

Polish course name	MATERIAŁY CERAMICZNE
English course name	CERAMIC MATERIALS
Course code	WIP-MDL-D1-CM-03
Field of study	Materials design and logistics
Level of qualification	First degree
Form of study	Full-time
Semester	3
Number of ECTS points	4
Ways of assessment	Test

Number of hours per semester

Lecture	Seminar	Classes	Laboratory	Project
30			30	

TEACHERS:

Dr inż. Małgorzata Lubas.

COURSE OBJECTIVES:

- › **C1** To acquaint students with the internal structure of ceramics, properties of ceramic materials, their division and application.
- › **C2** To provide students with knowledge of manufacturing techniques for traditional and modern ceramic materials and the raw materials used for this purpose.
- › **C3** To acquaint students with the methods of testing ceramic materials.

PRELIMINARY REQUIREMENTS FOR KNOWLEDGE, SKILLS AND OTHER COMPETENCES:

1. The student knows the basics in physics, mathematics, chemistry and the basic of science of the structure of matter.
2. The 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 from the laboratory exercises conducted.

3. The student knows the principles of occupational safety in the use of machinery and technical equipment, works independently and in a group.

COURSE CONTENT

LECTURE

- › **L1** General characteristics of the ceramic industry - historical development in Poland and the world.
- › **L2, 3** Ceramic materials - characteristics of structure and properties. Comparison with other engineering materials.
- › **L4, 5** Basic ceramic raw materials - criteria for classification and requirements that they must meet.
- › **L6, 7** Types of ceramic masses. Methods of preparation, enrichment and processing.
- › **L8, 9** Production of ceramic products - general scheme. Example technologies.
- › **L10, 11** Characteristics of selected groups of ceramic materials (refractory mats, building ceramics...).
- › **L12, 13** Glass - material of the ceramic industry.
- › **L14** Raw materials of glassmaking. Properties and applications of glasses.
- › **L15** Modern ceramic materials and technologies of their production.

LABORATORY

- › **Lab 1** Health and safety training and discussion of the rules of the course credit.
- › **Lab 2** Macroscopic and microscopic analysis of basic ceramic raw materials.
- › **Lab 3, 4** Design of ceramic masses.
- › **Lab 5** Manufacturing of ceramic masses.
- › **Lab 6, 7** Forming of ceramic products.
- › **Lab 8** Drying and firing of ceramic products.
- › **Lab 9** Glazing, decoration, processing of ceramic products.
- › **Lab 10 - Lab13** Testing of selected properties of ceramic materials.
- › **Lab 14, 15** Technological processes of production of selected ceramic materials - field classes, colloquium.

BASIC REFERENCES

1. P. Wyszomirski, Wybrane naturalne i wtórne surowce mineralne, Wyd. Akapit, 2021 r.

2. P. Wyszomirski, K. Galos, Surowce mineralne i chemiczne przemysłu ceramicznego, Kraków, Uczelniane Wydaw. Nauk.-Dydakt. AGH im. S. Staszica, 2007 r.
3. S. Jusupow, Technologia Produkcji Wyrobów Ceramicznych, Wyd. Nasza wiedza, 2021 r., j. ang.
4. K. Subotowicz, Ceramika dla każdego, Wydawnictwo: Katowice ELAMED, 2008 r.
5. E. Brylska, P. Murzyn, Ceramiczne materiały budowlane. Metody badań surowców i wyrobów, Wyd. AHG, 2014 r.
6. R. Pampuch, Współczesne materiały ceramiczne, Wyd. Nauk.-Dydakt. AGH 2005 r.
7. M. Kordek, Ceramika szlachetna i techniczna, Wyd. AGH 2001 r.
8. M. Kaczorowski, A. Krzyńska, Konstrukcyjne materiały metalowe, ceramiczne i kompozytowe, Wyd. Oficyna Wyd. PW - Skrypt PW, 2019 r.
9. A. Olszyna, Ceramika supertwarda, Wyd. Oficyna Wyd. PW, 2011 r.
10. 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.

SUPPLEMENTARY REFERENCE MATERIALS

1. A. Jastrzębska, M. Kosteki, A. Olszyna i inni, Tworzywa ceramiczne. Ćwiczenia laboratoryjne, Wyd. Oficyna PW., 2020 r.
2. J. Mastalska-Popławska, A. Stempkowska, Ł. Wójcik, Elementy reologii w technologii ceramiki, Wyd. AGH, 2022 r.
3. Pampuch, K. Haberko, M. Kordek, Nauka o procesach ceramicznych, PWN Warszawa 1992 r.

LEARNING OUTCOMES

- › **EU1** The student has theoretical knowledge of the internal structure, properties and applications of ceramic materials.
- › **EU2** Knows basic ceramic raw materials and techniques for manufacturing ceramic materials.

- › **EU3** Knows the testing techniques and can examine the basic properties of raw materials and ceramic materials and prepare reports on selected exercises.

TEACHING TOOLS

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

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

- › **F1.** Evaluation of the tasks covered by the curriculum.
- › **F2.** Evaluation of mastery of the learning material covered by the laboratory - colloquium.
- › **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	30	1,2
Seminar		
Classes	30	1,2
Laboratory		
Project		
Test		
Exam		
Total contact hours	60	2,4
Student's own work		
Getting acquainted with the indicated literature	10	0,4
Preparation for seminar		
Preparation for classes	15	0,6
Preparation for lab		
Project preparation		
Consultation	4	0,16
Preparation for the test	11	0,44
Total student's own work	40	1,60

Total number of hours/ ECTS points for the course	100	4,0
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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, F2, P1
EU 2	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, F2, P1
EU 3	K_K01, K_K02, K_K04,	C3	Lab1 - Lab15	F1, F2

FORM OF ASSESSMENT - DETAILS

EU1 The student has knowledge of the internal structure, properties and applications of ceramic materials.

- › 2,0 The student has not mastered the basic knowledge of internal structure, properties and application of ceramic materials.
- › 3,0 The student has partially (sufficiently) mastered the knowledge of internal structure, properties and application of ceramic materials.
- › 3,5 The student has almost mastered the knowledge of internal structure, properties and application of ceramic materials.
- › 4,0 The student has well mastered the knowledge of internal structure, properties and application of ceramic materials.
- › 4,5 The student has almost very well mastered the knowledge of internal structure, properties and application of ceramic materials.
- › 5,0 The student has mastered the knowledge of internal structure, properties and application of ceramic materials very well.

EU2 The student knows the basic ceramic raw materials and techniques for manufacturing ceramic materials.

- › 2,0 The student does not know the basic ceramic raw materials and techniques of production of ceramic materials.
- › 3,0 The student has partially mastered the knowledge of basic ceramic raw materials and techniques of production of ceramic materials.
- › 3,5 The student has almost mastered the knowledge of basic ceramic raw materials and techniques of manufacturing ceramic materials.
- › 4,0 The student has well mastered the knowledge of basic ceramic raw materials and techniques of manufacturing ceramic materials.
- › 4,5 The student almost very well mastered the knowledge of basic ceramic raw materials and techniques of manufacturing ceramic materials.
- › 5,0 The student has mastered very well the knowledge of basic ceramic raw materials and techniques of manufacturing ceramic materials.

EU 3 The student knows the research techniques and is able to investigate the basic properties of raw materials and ceramic materials and prepare reports on selected exercises.

- › 2,0 The student does not know the research techniques and is not able to examine the basic properties of raw materials and ceramic materials and develop reports on selected exercises.
- › 3,0 The student has partially mastered the research techniques and is partially able to investigate the basic properties of raw materials and ceramic materials and prepare reports on selected exercises.
- › 3,5 The student has almost mastered the research techniques and is almost able to investigate the basic properties of raw materials and ceramic materials and prepare reports on selected exercises.
- › 4,0 The student has mastered the research techniques well and is able to investigate the basic properties of raw materials and ceramic materials and develop reports of selected exercises well.
- › 4,5 The student has almost very well mastered the research techniques and is able to investigate the basic properties of raw materials and ceramic materials and almost very well able to develop reports of selected exercises.
- › 5,0 The student has mastered the research techniques very well and is able to investigate the basic properties of raw materials and ceramic materials and is able to prepare reports of selected exercises very well.