. Mały poradnik mechanika, tom I i II, WNT, 2009
5. Wilhem Domke: ?Vademecum materiałoznawstwa?, NT, 1997
6. Feliks Wojtking, Jurij Soncew: Materiały specjalnego przeznaczenia, Wydawnictwo Politechniki Radomskiej, 2001

Result of average student's workload

Activity	Time (working hours)	
Student's workload		
Source of workload	hours	ECTS
Total workload	60	3
Contact hours	30	2
Practical activities	15	1