



## COURSE DESCRIPTION CARD - SYLLABUS

Course name

Product maintenance

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### Course

Field of study

Product Lifecycle Engineering

Area of study (specialization)

Level of study

Second-cycle studies

Form of study

full-time

Year/Semester

2/3

Profile of study

general academic

Course offered in

English

Requirements

compulsory

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### Number of hours

Lecture

5

Tutorials

Laboratory classes

10

Projects/seminars

Other (e.g. online)

### Number of credit points

1

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### Lecturers

Responsible for the course/lecturer:

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Faculty of Mechanical Engineering

Piotrowo Street No 3, 60-965 Poznań

Responsible for the course/lecturer:

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### Prerequisites

Basic knowledge of materials science, tribology, machine construction, mathematical statistics, manufacturing techniques



### Course objective

Learning the basic issues concerning the maintenance of products, their reliability, diagnostics and servicing

### Course-related learning outcomes

#### Knowledge

The student should characterize the basic methods of maintenance in product life cycle, the role of servitization and methodology for supporting preventive action planning by maintenance services

#### Skills

The student is able to use a computer system supporting maintenance

#### Social competences

The student is aware of the role of the correct maintenance of products in the modern economy and for society

### Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture - exam

Laboratory classes - elaboration an example of computer-aided maintenance

### Programme content

#### LECTURE

Maintenance - definition and purposes,

Maintenance management over the time,

The role of data in maintenance strategies evolution,

Maintenance data life-cycle management (data acquisition, data storage, data preprocessing, data visualisation and application),

Diagnostics and reliability of products

Maintenance in product life cycle (BOL, MOL, EOL),

New data-driven technologies in maintenance,

Servitization (role of service provider in maintenance, warranty)

Methodology for supporting preventive action planning by maintenance services

#### LABORATORY CLASSES

Computer Aided Maintenance - various solutions



System CMMS - architecture, functions, examples of applications

Developing of specific examples by students

### Teaching methods

Lecture with multimedia presentations, work on a computer

### Bibliography

Basic

Tonci Grubic, Remote monitoring technology and servitization: Exploring the relationship, *Computers in Industry* 100 (2018) 148–158, doi.org/10.1016/j.compind.2018.05.002

Galar D., Sandborn P., Kumar U. 2017. *Maintenance Costs and Life Cycle Cost Analysis*. CRC Press Taylor & Francis Group

Fedele L. *Methodologies and Techniques for Advanced Maintenance*. Springer-Verlag London Limited 2011 DOI 10.1007/978-0-85729-103-5 ISBN 978-0-85729-102-8

Zhang W. Yang D. Wang H. *Data-Driven Methods for Predictive Maintenance of Industrial Equipment: A Survey*. 2019 *IEEE Systems Journal* Vol. 13, Issue: 3 pp. 2213 – 2227

Razmi-Farooji, A., Kropsu-Vehkaperä, H., Härkönen, J. and Haapasalo, H. (2019), Advantages and potential challenges of data management in e-maintenance, *Journal of Quality in Maintenance Engineering*, Vol. 25 No. 3, pp. 378-396

Gaiardelli P., Resta B., Martinez V., Pinto R., Albores P.: A classification model for product-service offerings. *Journal of Cleaner Production* 66 (3), pp. 507–519 (2014)

Bokrantz J Skoogh A Berlin C Wuest T Stahre J 2019 *Smart Maintenance: an empirically grounded conceptualization International Journal of Production Economics*  
<https://doi.org/10.1016/j.ijpe.2019.107547>

Diez-Olivan A., Del Ser J., Galar D., Sierra B., *Data fusion and machine learning for industrial prognosis: Trends and perspectives towards Industry 4.0. Information Fusion* 50, pp. 92–111(2019)

Additional



### Breakdown of average student's workload

	Hours	ECTS
Total workload	25	1,0
Classes requiring direct contact with the teacher	15	0,5
Student's own work (literature studies, preparation for laboratory classes/tutorials, preparation for tests/exam, project preparation) <sup>1</sup>	10	0,5

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<sup>1</sup> delete or add other activities as appropriate

