COURSE DESCRIPTION CARD - SYLLABUS

Course name
Metal science of machines and vehicles

Course

Field of study
Mechanical and Automotive Engineering

Year/Semester
2/3

Area of study (specialization)

Profile of study
general academic

Level of study
First-cycle studies

Course offered in
Polish

Form of study
part-time

Requirements
compulsory

Number of hours

Lecture
9

Laboratory classes
9

Other (e.g. online)

Tutorials
0

Projects/seminars

Number of credit points

3

Lecturers

Responsible for the course/lecturer:
prof. dr hab. inż. Leszek Małdziński email:
leszek.maldzinski@put.poznan.pl

Responsible for the course/lecturer:

Prerequisites

Prerequisites

Knowledge: Corrosion of steel and alloys. Industrial technologies of heat and thermo-chemical treatment of steel. Constant

design, tool and with special properties (structure, properties,

application of, among others for the construction of motor vehicles and machines). Problems in the selection of alloys

metals, steel and other alloys in engineering practice.

Course objective

Getting to know the theoretical foundations of steel and alloy corrosion and its prevention. Knowledge of steel

constructional, tooling and with special properties (structure, properties,

application). Knowledge of steels and alloys used in the construction of cars, machines, tools.

Getting acquainted with the issues of selection of metal alloys, steel and other alloys in practice

engineering.

Course-related learning outcomes

Knowledge

Has basic knowledge of the strength of materials, including the basics of the theory of elasticity and plasticity, stress hypotheses, calculation methods for beams, membranes, shafts, joints and other simple structural elements, as well as methods of testing the strength of materials and the state of deformation and stress in mechanical structures.

Has basic knowledge of manufacturing techniques used in the engineering industry, such as casting, forming, reducing and incremental machining, welding and other joining techniques, cutting, coating and surface treatments.

Has basic knowledge of tribological processes occurring in machines, i.e. friction, lubrication and wear.

Skills

Can obtain information from literature, the Internet, databases and other sources. Can integrate the obtained information, interpret and draw conclusions from it, and create and justify opinions.

Can create a system diagram, select elements and perform basic calculations using ready-made computational packages of mechanical, hydrostatic, electric or hybrid machine drive system.

Can perform strength calculations of simple frames and load-bearing structures of machines using elementary strength theories.

Social competences

Is ready to recognize the importance of knowledge in solving cognitive and practical problems and to consult experts in case of difficulties in solving the problem on his own.

Is ready to initiate actions for the public interest.

Is willing to think and act in an entrepreneurial manner.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

The learning outcomes presented above are verified as follows: written and oral examination

Programme content

Theoretical foundations of electrochemical and chemical corrosion of steel alloys. Knowledge of the factors

determining the type and speed of corrosion, methods of protection against corrosion.

Understanding the most important technologies of heat and thermo-chemical treatment on an industrial scale:

normalizing annealing, steel hardening and tempering, nitriding and carburizing. Get acquainted with

modern industrial devices.

Structural, tool and special steels and application examples in

industrial practice: weldable steels (for pipelines), steels for thermal improvement (for crankshafts,

camshafts, gears etc.

Steels for nitriding and carburizing for selected parts of machines and vehicles

Tool steels for cold, hot and high-speed work: structural structure, heat treatment,

properties and applications.

Teaching methods

Steels and alloys for building a nuclear power plant reactor; reactor operating conditions, wear criteria,

modern steel and alloys for the construction of the reactor.

Selected physical and functional properties of metals, steel and metal alloys: electrical and thermal properties.

The issues of the selection of metals, steels and alloys in engineering practice. incl. for building engines

automotive, incl. gears, jet fan motors, drums, turbines

gas.

Bibliography

Basic

1. Michael Ashby i in.: Materials selection in Mechanical design, 2017, ISBN: 978-0-08-100599-6

2. Michael Ashby i in.: Materials Engineering, science. Procrssing and Design. North Amerrican Edition: ISBN-13: 978-1-85617-743-6

3. Budinski, K.G. et all: Engineering Materials, Properties and Selection, 2010, ISBN 978-0-13-712842-6

4. Callister, W.D.: Material Science and Engineering, ISBN 978-1-118-54689-5

5. Mechanical Properties of Matter. New Yourk Congress Number 65-14262

Additional

1. Shackelford J.F.: Introduction to Materials Science for Engineers, 2014, ISBN 978-0133789713

2. Metal hanndbook ASM 2012

2. Burakowski T., Wierzchoń T.: Surface engineering of metals – principles, equipment, technology. CRS Press, Boca Raton – London-New York-Washington, D.C., 1999.

Breakdown of average student's workload

	Hours	ECTS
Total workload	75	3,0
Classes requiring direct contact with the teacher	18	1,0
Student's own work (literature studies, preparation for laboratory classes/tutorials, preparation for tests/exam, project preparation) [1]	57	2,0

[1] delete or add other activities as appropriate