STUDY MODULE DESCRIPTION FORM

Name of the module/subject **Surface Engineering**		Code **1010612111010610430**

Field of study **Mechanical Engineering**	Profile of study (general academic, practical) **(brak)**	Year /Semester **1 / 1**

Elective path/specialty **Heavy Machinery**	Subject offered in: **Polish**	Course (compulsory, elective) **obligatory**

Cycle of study: **Second-cycle studies**	Form of study (full-time,part-time) **full-time**

No. of hours							No. of credits
Lecture: **1**	Classes:	**-**	Laboratory:	**-**	Project/seminars:	**-**	**1**

Status of the course in the study program (Basic, major, other) **(brak)**	(university-wide, from another field) **(brak)**

Education areas and fields of science and art	ECTS distribution (number and %**)**

Responsible for subject / lecturer:

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Prerequisites in terms of knowledge, skills and social competencies:

1	**Knowledge**	Student is obligated to know about basic sciences like physics, chemistry and subjects carried out in I cycle of study like physical chemistry, thermodynamics, material engineering, mechanic, materials durability, machine designing.
2	**Skills**	Student should have general skills of problem identification, methods of their solving and skills of engineering tasks solving. Student should understand basic phenomenon taking place in solid states, and to be able to identify and characterized them.
3	**Social competencies**	Student shows the willingness of improvement of the knowledge of interdisciplinary subjects. Student wants to getting to know about new technologies and engineering solutions.

Assumptions and objectives of the course:

-The aim of the course: ?Surface engineering? is getting to know by student with the aspect of the most importation filed of material engineering in machines range, namely with designing, researching and application of surface layer and coatings.

Study outcomes and reference to the educational results for a field of study

Knowledge:

1. Student knows surface layer construction, its types, properties and applications. - [K2A_W01]

2. Student knows the influence of the surface treatment on microstructure of surface layer in machine made of different materials. Additionally student knows application of particular treatment to specific machine parts. - [K2A_W02]

3. Student knows different methods of coatings and surface layer production as well as methods of their investigation - [K2A_W03]

Skills:

1. Student is able to use information got during this course to technical problems solving in machine designing range, particularly. - [K2A_U01]

2. Student is able to propose appropriate surface treatment to special requirements of work conditions of particular machine parte made of specified material. - [K2A_U02]

3. Student is able to match appropriate surface layer investigation method to assess its specified properties. - [K2A_U03]

4. Student understands relations between:- surface treatment and surface layer microstructure,- surface layer microstructure and its properties,- surface layer properties and possibility of its application to particular case. - [K2A_U04]

Social competencies:

1. Student understands need and know possibilities of continuous of knowledge widening and further training. - [K2A_K01]

2. Student shows understanding the relations taking place between different aspects of surface engineering and underspends interdisciplinary character of this filed of science.Student understands mutual influence between surface engineering and other fields of science. - [K2A_K02]

3. Student shows the ability of the solving problems in the range of surface engineering and has ability to executing it by his/her own or in group. - [K2A_K03]

Assessment methods of study outcomes
--   project task,-   oral examination,-   written examination.

Course description

Definitions: surface engineering, tribology, surface layer, coat, surface

Surface layer structure

General charcterization of surface layer

Geometrical structure of surface

Microhardness of surface layer, methods of measurment

Stresses in surface layer, methods of measurment

Chemical composition of surface layer, methods of measurment (UPS, XPS, AES, XRF, SIMS)

Microstructure of of surface layer, methods of measurment (TEM, SEM, FEM, FIM, STM, XRD)

Methods of surface layer desingning

Basic bibliography:

Additional bibliography:

Result of average student's workload

Activity	Time (working hours)
1. Lectures	15
2. Own learning on the basis of lecture	5
3. Consultation	1
4. Preparation to the knowledge assessment	2
5. Time of the assessment	1

Student's workload

Source of workload	hours	ECTS
Total workload	23	1
Contact hours	1	0
Practical activities	0	0