

Polish course name	INSTRUMENTARIUM BADAWCZE
English course name	INSTRUMENTATION OF RESEARCH
Course code	WIP-MDL-D1-IOR-02
Field of study	Materials design and logistics
Level of qualification	First degree
Form of study	Full-time
Semester	2
Number of ECTS points	5
Ways of assessment	Exam

Number of hours per semester

Lecture	Seminar	Classes	Laboratory	Project
15			30	

TEACHERS:

Dr inż. Zbigniew Bałaga.

COURSE OBJECTIVES:

- › **C1** Provide students with basic knowledge about measuring equipment.
- › **C2** To acquaint students with the methods of materials research.

PRELIMINARY REQUIREMENTS FOR KNOWLEDGE, SKILLS AND OTHER COMPETENCES:

1. Basic knowledge of physics, chemistry, work safety rules when using machines and devices.
2. Ability to use basic measuring tools.
3. Ability to work alone and in a group.
4. Ability to prepare written reports on the performed laboratory exercises.
5. Ability to use literature sources and internet resources.

COURSE CONTENT

LECTURE

- › **L1** Outline in the development of materials and trends in the development of methods of their study.
- › **L2 - L5** Apparatus used for macroscopic and microscopic examination of materials (construction and types of microscopes).
- › **L6 - L11** Research instruments for determining the mechanical properties of materials (construction and use of a universal testing machine, construction and types of hardness testing devices).
- › **L12 - L15** Apparatus used in non-destructive testing of materials.

LABORATORY

- › **Lab1** Acquainting students with the rules of passing the course.
- › **Lab2 - L3** Macroscopic research.
- › **Lab4 - L11** The use of microscopes in the assessment of the structure of materials.
- › **Lab12 - L20** The use of a universal testing machine and hardness testers in the assessment of material properties.
- › **Lab21 - L27** Construction and use of an X-ray diffractometer as an example of non-destructive testing.
- › **Lab28 - L29** Chemical composition analyzers.
- › **Lab30** Test.

BASIC REFERENCES

1. G. Golański, A. Dudek, Z. Bałaga: Metody badania właściwości materiałów. Wyd. Politechnika Częstochowska 2011 r.
2. Z. L. Kowalewski: Współczesne badania wytrzymałościowe. Wyd. Biuro Gamma, Warszawa 2008 r.
3. M. Wojas: Wady wyrobów wykrywane metodami nieniszczącymi - Cz.2. wady eksploatacyjne. Wyd. Biuro Gamma, Warszawa 2006 r.
4. J. Lis: Laboratorium z nauki o materiałach, Wyd. AGH, Kraków 2003 r.
5. K. Przybyłowicz: Metody badania metali i stopów. Wyd. AGH, Kraków 1997 r.

SUPPLEMENTARY REFERENCE MATERIALS

1. M. Łomozik: Metaloznawstwo i badania metalograficzne połączeń spawanych. Instytut Spawalnictwa, Gliwice 2005 r.
2. M. Blicharski: Odształcanie i pękanie. Uczelniane Wyd. AGH, Kraków 2002 r.

3. L.A. Dobrzański: Podstawy nauki o materiałach i metaloznawstwo. Materiały inżynierskie z podstawami projektowania materiałowego. WNT, Warszawa 2002 r.

LEARNING OUTCOMES

- › **EU1** The student has theoretical knowledge in the field of measuring equipment used in materials research.
- › **EU2** The student is able to calculate and interpret the obtained results of materials research.

TEACHING TOOLS

- › Multimedia presentations.
- › Laboratory equipment and guides.
- › The e-learning platform of the Częstochowa University of Technology (if the classes are held in a stationary form, it can be used as an auxiliary tool), or other tools for distance learning. Computer stations with software.

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

- › **F1.** Assessment of the implementation of tasks included in the curriculum.
- › **F2.** Assessment of the mastery of the teaching material being the subject of laboratory tasks - final test.
- P1.** Assessment of the mastery of the teaching material within the lectures – exam.

STUDENT WORKLOAD

Form of activity	Number of hours	ECTS
Contact hours with the teacher		
Lectures	15	0,6
Seminar		
Classes		
Laboratory	30	1,2
Project		
Test		
Exam	2	0,08

Total contact hours	47	1,88
Student's own work		
Getting acquainted with the indicated literature	26	1,04
Preparation for seminar		
Preparation for classes		
Preparation for lab	26	1,04
Project preparation		
Consultation	4	0,16
Preparation for the exam	22	0,88
Total student's own work	78	3,12
Total number of hours/ ECTS points for the course	125	5,0

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_U08, K_K01,	C1, C2	L1 - L15 Lab1 - Lab30	F1, P1
EU 2	K_W01, K_W03, K_W04,	C1, C2	L1 - L15 Lab1 - Lab30	F1, F2, P1

	K_U08,			
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FORM OF ASSESSMENT - DETAILS

EU1 The student has theoretical knowledge in the field of measuring equipment used in materials research.

- › 2,0 The student has not mastered the basic theoretical knowledge in the field of measuring equipment used in materials research.
- › 3,0 The student partially mastered the basic theoretical knowledge in the field of measuring equipment used in materials research.
- › 3,5 The student has almost mastered the basic theoretical knowledge in the field of measuring apparatus used in materials research.
- › 4,0 The student has mastered the basic theoretical knowledge in the field of measuring apparatus used in materials research.
- › 4,5 The student has almost very well mastered the basic theoretical knowledge in the field of measuring equipment used in materials research.
- › 5,0 The student has mastered the basic theoretical knowledge in the field of measuring equipment used in materials research very well.

EU2 The student is able to calculate and interpret the obtained results of materials research

- › 2,0 The student has not mastered the conversion and interpretation of the obtained material test results.
- › 3,0 The student partially mastered the conversion and interpretation of the obtained material test results.
- › 3,5 The student has almost mastered the conversion and interpretation of the obtained material test results.
- › 4,0 The student has mastered the conversion and interpretation of the obtained material test results.
- › 4,5 The student mastered the conversion and interpretation of the obtained material test results almost very well.
- › 5,0 The student has mastered the conversion and interpretation of the obtained material test results very well.

Student's own work		
Getting acquainted with the indicated literature		
Preparation for seminar		
Preparation for classes		
Preparation for lab		
Project preparation		
Consultation		
Preparation for the exam		
Total student's own work		
Total number of hours/ ECTS points for the course	30	0

ADDITIONAL INFORMATION

Timetable of classes	https://swfis.pcz.pl/menu/student---niezbedne-informacje
Information about the consultation (time + place)	https://swfis.pcz.pl/menu/student---niezbedne-informacje

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_K01,	C1	C1 - C15	F1, F2, P1, P2
EU 2	K_U02, K_K01,	C1	C1 - C15	F1, F2, P1, P2
EU 3	K_U02, K_K01,	C1	C1 - C15	F1, F2, P1, P2

FORM OF ASSESSMENT - DETAILS

EU1 The student knows the theoretical foundations of the selected sports discipline.

- › 2,0 The student does not know the basic rules of the selected sports discipline. He does not systematically participate in classes.
- › 3,0 The student partially knows the basic rules of the selected sports discipline. Participates systematically in classes.
- › 3,5 The student knows the basic rules of the chosen sport discipline. Participates systematically in classes.
- › 4,0 The student knows the basic rules of the selected sport discipline well. Participates systematically in classes.
- › 4,5 Student almost very well knows the basic rules of the chosen sports discipline. Participates systematically in classes.
- › 5,0 The student knows the basic rules of the chosen sport very well. Participates systematically in classes.

EU2 The student is able to perform the technical elements of the selected discipline presented in class.

- › 2,0 The student is not able to perform the technical elements of the selected discipline presented in the class. He does not systematically participate in classes.
- › 3,0 The student is able to partially perform the technical elements of the selected discipline presented in class. Participates systematically in classes.
- › 3,5 The student is almost able to perform the technical elements of the selected discipline presented in class. Participates systematically in classes.
- › 4,0 The student is able to perform well presented in class, technical elements in the field of the selected discipline. Participates systematically in classes.
- › 4,5 The student can almost very well perform the technical elements presented in the class in the field of the selected discipline. Participates systematically in classes.
- › 5,0 The student is able to very well perform the technical elements presented in the class in the field of the selected discipline. Participates systematically in classes.

EU3 The student is able to cooperate in: a couple, a group, a team, observes the rules of fair-play.

- › 2,0 The student is not able to cooperate in: a couple, a group, a team, observes the rules of fair-play. He does not systematically participate in classes.

- › 3,0 The student is able to partially cooperate in: a couple, a group, a team, he observes the rules of fair-play. Participates systematically in classes.
- › 3,5 The student can almost cooperate in: a couple, a group, a team, he observes the rules of fair play. Participates systematically in classes.
- › 4,0 The student is able to cooperate well in: a couple, a group, a team, observes the rules of fair-play. Participates systematically in classes.
- › 4,5 The student is able to cooperate very well in: a couple, a group, a team, he observes the rules of fair play. Participates systematically in classes.
- › 5,0 The student is able to cooperate very well in: a couple, a group, a team, observes the rules of fair-play. Participates systematically in classes.