



## COURSE DESCRIPTION CARD - SYLLABUS

Course name

Microscopy as a research method [S1IMat1>MM]

### Course

Field of study

Materials Engineering

Year/Semester

2/4

Area of study (specialization)

–

Profile of study

general academic

Level of study

first-cycle

Course offered in

polish

Form of study

full-time

Requirements

compulsory

### Number of hours

Lecture

15

Laboratory classes

30

Other (e.g. online)

0

Tutorials

0

Projects/seminars

0

### Number of credit points

3,00

### Coordinators

dr inż. Adam Piasecki

adam.piasecki@put.poznan.pl

### Lecturers

### Prerequisites

Basic knowledge of chemistry, physics, materials science. Logical thinking, use of the information obtained from the library and the Internet. Understanding the need for learning and acquiring new knowledge.

### Course objective

Knowing the microscopic methods of testing materials

### Course-related learning outcomes

Knowledge:

1. the student should know the microscopic methods of examining materials. - [k\_w11]
2. the student should know the preparation methodology for various microscopic methods. - [k\_w11]
3. the student should know the physical basics of various microscopic methods. - [k\_w11]

Skills:

1. the student is able to choose a research method leading to a correct result - [k\_u08, k\_u09]
2. the student is able to perform a metallographic examination and interpret the obtained structure. - [k\_u08, k\_u09]

3. the student is able to interpret the structure by transmission electron microscopy - [k\_u08, k\_u09]
4. the student is able to interpret the image obtained by scanning electron microscopy and to examine the chemical composition by x-ray microanalysis. - [k\_u08, k\_u09]

Social competences:

1. the student is able to work in a group - [k\_k03]
2. the student is aware of the importance of modern microscopic methods of researching materials in the modern economy and for society - [k\_k02]

### Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Learning outcomes presented above are verified as follows:

Lecture: - credit on the basis of a test consisting of both open and test questions carried out at the end of the semester.. Scale of estimate: 51-60% - dst(C), 61-70% - dst+(C+), 71-80% - db(B), 81-90% - db+(B+), 91-100% - bdb(A).

Laboratory classes: evaluation of students knowledge necessary to prepare, and carry out the lab tasks and evaluation of reports.

### Programme content

Lecture: Light microscopy – structure and functioning of metallographic microscope, investigation methods, sample preparation. Transmission electron microscopy – the physical background, structure and functioning of the microscope, interaction of the electron beam with the matter, basic research methods, sample preparation, interpretation of the microscopic images and diffraction patterns. Scanning electron microscopy - structure and functioning of the microscope, the research methods and their application, sample preparation, the interpretation of the obtained images. Microanalytical methods in electron microscopy.

Laboratory classes: 1. Light microscopy. Metallographic specimens. 2. Polishing and etching of specimens. 3. Microscopic observations. 4. Methods of quantitative metallography in light microscopy. 5. Performing intermediate and extraction replicas. 6. Thin foils. 7. Observations of preparations in transmission electron microscopy. 8. Diffraction analysis. 9. Scanning electron microscopy. 10. X-ray microanalysis.

### Teaching methods

multimedia presentations

### Bibliography

Basic

1. Kubiński W., Wybrane metody badania materiałów. Badanie metali stopów. Wyd. PWN. 2016.
2. Barbacki A. (red.), Metody i techniki strukturalnych badań metali, Wyd. Politechniki Poznańskiej, Poznań 1994.

Additional

1. Barbacki A. (red.), Mikroskopia elektronowa, Wyd. Politechniki Poznańskiej, Poznań 2005.
2. Kurzydłowski K., Lewandowska M., Nanomateriały inżynierskie konstrukcyjne i funkcjonalne, Wyd. PWN. 2010.

### Breakdown of average student's workload

	Hours	ECTS
Total workload	60	3,00
Classes requiring direct contact with the teacher	45	2,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	15	1,00