COURSE GUIDE

Subject name	**Materials in production processes**
Course of study	**Quality and Production Management**
The form of study	**Full-time**
Level of qualification	**First**
Year	**I**
Semester	**II**
The implementing entity	**Department of Production Engineering and Safety**
The person responsible for preparing	**dr hab. inż. Dorota Klimecka-Tatar**
Profile	**General academic**
ECTS points	**4**

TEACHNING METHODS – NUMBER OF HOURS PER SEMESTER

LECTURE	CLASS	LABORATORY	PROJECT	SEMINAR
15E	15	15		

COURSE AIMS

C1. Knowledge and ability to identify basic groups of engineering materials.
C2. Knowledge and characteristics of materials testing methods.
C3. Understanding the possibilities of materials selection in manufacturing processes.

ENTRY REQUIREMENTS FOR KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. Student demonstrates knowledge of basic physical and chemical laws.
2. Student can make mathematical calculations.

LEARNING OUTCOMES

EU1. The student is able to divide the basic groups of engineering materials.
EU2. Student can characterize groups of metallic, polymer, ceramic and composite materials. Discuss their physical and mechanical properties.
EU3. Student knows basic research methods in determining properties of engineering materials.
EU4. Student is able to characterize the physical and mechanical properties of metallic, polymeric ceramic and composite materials.

COURSE CONTENT

Type of teaching – LECTURES	Number of hours
W1. Introduction to the subject. Presentation of basic concepts and terms related to material science.	1
W2. Presentation of the basic classification of engineering materials from the point of view of their construction and chemical composition.	1
W3. Presentation of basic information on metallic materials, metal processing techniques and their alloys.	1
W4. Overview of phase systems of metal alloys: iron alloys.	2
W5. Characteristics of polymer materials: classification of polymers, methods of polymer production.	2
W6. Characteristics of ceramic materials: classification of ceramic materials, technologies in the manufacturing of ceramics.	2
W7. Characteristics of composite materials: classification in terms of matrix material and applied filler / reinforcement.	2
W8. Introduction to identification and evaluation of microstructure and microstructure of engineering materials.	1
W9. Introduction to basic methods of measurement of engineering parameters.	2

W10. Introduction to materials selection methods - Ashby's maps.	1
Type of teaching – CLASS	**Number of hours**
C1. Introduction to the subject - discuss the rules of the classes, discuss assessment methods. Introduce basic concepts in material science.	2
C2. Introduction and discussion of construction of engineering materials. Determination of the influence of chemical bond types in materials of all groups on material properties.	2
C3. Introduction to crystallography including basic crystallographic systems.	2
C4. Two-component phase equilibria (methods of graphical design, information read from graphs, identification of reactions).	2
C5. Introduction to the basic calculations regarding the mechanical properties of materials.	4
C6. Selection of engineering materials based on Ashby's maps.	2
C7. Test.	1
Type of teaching – LABORATORY	**Number of hours**
L1. Introduction to the subject - discuss the rules of the classes, discuss assessment methods. Introduce basic concepts in material science.	2
L2. Methods for the identification and classification of materials based on physical properties, methods of determining the density of materials.	2
L3. Microscopic examination. Acquisition of single- and multi-phase alloys (including Fe-C alloys).	4
L4. Determination of particle size in single-phase materials, identification of the volume fraction of individual components based on stereological calculations.	2
L5. Introduction to the basic methods of measuring the mechanical properties (hardness for different material groups).	4
L7. Test.	1

TEACHNING TOOLS

1. Manuals and scripts.
2. Audiovisual equipment.
3. Analytical weight.
4. Optical microscopes - metallographic.
5. Hardness Testers.
6.

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

F1. Evaluation of the implementation tasks in the auditorium classes.
F2. Evaluation of the implementation tasks in the laboratory.
P1. Written exam.

STUDENT WORKLOAD

Form of activity		**Average number of hours for realization of the activity**		
		[h]	ECTS	ECTS
Contact hours with the teacher	Lecture	15	0.6	1.32
Preparation for exam		15	0.6	
Exam		3	0.12	
Contact hours with the teacher	Class	15	0.6	1.2
Preparation for auditorium class		15	0.6	
Contact hours with the teacher	Laboratory	15	0,6	1.2
Preparation for laboratory		15	0.6	
Consultation		7	0.28	0.28
TOTAL NUMBER OF HOURS / ECTS POINTS FOR THE COURSE		**100**	**4**	

BASIC AND SUPPLEMENTARY RESOURCE MATERIALS

Basic resources

1. Ashby M., Shercliff H., Cebon D. Materials: Engineering, Science, Processing and Design. Amsterdam, Oxford, Butterworth-Heinemann / Elsevier, 2014.
2. Callister W.D. Jr., Rethwisch D.G. Fundamentals of Materials Science and Engineering: an Integrated Approach: International Student Version. Singapore, John Wiley and Sons, 2016.
3. Askeland D.R., Wright W.J. SI Edition prepared by D. K. Bhattacharya, Raj P. Chhabra, The Science and Engineering of Materials: SI Edition. Boston: Cengage Learning, 2016.

Supplementary resources

1. Borkowski S., Sygut P. (eds.) Improvement Processes in Materials Engineering and Commodity Science. Zagreb, Croatian Quality Managers Society, 2015.
2. Cook R.D., Young W.C. Advanced Mechanics of Materials. New York, Macmillan Publishing Company, 1985.
3. Abramovich H. Intelligent Materials and Structures. Berlin, Walter de Gruyter, 2016.
4. Mazur M., Kucharikova L., Tillova E., Chalupova M. A Change of Mechanical Properties of the Self-hardening UNIFONT 90 Due to Temperature. [in:] 10th Conference on Terotechnology, Materials Research Proceedings nr 5. Materials Research Forum LLC, 2018.
5. Mazur M., Ulewicz R. Analiza wytrzymałości materiałów konstrukcyjnych w produkcji naczep samochodowych. [in:] XLIV Szkoła Inżynierii Materiałowej, Wydawnictwo Naukowe AKAPIT, 2016.
6. Pietraszek J., Klimecka-Tatar D. (eds.) Technical Aspects of Materials Quality. Oficyna Wydawnicza Stowarzyszenia Menedżerów Jakości i Produkcji. Częstochowa 2013.

TEACHERS (NAME,SURNAME, ADRES E-MAIL)

dr hab. inż. Dorota Klimecka-Tatar, dorota.klimecka-tatar@wz.pcz.pl
dr inż. Magdalena Mazur, magdalena.mazur@wz.pcz.pl
dr hab. inż. Robert Ulewicz, Prof. PCz, robert.ulewicz@wz.pcz.pl

MATRIX OF LEARNING OUTCOMES REALISATION

Learning outcome	Reference of given outcome to outcomes defined for whole program (PRK)	Course aims	Course content	Teaching tools	Ways of assessment
EU1	K_W01, K_W02, K_W09, K_U01, K_U02, K_U04, K_U05, K_U07 K_U09, K_U11, K_K02	C1, C2	W1-W4, C1-C3, L1-L2	1, 2	F1, F2, P1
EU2	K_W01, K_W02, K_W09, K_U01, K_U02, K_U04, K_U05, K_U07 K_U09, K_U11, K_K02	C2, C3	W5-W7, C2-C4, L2-L6	1, 3-5	F1, F2, P1
EU3	K_W01, K_W02, K_W09, K_U01, K_U02, K_U04, K_U05, K_U07 K_U09, K_U11, K_K02	C2, C3	W8-W10, C5-C7, L2-L6	1, 3-5	F1, F2, P1
EU4	K_W01, K_W02, K_W09, K_U01, K_U02, K_U04, K_U05, K_U07 K_U09, K_U11, K_K02	C2, C3	W5-W7, C2-C4, L2-L6	1, 3-5	F1, F2, P1

FORM OF ASSESSMENT - DETAILS

	grade 2	grade 3	grade 4	grade 5
EU1	Student cannot divide the basic groups of engineering materials.	Student knows the types of engineering materials he or she cannot properly classify.	Student knows the types of engineering materials, can do the division, but cannot point to examples.	Student can define special processes and discuss their specificities in detail, referring to specific examples.

EU2	Student can not characterize groups of metallic materials, ceramic and composite polymers.	Student is able to characterize selected groups of metallic, ceramic and composite polymers.	Student can identify and characterize groups of metallic, ceramic and composite materials	Student is able to characterize and discuss in detail the methods of quality control in selected special processes.
EU3	Student does not know basic research methods in determining the properties of engineering materials.	Student knows only a few research methods in determining the properties of engineering materials.	Student knows the basic research methods in determining the properties of engineering materials.	Student knows the methods of quality control in processes, can apply them and discuss them.
EU4	Student cannot characterize the physical and mechanical properties of metallic, polymeric ceramic and composite materials.	Student can indicate selected physical and mechanical properties of metallic, polymeric ceramic and composite materials.	Student knows the characteristic physical and mechanical properties of metallic, polymeric ceramic and composite materials.	Student is able to properly and in detail characterize the physical and mechanical properties of the mat. metallic, polymeric ceramic and composite.

ADDITIONAL USEFUL INFORMATION ABOUT THE COURSE

1. Information where presentation of classes, instruction, subjects of seminars can be found, etc. - presented to students during first classes, if required by the formula classes are sent electronically to the e-mail addresses of individual dean groups.
2. Information about the place of classes - Information can be found on the website of the Faculty of Management.
3. Information about the timing of classes (day of the week / time) - Information can be found on the website of the Faculty of Management.
4. Information about the consultation (time + place) - Information can be found on the website of the Faculty of Management.