COURSE DESCRIPTION CARD - SYLLABUS

Course name

Materials engineering [S1MwT1>ME]

Course

Field of study	Year/Semester
Mathematics in Technology	2/3
Area of study (specialization)	**Profile of study**
–	general academic
Level of study	**Course offered in**
first-cycle	polish
Form of study	**Requirements**
full-time	compulsory

Number of hours

Lecture	Laboratory classes	Other (e.g. online)
30	15	0
Tutorials	**Projects/seminars**	
0	0	

Number of credit points

4,00

Coordinators

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Lecturers

Prerequisites

Mathematics, chemistry and physics fundamentals. Students can assemble the measurement system, can perform measurements of basic physical quantities. Is able to develop test results and work in a group.

Course objective

Knowledge of basic materials used in electrical engineering, phenomena occurring in them and characterized them properties. Learning new techniques and research methods

Course-related learning outcomes

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
2.The student has a basic knowledge of the properties and applications of materials used in electrical engineering
3. The student has knowledge of the physical phenomena occurring in insulating, conductive, semi-conductive and magnetic materials

Skills:
1. Students can compile the research documentation and discuss obtained research results
2. The student can choose the right method and use the measuring equipment to determine the basic characteristics specific to tested materials

Social competences:
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
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 .

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

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Lectures:
- assessment of knowledge and skills in written and oral exams
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 reports.

Programme content

Insulating materials - gases (air, nitrogen, SF6, hydrogen, freon, mixtures), liquids (vegetable, mineral and synthetic oils - new electro-insulating liquids, in particular biodegradable synthetic and natural liquids, their mixtures and nanofluids based on these liquids), 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.

Teaching methods

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

Bibliography

Basic
1.Celiński Z., Materiałoznawstwo elektrotechniczne, Wydawnictwo Politechniki Warszawskiej,1998
2.Florkowska B., Furgał J., Szczerbiński M., Włodek R., Zydroń P., Materiały Elektrotechniczne, Podstawy teoretyczne i zastosowania, Wyd. AGH, Kraków 2010
3.Kolbiński K., Słowikowski J., Materiałoznawstwo Elektrotechniczne, WNT, Warszawa, 1988
4.Gielniak J. - red. Ćwiczenia laboratoryjne z inżynierii materiałowej w elektrotechnice, Wydawnictwo Politechniki Poznańskiej, Poznań 2009
Additional
1.Mościcka-Grzesiak H., Inżynieria wysokich napięć w elektroenergetyce, Wydawnictwo Politechniki Poznańskiej, tom I, 1996
2.Mościcka-Grzesiak H., Inżynieria wysokich napięć w elektroenergetyce, Wydawnictwo Politechniki Poznańskiej, tom II, 1999
3.Flisowski Z., Technika wysokich napięć, WNT W-wa, 2005
4.Gielniak J., Przybyłek P., Mościcka-Grzesiak H.,Wytrzymałość elektryczna nanomodyfikowanych dielektryków ciekłych, Przegląd Elektrotechniczny, ISSN 0033-2097, R. 91 NR 2/2015

5.Gielniak J., Dombek G., Wróblewski R., Fire Safety and Electrical Properties of Mineral Oil/Synthetic Ester Mixtures, 8th International Symposium on Electrical Insulating Materials, September 12-15, 2017, Toyohashi Chamber of Commerce & Industry, Toyohashi City, Japan, Conference Proceedings of ISEIM 2017, V1-10, p. 227-230

Breakdown of average student's workload

	Hours	ECTS
Total workload	100	4,00
Classes requiring direct contact with the teacher	50	2,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	50	2,00