

STUDY MODULE DESCRIPTION FORM		
Name of the module/subject Materials engineering		Code 1010321311010314752
Field of study Electrical Engineering	Profile of study (general academic, practical) (brak)	Year /Semester 1 / 1
Elective path/specialty -	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: 15 Classes: - Laboratory: 15 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		ECTS distribution (number and %)
Responsible for subject / lecturer: Jarosław Gielniak email: jaroslaw.gielniak@put.poznan.pl tel. 61-665-2024 Elektryczny Piotrowo 3A, 60-965 Poznań		Responsible for subject / lecturer: Wojciech Sikorski email: wojciech.sikorski@put.poznan.pl tel. 61-665-2035 Elektryczny Piotrowo 3A, 60-965 Poznań
Prerequisites in terms of knowledge, skills and social competencies:		
1	Knowledge	Mathematics, chemistry and physics fundamentals
2	Skills	Students can assemble the measurement system, can perform measurements of basic physical quantities. Is able to develop test results and work in a group.
3	Social competencies	Understands the importance of teamwork.
Assumptions and objectives of the course: Knowledge of basic materials used in electrical engineering, phenomena occurring in them and characterized them properties. Learning new techniques and research methods.		
Study outcomes and reference to the educational results for a field of study		
Knowledge:		
1. The student has structured and theoretically founded knowledge of the structure and operation of electrical equipment, is knowledgeable about the exploitation of technical systems - [K_W13 ++]		
2. The student has a basic knowledge of the properties and applications of materials used in electrical engineering - [K_W23 +++]		
3. The student has knowledge of the physical phenomena occurring in insulating, conductive, semi-conductive and magnetic materials - [K_W26 ++]		
Skills:		
1. Students can compile the research documentation and discuss obtained research results - [K_U07 ++]		
2. The student can choose the right method and use the measuring equipment to determine the basic characteristics specific to tested materials - [K_U14 +++]		
Social competencies:		
1. The student understands the aspects and consequences of the use of materials, including the impact on the environment, and the related responsibility for decisions - [K_K02 ++]		
2. The student is aware of their own responsibility for their work and a willingness to comply with the principles of teamwork and shared responsibility for the implementation of tasks - [-]		
Assessment methods of study outcomes		

<p>Lectures: - assessment of knowledge and skills in written and oral exams</p> <p>Laboratory: - tests, continuous evaluation for each course - evaluation of the knowledge and skills associated with the implementation of the practice tasks, the assessment of exercise report.</p>		
Course description		
<p>Insulating materials - gases (air, nitrogen, SF₆, hydrogen, freon, mixtures), liquids (vegetable, mineral and synthetic oils), fibrous materials (cellulose, glass, carbon and fibres), elastomers (natural and synthetic rubbers), thermoplastics, hardening plastics, inorganic dielectric (mica, glass, ceramics) - conductivity in dielectrics. Magnetic materials - theory of magnetism, ferromagnetic, paramagnetic, ferri- and antiferrimagnetic materials, materials magnetically soft and hard. Conductive materials - theory of conduction, scattering centres, conductive and resistive materials. Superconductors - the theory of superconductivity, classic, mixed and high temperature superconductors, cryogenics. Semiconductors - types, applications. Methods for testing the mechanical, electrical and chemical properties of materials - hardness test, impact resistance, tensile strength, electric polarization, volume and surface resistivity, complex permittivity, humidity, acidity, polymerisation degree.</p> <p>Update 2017: new electro-insulating liquids, in particular biodegradable synthetic and natural liquids, their mixtures and nanofluids based on these liquids</p> <p>Applied methods of education: lectures - lecture with multimedia presentation (including: drawings, pictures) supplemented with examples given on the board and presentation of samples of discussed materials. Theory presented in close connection with practice laboratories - team work, detailed review of lab reports and discussion of comments</p>		
<p>Basic bibliography:</p> <ol style="list-style-type: none"> Celiński Z., Materiałoznawstwo elektrotechniczne, Wydawnictwo Politechniki Warszawskiej, 1998 Florkowska B., Furgal J., Szczerbiński M., Włodek R., Zydrzoń P., Materiały Elektrotechniczne, Podstawy teoretyczne i zastosowania, Wyd. AGH, Kraków 2010 Kolbiński K., Słowikowski J., Materiałoznawstwo Elektrotechniczne, WNT, Warszawa, 1988 Gielniak J. - red. Ćwiczenia laboratoryjne z inżynierii materiałowej w elektrotechnice, Wydawnictwo Politechniki Poznańskiej, Poznań 2009 		
<p>Additional bibliography:</p> <ol style="list-style-type: none"> Mościcka-Grzesiak H., Inżynieria wysokich napięć w elektroenergetyce, Wydawnictwo Politechniki Poznańskiej, tom I - 1996, tom II ? 1999 Flisowski Z., Technika wysokich napięć, WNT W-wa, 2005 Gielniak J., Przybyłek P., Mościcka-Grzesiak H., Wytrzymałość elektryczna nanomodyfikowanych dielektryków ciekłych, Przegląd Elektrotechniczny, ISSN 0033-2097, R. 91 NR 2/2015 		
Result of average student's workload		
Activity	Time (working hours)	
1. participation in class lectures	15	
2. participation in laboratory classes	15	
3. current preparation for the laboratory classes,	10	
4. preparation for final test	20	
5. consultation on laboratory classes,	4	
6. preparation of laboratory reports	11	
Student's workload		
Source of workload	hours	ECTS
Total workload	75	3
Contact hours	33	2
Practical activities	15	1