

Polish course name	MATERIAŁY NOWEJ GENERACJI
English course name	NEW GENERATION MATERIALS
Course code	WIP-MDL-D1-NGM-02
Field of study	Materials design and logistics
Level of qualification	First degree
Form of study	Full-time
Semester	2
Number of ECTS points	3
Ways of assessment	Test

Number of hours per semester

Lecture	Seminar	Classes	Laboratory	Project
15			15	

TEACHERS:

Dr inż. Małgorzata Lubas.

COURSE OBJECTIVES:

- › **C1** To provide students with basic knowledge of engineering materials - new generation.
- › **C2** To acquaint students with manufacturing techniques, applications and research methods of new generation materials.
- › **C3** Student are able to use various sources of information and are able to prepare and present the results obtained during the class.

PRELIMINARY REQUIREMENTS FOR KNOWLEDGE, SKILLS AND OTHER COMPETENCES:

1. The student knows the basics in physics, mathematics, chemistry.
2. Student skillfully: uses mathematical operations to solve the tasks set, uses various sources of information, instructions, technical documentation, correctly interprets and presents the results obtained in the course of laboratory exercises.
3. The student knows the principles of work safety in the use of machinery and technical equipment, works independently and in a group.

COURSE CONTENT

LECTURE

- › **L 1, 2** Classification and nomenclature of engineering materials, bonds between atoms. General characteristics of basic groups of engineering materials.
- › **L 3, 4** Structure of materials: crystalline, amorphous. Phase equilibrium systems.
- › **L 5** Selection of engineering materials in modern engineering.
- › **L 6, 7** New generation metallic materials, shape memory alloys.
- › **L 8, 9, 10** Ceramic, vitreous and glass-crystalline materials (new generation glasses).
- › **L 11, 12** Modern polymeric and composite materials.
- › **L 13** Characterization of nanomaterials.
- › **L 14** New generation of biomaterials.
- › **L 15** Test methods for new generation materials, colloquium.

LABORATORY

- › **Lab 1** Health and safety training and discussion of the rules for passing the course.
- › **Lab 2, 3** Physical properties of selected new generation materials.
- › **Lab 4, 5** Modern ceramic materials - manufacture and determination of basic properties.
- › **Lab 6, 7** Fibre - reinforced composites and not only... - tipping, testing of selected properties of the obtained materials.
- › **Lab 8, 9** Fibrous materials of the new generation - studies of selected properties.
- › **Lab 10, 11** Glass and glass-ceramic materials as new generation materials - fabrication and determination of selected properties.
- › **Lab 12, 13** Metallic materials of the new generation - microstructural studies.
- › **Lab 14, 15** Surface modification - microstructural studies and selected properties. Course credit.

BASIC REFERENCES

1. S. Jusupow, Technologia Produkcji Wyrobów Ceramicznych, Wyd. Nasza wiedza, 2021 r., j. ang.
2. R. Pampuch, Współczesne materiały ceramiczne, Wyd. Nauk.-Dydakt. AGH 2005 r.
3. J. Mastalska-Popławska, P. Rutkowski, J. Huebner i inni, red. D. Kata, Skrypt do zajęć laboratoryjnych z przedmiotu Nanomateriały i nanotechnologie, Wyd. Oficyna Wydawnicza Politechniki Warszawskiej, 2022 r.
4. M. Kaczorowski, A. Krzyńska, Konstrukcyjne materiały metalowe, ceramiczne i kompozytowe, Wyd. Oficyna Wyd. PW - Skrypt PW, 2019 r.
5. A. Olszyna, Ceramika supertwarda, Wyd. Oficyna Wyd. PW, 2011 r.
6. M. Ciecińska, D. Dorosz, E. Greiner - Wrona i inni, Technologia szkła, Właściwości fizykochemiczne, Metody Badań, Cz.1,2; Pol. Towarzystwo Ceramiczne, PKNC, Vol 73, 2002 r.
7. Suchanicz J., Elementy inżynierii materiałowej. Wydawnictwa Naukowe Uniwersytetu Pedagogicznego, Kraków 2009 r.
8. Blicharski M., Inżynieria powierzchni. WNT, Warszawa 2009 r.
9. Kaczorowski M., Krzyńska A., Konstrukcyjne materiały metalowe, ceramiczne i kompozytowe. Oficyna Wydawnicza Politechniki Warszawskiej, Warszawa 2008 r.
10. Dobrzański L.A., Nietalowe materiały inżynierskie, Wyd. Pol. Śląskiej, 2008 r.

SUPPLEMENTARY REFERENCE MATERIALS

1. K. Subotowicz, Ceramika dla każdego, Wydawnictwo: Katowice ELAMED, 2008 r.
2. A. Jastrzębska, M. Kostecki, A. Olszyna i inni, Tworzywa ceramiczne. Ćwiczenia laboratoryjne, Wyd. Oficyna PW., 2020 r.
3. Prociak A., Poliuretanowe materiały termoizolacyjne nowej generacji, Wyd. Pol. Krakowskiej, Kraków 2008 r.
4. Pampuch, K. Haberko, M. Kordek, Nauka o procesach ceramicznych, PWN Warszawa 1992 r.

LEARNING OUTCOMES

- › **EU1** Has theoretical knowledge of new generation engineering materials their properties, manufacturing, application, and testing methods.
- › **EU2** The Student can prepare a report on the implementation of exercise.

TEACHING TOOLS

- › Multimedia presentations.
- › Laboratory equipment and guides.

WAYS OF ASSESSMENT (F – FORMATIVE, P – SUMMATIVE)

- › **F1.** Evaluation of mastery of the learning material covered by the laboratory - colloquium.
- › **F2.** Evaluation of reports.
- › **P1.** Evaluation of mastery of the teaching material covered in the lectures – colloquium.

STUDENT WORKLOAD

Form of activity	Number of hours	ECTS
Contact hours with the teacher		
Lectures	15	0,6
Seminar		
Classes		
Laboratory	15	0,6
Project		
Test		
Exam		
Total contact hours	30	1,2
Student's own work		
Getting acquainted with the indicated literature	10	0,4
Preparation for seminar		
Preparation for classes		
Preparation for lab	15	0,6
Project preparation		

Consultation	4	0,16
Preparation for the test	16	0,64
Total student's own work	45	1,80
Total number of hours/ ECTS points for the course	75	3,0

ADDITIONAL INFORMATION

Timetable of classes	https://wip.pcz.pl/dla-studentow/plan-zajec/studia-stacjonarne
Information about the consultation (time + place)	https://wip.pcz.pl/dla-studentow/konsultacje-dla-studentow

MATRIX OF LEARNING OUTCOMES REALISATION

Learning outcome	Reference of given outcome to outcomes defined for whole program	Course objectives	Course content	Ways of assessment
EU 1	K_W01, K_W03, K_W04, K_U03, K_U04, K_U05, K_K01, K_K02, K_K04,	C1, C2, C3	L1 – L15 Lab1 - Lab15	F1, P1
EU 2	K_K01, K_K02, K_K04,	C3	Lab1 - Lab15	F2

FORM OF ASSESSMENT - DETAILS

EU1 The student has theoretical knowledge of the new generation of engineering materials their properties, manufacture, application, and research methods.

- › 2,0 The student has not mastered the basic knowledge of new generation engineering materials their properties, manufacture, application, and their research methods.

- › 3,0 The student has partially (sufficiently) mastered the knowledge of new generation engineering materials their properties, manufacturing, application and their research methods.
- › 3,5 The student has almost mastered the knowledge of new generation engineering materials their properties, manufacture, application and their research methods.
- › 4,0 The student has well mastered the knowledge of new generation engineering materials their properties, manufacture, application and their research methods.
- › 4,5 The student has almost very well mastered the knowledge of new generation engineering materials their properties, manufacturing, application, and their research method.
- › 5,0 The student has mastered very well the knowledge of new generation engineering materials their properties, manufacturing, application and their research methods.

EU2 The student is able to prepare a report on the implementation of the exercises

- › 2,0 The student is not able to prepare a report, is not able to present the results of his research.
- › 3,0 Student is partially able to prepare a report on the course of implementation of exercises.
- › 3,5 Student is almost able to prepare a report and present the results of their research.
- › 4,0 The student developed the report well and presented the results of the research obtained.
- › 4,5 The student almost very well developed the report and presented the obtained research results.
- › 5,0 The student developed the report very well and presented the obtained research results.