Polish course name	**DEGRADACJA MATERIAŁÓW**
English course name	**DEGRADATION OF MATERIALS**
Course code	**WIP-MDL-D1-DOM-07**
Field of study	**Materials design and logistics**
Level of qualification	**First degree**
Form of study	**Full-time**
Semester	**7**
Number of ECTS points	**3**
Ways of assessment	**Test**

Number of hours per semester

Lecture	Seminar	Classes	Laboratory	Project
30			30	

TEACHERS:

Dr Edyta Owczarek,

Dr inż. Karina Jagielska-Wiaderek,

Dr hab. Krystyna Giza, prof. PCz.

COURSE OBJECTIVES:

› **C1** The aim is to familiarize students with the phenomena of material degradation and selected technologies of protection against material degradation.

› **C2** Acquiring by students the ability to assess the degree of degradation of materials

PRELIMINARY REQUIREMENTS FOR KNOWLEDGE, SKILLS AND OTHER COMPETENCES:

1. Basic knowledge of chemistry, mathematics, materials science, engineering materials.
2. Ability to keep documentation and prepare a report on the course of the exercise.
3. Ability to use literature sources and internet resources

COURSE CONTENT

LECTURE

- **L1, L2** Durability of materials in natural and artificial environments. Factors causing degradation of materials. Types of material degradation.
- **L3 - L5** Classification of corrosion phenomena and destruction of materials. Types of corrosion damage and their effects. Methods of expressing the corrosion rate. Chemical corrosion of metals.
- **L6 - L12** Electrochemical corrosion of metallic materials.
- **L13 - L15** Corrosion of ceramic materials.
- **L16 - L17** Selected technologies to prevent corrosion degradation.
- **L18 - L22** Degradation by tribological wear (abrasive, abrasion, fatigue, abrasive-adhesive, adhesive, oxidation, hydrogen).
- **L23 - L27** Degradation by non-ribological wear (thermal, diffusion, deformation, erosion, cavitation and others).
- **L28, L29** Biodegradation.
- **L30** Final test.

Laboratory

- **Lab1, Lab2** Acquainting students with the rules of passing the course. Health and safety rules in the research laboratory. Physicochemical properties of solids.
- **Lab3 - Lab6** Determination of the corrosion rate of metallic materials in environments of various aggressiveness.
- **Lab7 - Lab10** Research on the degradation of materials in the biological environment.
- **Lab11 - Lab14** Influence of non-metallic coatings on the corrosion resistance of materials in various environments.
- **Lab15 - Lab18** Research on the influence of the geometrical structure of the surface of materials on their strength.
- **Lab19 - Lab22** Assessment of surface resistance to wear under frictional conditions.
- **Lab23 - Lab26** Assessment of scratch resistance.
- **Lab27 - Lab30** Microscopic evaluation of the type and degree of degradation of selected materials.

BASIC REFERENCES

1. T. Burakowski, T. Wierzchoń: Inżynieria powierzchni metali. WNT, Warszawa 1995 r.
2. L. A. Dobrzański: Materiały inżynierski i projektowanie materiałowe. Podstawy nauki o materiałach i metaloznawstwo. WNT, Warszawa 2006 r.
3. J. Łaskawiec: Inżynieria Powierzchni. Wydawnictwo Politechniki Śląskiej, Gliwice 1997 r.
4. T. Hryniewicz., Rokosz K.: Podstawy teoretyczne i aspekty praktyczne zjawisk korozji, Wyd. UPK, Koszalin, 2010 r.
5. W. Gumowska, E. Rudnik, I. Harańczyk: Korozja i ochrona metali, Wyd. naukowo-dydaktyczne AGH, Kraków, 2007 r.
6. M. Blicharski: Wstęp do inżynierii materiałowej, WNT 2009 r.

SUPPLEMENTARY REFERENCE MATERIALS

1. Owczarek E.: Methods of modifying anticorrosive protective properties of silane films, Acta Physica Polonica A, (2019) 135 (2):147-152.
2. Owczarek E.: Comparision studies of the protective properties of silane/polyrhodanine and polyrhodanine/silan bilayer coatings applied on stainless steel, Anti-Corrosion Methods and Materials, (2018) 65:190-196.

LEARNING OUTCOMES

› **EU1** The student has a basic knowledge of the mechanisms and effects of material degradation.

› **EU2** The student is able to carry out appropriate tests of the degree of degradation of the material and, on the basis of the obtained results, make an analysis and prepare a report on the conducted research.

TEACHING TOOLS

› Lecture with the use of audiovisual aids.

› Instructions for laboratory exercises. The laboratory is equipped with measuring apparatus and a microscope for observation of damages.

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

› **F1.** Assessment of the implementation of tasks included in the curriculum.

- **F2.** Assessment of the preparation of laboratory reports.
- **P1.** Assessment of the mastery of the teaching material being the subject of the laboratory - final test.
- **P2.** Assessment of the mastery of the teaching material within the lectures - final test.

STUDENT WORKLOAD

Form of activity	Number of hours	ECTS
Contact hours with the teacher		
Lectures	30	1,2
Seminar		
Classes		
Laboratory	30	1,2
Project		
Test		
Exam		
Total contact hours	60	2,4
Student's own work		
Getting acquainted with the indicated literature	5	0,2
Preparation for seminar		
Preparation for classes		
Preparation for lab	6	0,24
Project preparation		
Consultation	2	0,08
Preparation for the test	2	0,08
Total student's own work	**15**	**0,6**
Total number of hours/ ECTS points for the course	**75**	**3,0**

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_W04, K_U03, K_U04,	C1	L1 - L30	F1, P2
EU 2	K_W01, K_W04, K_U03, K_U04,	C1, C2	L1 - L30, Lab1 - Lab30	F1, F2, P1

FORM OF ASSESSMENT - DETAILS

EU1 The student has a basic knowledge of the mechanisms and effects of material degradation.

- 2,0 The student has no basic knowledge about the mechanisms and effects of material degradation.
- 3,0 The student partially has a basic knowledge of the mechanisms and effects of material degradation.
- 3,5 The student has almost a basic knowledge of the mechanisms and effects of material degradation.
- 4,0 The student knows the mechanisms and effects of material degradation well.
- 4,5 The student knows the mechanisms and effects of material degradation almost very well.
- 5,0 The student knows the basic knowledge about the mechanisms and effects of material degradation very well.

EU2 The student is able to carry out appropriate tests of the degree of degradation of selected materials and, on the basis of the obtained results, make an analysis and prepare a report on the conducted research.

- 2,0 The student is not able to carry out an appropriate examination of the degree of degradation of selected materials and, on the basis of the obtained results, make an analysis and prepare a report on the research carried out.

- 3,0 The student is able to partially carry out appropriate tests of the degree of degradation of selected materials and, on the basis of the obtained results, make an analysis and prepare a report on the research.
- 3,5 The student is able to almost carry out appropriate tests of the degree of degradation of selected materials and, on the basis of the obtained results, make an analysis and prepare a report on the research carried out.
- 4,0 The student is able to carry out appropriate research on the degree of degradation of selected materials and, on the basis of the obtained results, make an analysis and prepare a report on the research.
- 4,5 The student is able to carry out the appropriate tests of the degree of degradation of selected materials very well, and on the basis of the obtained results, make an analysis and prepare a report on the conducted research.
- 5,0 The student is very well able to carry out appropriate research on the degree of degradation of selected materials and, on the basis of the obtained results, make an analysis and prepare a report on the research.