

**AGH**AGH UNIVERSITY OF SCIENCE
AND TECHNOLOGY

Module name: Protective coatings: synthesis, properties and application

Academic year: 2019/2020 Code: ZSDA-3-0034-s ECTS credits: 3

Faculty of: Szkoła Doktorska AGH

Field of study: Szkoła Doktorska AGH Specialty: —

Study level: Third-cycle studies Form and type of study: Full-time studies

Lecture language: English Profile of education: Academic (A) Semester: 0

Course homepage: <http://home.agh.edu.pl/~zbgrzesik>

Responsible teacher: prof. dr hab. inż. Grzesik Zbigniew (grzesik@agh.edu.pl)

Module summary

Students obtain essential information about functional coatings, their fabrication methods and application in a number of industry branches.

Description of learning outcomes for module

MLO code	Student after module completion has the knowledge/ knows how to/is able to	Connections with FLO	Method of learning outcomes verification (form of completion)
Social competence: is able to			
M_K001	understands the economic and ecologic aspects of application of new materials and technologies	SDA3A_K01	Participation in a discussion, Activity during classes
Skills: he can			
M_U001	is able to use novel information on materials for the needs of technological developments;	SDA3A_U01	Presentation, Participation in a discussion, Case study, Activity during classes
Knowledge: he knows and understands			
M_W001	has knowledge on the manufacturing and processing of coatings;	SDA3A_W01	Presentation, Participation in a discussion, Activity during classes
M_W002	understands the role of coatings	SDA3A_W02	Activity during classes

Number of hours for each form of classes

Suma	Form of classes										
	Lectures	Auditorium classes	Laboratory classes	Project classes	Conversation seminar	Seminar classes	Practical classes	Fieldwork classes	Workshops	Prace kontrolne i przejściowe	Lektorat
30	10	0	0	0	0	20	0	0	0	0	0

FLO matrix in relation to forms of classes

MLO code	Student after module completion has the knowledge/ knows how to/is able to	Form of classes										
		Lectures	Auditorium classes	Laboratory classes	Project classes	Conversation seminar	Seminar classes	Practical classes	Fieldwork classes	Workshops	Prace kontrolne i przejściowe	Lektorat
Social competence: is able to												
M_K001	understands the economic and ecologic aspects of application of new materials and technologies	-	-	-	-	-	+	-	-	-	-	-
Skills: he can												
M_U001	is able to use novel information on materials for the needs of technological developments;	-	-	-	-	-	+	-	-	-	-	-
Knowledge: he knows and understands												
M_W001	has knowledge on the manufacturing and processing of coatings;	+	-	-	-	-	-	-	-	-	-	-
M_W002	understands the role of coatings	-	-	-	-	-	-	-	-	-	-	-

Student workload (ECTS credits balance)

Student activity form	Student workload
Udział w zajęciach dydaktycznych/praktyka	30 h
Preparation for classes	20 h
przygotowanie projektu, prezentacji, pracy pisemnej, sprawozdania	5 h
Realization of independently performed tasks	10 h
Summary student workload	65 h
Module ECTS credits	3 ECTS

Additional information

Module content

Lectures

- structure of solid surfaces
- coating fabrication (vapor deposition, chemical and electrochemical techniques, spraying, roll-to-roll coating processes, etc.)
- functions of coatings (adhesive, optical, catalytic, photo-sensitive, protective, magnetic, electric, etc.)
- selected characterization techniques of coatings
- prospects in designing new generation of functional coatings

Seminar classes

- industrial coatings
- printed electronics
- protective coatings in medical tools
- coatings for cutting tools
- TBC coatings
- coatings for light Al-alloys
- protective coatings for automobile industry
- functional coatings in aircraft industry
- application of functional coatings in astronautics

Teaching methods and techniques:

Lectures: Classical technique;
Self-organized Learning Environment
Seminar classes: Reverse teaching technique;
Self-organized Learning Environment;
Work in groups;
Brainstorm

Warunki i sposób zaliczenia poszczególnych form zajęć, w tym zasady zaliczeń poprawkowych, a także warunki dopuszczenia do egzaminu:

In order to complete the seminar class, a presentation on a chosen subject must be given and the student must take part in a discussion, which will be positively graded. In order to pass the subject in the secondary term, a positive grade must be obtained from a test on the entirety of the material.

Zasady udziału w poszczególnych zajęciach, ze wskazaniem, czy obecność studenta na zajęciach jest obowiązkowa:

Lectures:
- Attendance is mandatory: No
- Participation rules in classes: Official permission for participation in classes is required.
Seminar classes:
- Attendance is mandatory: Yes
- Participation rules in classes: Official permission for participation in classes is required.

Method of calculating the final grade

Final grade = grade from oral presentation + grade from participation in discussions

Sposób i tryb wyrównywania zaległości powstałych wskutek nieobecności studenta na zajęciach:

If the requirements are met for obtaining a passing grade, the student is required to independently catch up with the material. If he/she fails to do so, he/she must obtain a positive grade on a test that pertains to the material discussed during his absence.

Prerequisites and additional requirements

None

Recommended literature and teaching resources

- C.B. Carter, M.G. Norton: Ceramic Materials Science and Engineering, Springer (2007).
- A.A. Tracton: Coatings Technology Handbook Third Edition, CRC Press Taylor & Francis Group (2006).
- A.W. Adamson, A.P. Gast: Physical Chemistry of Surfaces, John Wiley & Sons Inc. (1997).
- N. Birks, G.H. Meier and F.S Pettit, Introduction to the high temperature oxidation of metals, Cambridge, University Press (2009).
- W. Gao, Z. Li, High-temperature Corrosion and Protection of Materials, Woodhead Publishing in Materials, Cambridge, England (2008).

Scientific publications of module course instructors related to the topic of the module

- D. Dulińska, W. Pawlak, Z. Grzesik, „The prospects in designing new generation of high temperature coatings in automobile engines”, Archives of Metallurgy and Materials, 60, 903-907 (2015).
- S. Jonas, J. Konefał-Góral, A. Małek, S. Kluska, Z. Grzesik, „Surface modification of the Ti6Al4V alloy with silicon carbonitride layer deposited by PACVD method” High Temperature Materials and Processes, 33, 391-398 (2014).

Additional information

None