COURSE DESCRIPTION CARD - SYLLABUS

Course name
Manufacturing and processing of materials [S1Lot2>WiOM]

Course

Field of study
Aviation

Year/Semester
2/3

Area of study (specialization)
Air Traffic Organisation

Profile of study
general academic

Level of study
first-cycle

Course offered in
Polish

Form of study
full-time

Requirements
compulsory

Number of hours

Lecture
15

Laboratory classes
15

Other
0

Tutorials
0

Projects/seminars
0

Number of credit points

2,00

Coordinators

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Lecturers

Prerequisites

Basic knowledge of mathematics, physics and materials science. Logical thinking skills, using information sources (library, Internet) and understanding the need to learn and acquire new knowledge.

Course objective

Learning about the three basic technologies for producing machine parts, i.e. plastic processing (methods metal forming in the production of parts and operation of machines, and introduction with machines and equipment for metal forming), foundry (casting methods and basics of the casting technology simulation process) and machining (machining methods, cutting tools, process course and its physical, technological and economic effects).

Course-related learning outcomes

Knowledge:
1. has extended knowledge in the field of material strength, including the theory of elasticity and plasticity, stress hypotheses, methods of calculating beams, membranes, shafts, joints and other structural elements, as
well as methods of testing the strength of materials and the state of deformation and stress in structures,

and
has basic knowledge of the main departments of technical mechanics: statics, kinematics and dynamics of a material point and a rigid body
2. has basic knowledge of metal, non-metal and composite materials used in machine construction, in particular
about their structure, properties, methods of production, heat and thermo-chemical treatment and the influence
of plastic processing on their strength, as well as fuels, lubricants, technical gases, refrigerants e.t.c.
3. has a basic knowledge of the mechanisms and laws governing human behavior and psyche

Skills:
1. is able to properly select materials for simple aviation structures, and can indicate the differences between
the fuels used in aviation
2. is able to estimate various types of costs, is able to verify and assess market phenomena, is able to assess
the factors of economic growth and the importance of money for its development, is able to decide about economic choices in the field of consumption and production

Social competences:
1. understands that in technology, knowledge and skills very quickly become obsolete
2. is aware of the social role of a technical university graduate, in particular understands the need to formulate
and provide the society, in an appropriate form, with information and opinions on engineering activities, technological achievements, as well as the achievements and traditions of the engineer profession.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture:
Written assessment carried out at the end of the semester (pass if obtaining at least 50.1%
correct answers). Up to 50.0% - ndst, from 50.1% to 60.0% - dst, from 60.1% to 70.0% - dst+, from 70.1 up to 80.0 - db, from 80.1% to 90.0% - db+, from 90.1% - very good.
Lab:
Assessment criteria based on oral or written answer regarding the content of each activity
laboratory exercise, report on each laboratory exercise as indicated
conducting laboratory exercises. To pass the laboratories, all exercises must be completed
be passed (positive grade for answers and reports).

Programme content

I) PART I. Forging
II) PART II. Foundry
III) PART III. Machining
1. PART - 66 (THEORY - 7.5 hours, PRACTICE 11.25 hours)
MODULE 6. MATERIALS AND EQUIPMENT
6.1 Aircraft materials containing iron
a) Characteristics, properties and identification of commonly used alloy steel
used in aircraft;
Heat treatment and use of alloy steel. [2]

Course topics

IV) PART I.
Forging Lecture:
1. Basic theoretical knowledge about the plastic shaping of metals and their alloys (conditions
plasticity, plastic deformation mechanism).
2. Technological operations of shaping products from sheet metal (cutting, bending, stamping) and rods (forging,
rolling, extrusion, drawing).

3. Materials susceptible to plastic processing.
4. Changing the properties of materials when shaping products using plastic forming methods.
5. Defects in products and methods of prevention as well as examples of technological processes,
Lab:
1. Cutting sheet metal using guillotine and circular shears.
2. Pressing a cylindrical extrudate using a hydraulic press.
3. Volumetric plastic working processes - forging and extrusion.
5. Longitudinal and transverse rolling using laboratory rolling mills.
V) PART II. Foundry
Lecture:
1. Main and auxiliary molding materials and methods of testing the properties of molding sands.
2. Methods of producing castings in disposable and permanent molds.
3. Introduction to casting design.
4. Technological properties of selected casting alloys. Crystal structure of alloys
foundry.
5. Methods of destructive and non-destructive testing of castings.
Lab:
1. Research on selected properties of molding/core sands.
2. Making castings by hand molding.
3. Die casting.
4. Computer simulation of selected foundry processes.
5. Identification and assessment of features of castings obtained by various methods.
VI) PART III. Machining
Lecture
1. Types and varieties of cutting. Conditions for cutting to occur (material decohesion).
2. Technological and geometric cutting parameters and the basis for their selection.
3. Materials for blades and cutting tools. Blade wear and durability.
4. Accuracy and actual and theoretical roughness of the machined surface.
5. Selected tribological aspects. Machinability of various workpiece materials. Characteristic
top layer.
Lab
2. Technological capabilities of milling and drilling machines (machine tool, tools, process)
3. Technological capabilities of lathes and grinders (machine tool, tools, process).
4. Construction of cutting tools and analysis of tool materials
5. Assessment of the geometric and physical features of the surface layer after various processing methods
PART - 66 (THEORY - 7.5 hours, PRACTICE 11.25 hours)
MODULE 6. MATERIALS AND EQUIPMENT
6.1 Aircraft materials containing iron
b) Characteristics, properties and identification of commonly used alloy steel
used in aircraft;
Heat treatment and use of alloy steel. [2]

Teaching methods

Lecture: multimedia presentation, illustrated with examples given on the board.
Laboratory: performing tasks given by the teacher - practical exercises.

Bibliography

Basic:
I) PART I. Plastic working
1. Matysiak W., Plančak M. Equipment for metal forming processes (Poznań University of Technology Press, 2023, ISBN 978-83-7775-700-0, 220 pages).
2. Matysiak W., Plančak M. Terminology of plastic working (terminology handbook PL/EN/DE; edition available at the PUT bookshop).
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II) PART II. Foundry Work
1. Praca zbiorowa red. J. Jackowski, Podstawy odlewnictwa. Ćwiczenia laboratoryjne. Wyd.PP, Poznań 1993.
2. Szweycer M., Nagolska D., Metalurgia i odlewnictwo, Wyd. PP, Poznań 2002.
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4. Tabor A., Odlewnictwo , Wyd. Politechniki Krakowskiej, Kraków 2007
III) PART III. Machining
1. Dul-Korzyńska B.: - Obróbka skrawaniem i narzędzia. Oficyna Wydawnicza Politechniki Rzeszowskiej 2009.
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3. Filipowski R., Marciniak.: Techniki obróbki mechanicznej i erozyjnej. Oficyna Wydawnicza Politechniki Warszawskiej, Warszawa 2000.
Slaskiej, Gliwice 2002.
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Additional:
I) PART I. Plastic working
1. Erbel S.,Golatowski T.,Kuczyński K., Marciniak Z. i inni: Technologia obróbki plastycznej na zimno. Warszawa: SIMP-ODK 1983. Muster A.: KUCIE MATRYCOWE,
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4. M. Ustasiak, P. Kochmański: OBRÓBKA PLASTYCZNA Materiały pomocnicze do projektowania, Politechnika Szczecińska, Szczecin, 2004.
II) PART II. Foundry Work
1. Praca zbiorowa red. J.Sobczak, Poradnik Odlewnika. Odlewnictwo współczesne. Tom I Materiały, Wyd. STOP, 2013.
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III) PART III. Machining
1. Cichosz P.: Narzędzia skrawające. WNT. Warszawa 2008.
2. Jemielniak K.: Obróbka skrawaniem. Oficyna Wydawnicza Politechniki Warszawskiej - Warszawa 1998.
3. Grzesik W.: Podstawy skrawania materiałów metalowych, WNT Warszawa 1998.
4. Shaw M.C.: Metal Cutting Principles. Oxford University Press, Oxford 1996.

Breakdown of average student's workload

	Hours	ECTS
Total workload	55	2,00
Classes requiring direct contact with the teacher	30	1,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	25	1,00