**SYLLABUS**

**regarding the qualification cycle 2023/2024**

1. Basic Course/Module Information

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| --- | --- |
| Course/Module title | Modern technologies of materials production |
| Course/Module code \* |  |
| Faculty (name of the unit offering the field of study) | College of Natural Sciences |
| Name of the unit running the course | Institute of Material Engineering |
| Field of study | Material Engineering |
| Qualification level  | I |
| Profile | generally academic |
| Study mode | Full time |
| Year and semester of studies | II year, III semester |
| Course type | directional |
| Language of instruction | Polish/English |
| Coordinator | Iwona Rogalska |
| Course instructor |  |

\* - as agreed at the faculty

1.1.Learning format – number of hours and ECTS credits

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Semester(n0.) | Lectures | Classes | Colloquia | Lab classes | Seminars | Practical classes | Internships | others | **ECTS credits**  |
| 3 |  |  |  | 30 |  |  |  |  | 5 |

1.2. Course delivery methods

- conducted in a traditional way

1.3. Course/Module assessment (exam, pass with a grade, pass without a grade)

Laboratory: assessment: credit with a grade

2. Prerequisites

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| Basic knowledge of Materials Science and Physics. |

3. Objectives, Learning Outcomes, Course Content, and Instructional Methods

3.1. Course/Module objectives

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| --- | --- |
| O1 | To acquaint students with physical and chemical technologies of thin film deposition |
| O2 | To acquaint students with lithographic methods used in material technologies |
| O3 | Understanding the nature of manufacturing processes in modern manufacturing techniques |

3.2. Course/Module Learning Outcomes (to be completed by the coordinator)

|  |  |  |
| --- | --- | --- |
| Learning Outcome | The description of the learning outcome defined for the course/module | Relation to the degree programme outcomes |
| LO\_01 | Student knows the physical and chemical technologies of thin film deposition. Knows lithographic methods used in material technologies | IM\_W02IM\_W04IM\_W05 |
| LO\_02 | Is familiar with the current state and the latest development trends in material engineering. Has basic knowledge of modern materials used in technology. | IM\_W06IM\_W07IM\_W08IM\_W09 |
| LO\_03 | Student can and knows how to choose the right material and the most advantageous machining method, he can apply the basic parameters of the process. Is able to link the state of knowledge on the subject with the method of producing a specific element. | IM\_U10IM\_U15 |
| LO\_04 | The acquired theoretical knowledge can be adapted to existing working conditions, works in a team, can respond to the basic problems of modern technology. It is open to technical news related to advanced technology.Student understand the need to improve his qualifications, understands the need to enrich his knowledge and skills to change in technology and technology. | IM\_K01IM\_K08 |

**3.3. Course content (to be completed by the coordinator)**

1. Classes, tutorials/seminars, colloquia, laboratories, practical classes

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| L-1. Introductory exercise (discussion of the topic of classes, conditions for passing, health and safety regulations).L-2. Materials and devices research methods at the micro- and nanoscale.L-3. Preparation of samples for metallographic microscopic examinations.L-4. MBE / MOCVD technology - preparation of the substrate for the process.L-5. Preparation of material for applying layers by PVD / CVD / ALD / PLD techniques.L-6. Chemical methods for producing polymer layers.L-7. Research on the quality of nanomaterial structures after the annealing process.L-8. Impact of ultrasounds on the microstructure and properties of the obtained material. |

3.4. Methods of Instruction

e.g.

*Lecture: a problem-solving lecture/a lecture supported by a multimedia presentation/ distance learning*

*Classes: text analysis and discussion/project work (research project, implementation project, practical project)/ group work (problem solving, case study, discussion)/didactic games/ distance learning*

*Laboratory classes: designing and conducting experiments*

Exercises in the laboratory: performing experiments, designing experiments

4. Assessment techniques and criteria

4.1 Methods of evaluating learning outcomes

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| --- | --- | --- |
| Learning outcome | Methods of assessment of learning outcomes (e.g. test, oral exam, written exam, project, report, observation during classes) | Learning format (lectures, classes,…) |
| LO-01 | *Observation during classes / project* | lectures, classes |
| LO-02 | *Observation during classes / project* | lectures, classes |
| LO-03 | *OBSERVATION DURING CLASSES* | lectures, classes |

4.2 Course assessment criteria

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| --- |
| Completion of the course will confirm the student's achievement of the intended learning outcomes. Verification of achieved learning outcomes is monitored on an ongoing basis during the course of classes. The grade obtained from passing the subject will assess the degree of effects achieved. Verification of the learning outcomes of the teacher's knowledge and skills take place through tests, reports, class participation and discussion. Verification of the learning outcomes of the classes without the participation of teachers will be based on the assessment of the student's preparation for laboratory exercises. The verification of social competences will take place through active participation in classes and participation in discussionsLaboratory: Form of credit: credit with gradeThe condition of passing the course is: obtaining a grade from knowledge and substantive preparation for the exercises, and colloquia.The final grade is the average of partial grades.Ects grading scale:A – excellent (91 – 100)%B - very good (81 – 90)%C – good (71 – 80)%D – satisfactory (61 – 70)%E – sufficient (51 – 60)%F – fail (0 – 50)% |

5. Total student workload needed to achieve the intended learning outcomes

– number of hours and ECTS credits

|  |  |
| --- | --- |
| Activity | Number of hours |
| Scheduled course contact hours | Laboratory 30 hours |
| Other contact hours involving the teacher (consultation hours, examinations) | 5 |
| Non-contact hours - student's own work (preparation for classes or examinations, projects, etc.) | 90 |
| Total number of hours | 123 |
| Total number of ECTS credits | 5 |

\* One ECTS point corresponds to 25-30 hours of total student workload

6. Internships related to the course/module

Not applicable

7. Instructional materials

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| Compulsory literature:1. M. Jurczyk „Nanomateriały” Wydawnictwo Politechniki Poznańskiej Poznań 2001
2. M. Jurczyk, J. Jakubowicz „Nanomateriały ceramiczne” Wydawnictwo Politechniki Poznańskiej Poznań 2004
3. M. Leonowicz „Nanokrystaliczne materiały magnetyczne” WNT Kraków 1998
4. T. Burakowski i T. Wierzchoń: Inżynieria Powierzchni Metali, WNT W-wa, 1995.
5. K. Kurzydłowski, M. Lewandowska „Nanomateriały inżynierskie, konstrukcyjne i funkcjonalne” Wydawnictwo naukowe PWN Warszawa 2012
 |
| Complementary literature:1. Major „Ablacja i osadzanie laserem impulsowym” Akapit Kraków 2002.
2. J. Głuszek „Tlenkowe powłoki ochronne otrzymywane metodą sol-gel”. Wydawnictwo Politechniki Wrocławskiej Wrocław 1988
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Approved by the Head of the Department or an authorised person