COURSE DESCRIPTION CARD - SYLLABUS

Course name
Ceramics and Composites [N1MiBP1>MCiK]

Course

Field of study
Mechanical and Automotive Engineering

Year/Semester
1/1

Area of study (specialization)
–

Profile of study
general academic

Level of study
first-cycle

Course offered in
polish

Form of study
part-time

Requirements
compulsory

Number of hours

Lecture
9

Laboratory classes
9

Other (e.g. online)
0

Tutorials
9

Projects/seminars
0

Number of credit points

3,00

Coordinators

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Lecturers

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Prerequisites

Knowledge: Selected properties of ceramics and composites. Material processing ceramics and composites. Selected examples of application in practice. The problem of selection engineering materials for the construction of engineering structures. Skills: Conducting selected research on ceramic materials and composites, The student is able to perform exemplary composite or ceramic details from materials generally available in the industry. Social competences: The student is aware of the importance of technical activity, understands the need for development and education.

Course objective

Providing students with knowledge on: selected properties, ceramics and composites, their processing, application in practice, selection of engineering materials for the construction of facilities engineering

Course-related learning outcomes

Knowledge:
Has a basic, structured knowledge of non-metallic and composite materials used in the construction and operation of machines, mainly ceramic materials, synthetic materials, non-metallic natural materials (wood, glass, stone) and fuels, lubricants, technical gases, refrigerants, etc.
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 a basic knowledge of the methods of linear measurements, measurements of stresses, strains, velocities, temperatures and fluid streams, including measurements of these quantities by electrical means.

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 use the experience gained in an environment professionally involved in engineering activities related to the maintenance of devices, facilities and systems typical for the field of study.
Has the ability to self-educate with the use of modern teaching tools, such as remote lectures, websites and databases, teaching programs, e-books.

Social competences:
Is ready to critically assess his knowledge and received content.
Is ready to initiate actions for the public interest.
Is ready to fulfill professional roles responsibly, including:
- observing the rules of professional ethics and requiring this from others,
- caring for the achievements and traditions of the profession.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

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Methods of verification of learning outcomes and assessment criteria The learning outcomes presented above are verified as follows:
Written and oral exam.

Programme content

Selected properties of ceramic materials and composites their assessment: general properties (density, viscosity, melt index, mechanical properties (yield stress, elongation
relative at the yield point, tensile strength, modulus of elasticity in tensile,
bending strength), impact strength (Charpy, Isolde method), hardness (Rockwell,
pressing the ball).
Selected properties of ceramic materials; dielectricity, poor electrical conductivity,
resistance to heat shocks, asymmetry of compressive and tensile strength
Processing of ceramics; forming by: rolling, drawing, spreading,
blow ironing, glass fiber drawing, isostatic ironing (e.g. candles
ignition), extruding with a screw press, turning (in plaster and on a mold
plaster), casting in plaster mold.
Special ceramic materials and their properties and used in industry: carbon fibers, diamond, nanotubes, fullerenes.
Special types of composites, their properties and application: metal matrix composites
particle hardening, dispersion hardening, sinters based on non-ferrous metals, metal-ceramic, sintered carbides, cermets, fiber composites, layer composites.
Composites manufacturing methods:
Selection of engineering materials for the construction of selected engineering structures: for a beam, for a mirror
telescope, on some elements of the car (bodywork, bumpers), on elements of houses (e.g. walls external-bearing).

Teaching methods

Lecture with multimedia presentation. Laboratory classes.

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	3,00
Classes requiring direct contact with the teacher	27	1,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	48	2,00