



## COURSE DESCRIPTION CARD - SYLLABUS

Course name

Machine maintenance [N1ZiIP2>URM]

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### Course

Field of study

Management and Production Engineering

Year/Semester

4/7

Area of study (specialization)

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Profile of study

general academic

Level of study

first-cycle

Course offered in

Polish

Form of study

part-time

Requirements

compulsory

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### Number of hours

Lecture

8

Laboratory classes

16

Other

0

Tutorials

8

Projects/seminars

0

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### Number of credit points

5,00

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### Coordinators

### Lecturers

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### Prerequisites

Basic knowledge in material science, physics, mathematical statistics, logical thinking, efficient acquisition and evaluation of information from technical literature and online resources, understanding the need for continuous learning and acquiring new knowledge.

### Course objective

Improving competencies in the field of machine maintenance in production enterprises, gaining knowledge of basic phenomena and laws related to machine operation, designing maintenance systems throughout the product lifecycle, raising awareness of the importance of diagnostics and technical condition monitoring in machine maintenance, understanding the causes of wear and reliability of technical objects, preventing and controlling wear processes, analyzing the impact of humans and environment on technical objects at different stages of existence, and presenting the legal framework for machine safety requirements as well as methods for risk assessment and minimization in designed and constructed machines.

### Course-related learning outcomes

Knowledge:

1. The student understands the fundamentals of maintenance management for machinery and equipment in industrial enterprises.
2. The student understands the structure and role of maintenance systems in industrial enterprises.

3. The student understands the basics of machine operation and diagnostics.
4. The student understands the fundamentals of reliability theory.
5. The student understands the formal requirements related to safety.
6. The student understands the nature of wear processes.
7. The student understands the sources of costs related to the maintenance of production systems.

#### Skills:

1. The student is able to use IT tools in maintenance management.
2. The student is able to assess the role of humans in the maintenance system of production systems.
3. The student is able to evaluate the reliability of machines.
4. The student is able to apply operational resources.
5. The student is able to conduct risk assessments for selected components of the production system.
6. The student is able to interpret the values of indicators related to maintenance.

#### Social competences:

Student understands the need for lifelong learning; is able to inspire and organize the learning process of others. Is aware of the importance and understanding of non-technical aspects and the consequences of engineering activities.

### Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

1. Lecture - Course passed based on a written test. A positive grade is achieved with a minimum of 50.1% correct answers. Assignment of grades to percentage ranges of results: <90-100> very good; <80-90) good plus; <70-80) good; <60-70) satisfactory plus; <50-60) satisfactory; <0-50) unsatisfactory.
2. Exercises - Course passed based on partial grades and a final test. A positive grade is achieved with a minimum of 50.1% correct answers. Assignment of grades to percentage ranges of results: <90-100> very good; <80-90) good plus; <70-80) good; <60-70) satisfactory plus; <50-60) satisfactory; <0-50) unsatisfactory.
3. Laboratories - Course passed based on partial grades from oral responses and reports prepared according to the instructor's guidelines.

### Programme content

Introduction to the theory and practice of machine and equipment operation. Introduction to the management and organization of maintenance in industrial enterprises. Introduction to the basics of machine diagnostics and reliability theory.

### Course topics

Maintenance management in production enterprises, maintenance strategies. Application of IT tools in maintenance management. The role of humans in the machine operation process. Product lifecycle. Introduction to disaster theory. Machine and equipment safety - presentation of selected formal issues, overview of the Machinery Directive. Diagnostic analysis and testing of machine components. Risk assessment using the SCRAM method, safety integrity level. Reliability theory. Sources of maintenance costs in machinery. Case studies. Wear processes - theory and physical foundations, case studies. Experimental research on phenomena related to operation. Analysis of maintenance indicators. Machine reliability - concepts, statistical issues, and reliability measures. Vibroacoustic diagnostics, methods for assessing the technical condition of machines.

### Teaching methods

1. Lecture: Multimedia presentations, case studies, leading discussions.
2. Exercises: Performing calculations and analyses related to machine reliability, maintenance costs, and maintenance management.
3. Laboratories: Preparing and conducting experiments related to phenomena concerning machine operation and diagnostics, analyzing experimental results, and discussions.

### Bibliography

Basic:

1. Mobley, R.K., (2014), Maintenance Engineering Handbook, 8th Edition, McGraw-Hill Education ,ISBN: 9780071826617
2. Baptista, J. (2019). Industrial maintenance. London, England: CRC Press, ISBN: 9780429327148
3. Gwidon Stachowiak, Andrew W. Batchelor, (2005), Engineering Tribology, Elsevier Inc.,ISBN-13: 978-0750678360

Additional:

1. Szellerski, M. W. (2023). O utrzymaniu ruchu w zakładach produkcyjnych, ISBN: 9788367635059
2. Szymaniec, S., Kacperak, M. (2021). Utrzymanie ruchu w przemyśle, ISBN: 9788301214241
3. Jasiulewicz-Kaczmarek, M., Mazurkiewicz, D., Wyczółkowski, R., (2023), Strategie i metody utrzymania ruchu, ISBN: 9788320825091

**Breakdown of average student's workload**

	Hours	ECTS
Total workload	125	5,00
Classes requiring direct contact with the teacher	34	1,50
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	91	3,50