COURSE DESCRIPTION CARD - SYLLABUS

Course name
Development of the upturning engineering [N2MiBM1>KRTB]

Course

Field of study
Mechanical Engineering

Year/Semester
1/1

Area of study (specialization)
–

Profile of study
general academic

Level of study
second-cycle

Course offered in
polish

Form of study
part-time

Requirements
compulsory

Number of hours

Lecture
30

Laboratory classes
18

Other (e.g. online)
0

Tutorials
0

Projects/seminars
0

Number of credit points

6,00

Coordinators

Lecturers

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Prerequisites

Basic in the basics of machine construction, materials manufacturing and processing, polymer physicochemistry and materials science. Logical thinking, analyzing occurring phenomena, using knowledge obtained from scientific, technical and popular science literature. Understanding the need for learning and acquiring new knowledge.

Course objective

Knowledge of advanced methods of smelting and refining metals and alloys intended for the production of cast machine parts using special casting methods and plastics processing technology, and the possibility of production using their unique products. Identification against the background of the current state of material technologies, trends in their improvement currently present in the world industry and the place of "high technology" solutions in plastic metalworking.

Course-related learning outcomes

Knowledge:
1. Student should characterize modern technologies of plastics processing and advanced methods of refining metals and casting alloys intended for making technologically advanced cast parts of machines. - [K_W08]
2. The student should be able to describe the course of these technological processes. - [K_W08]
3. The student should be able to propose a manufacturing process for the selected product. - [K_W08].

Skills:
1. Student is able to choose the production process for the production of a specific product. - [K_U10].
2. Student is able to analyze the technological process. - [K_U10].
3. Student is able to control the technological process. - [K_U10].

Social competences:
1. The student is aware of the role of production processes in the economy and human life. - [K_K02].
2. The student demonstrates an active attitude in the creation of plastics processing processes and the production of technologically advanced cast machine parts, taking into account the issues of natural resource protection. - [K_K08].
3. The student is determined to achieve the goals set. Is able to cooperate with various environments. - [K_K12].

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Learning outcomes presented above are verified as follows:
Written test carried out on the end of the term (in case of a credit min. 50.1% correct). Up to 50.0% - unsatisfactory (2.0) = F, from 50.1% to 60.0% - Satisfactory (3.0) = E, from 60.1% to 70.0% - Satisfactory plus (3,5) = D, from 70.1 to 80 - Good (4.0) = C, from 80.1% to 90.0% - Good plus (4,5) = B, from 90.1% - Very good (5,0) = A.
Laboratory: Passing the credit is conditioned by a positive assessment of each of the exercises (presence, written or oral answer to the topics indicated by the laboratory teacher.)

Programme content

Lecture:
Metallurgy refining methods of metals and alloys under normal and vacuum pressure, and metallurgical aggregates used. Technology for melting metals and reactive alloys and used metallurgical aggregates. Characteristics of selected special casting manufacturing methods. Making castings from titanium alloys used in technology and medicine. The use of Rapid Prototyping methods in foundry. Polymers in molten, straight state, rheological description of charging molten polymers. Properties of molten polymer processors.
Overview of the currently used technologies for shaping polymers and the directions of technology development, including - extrusion, - injection, - rotational molding, - polyurethane foam spraying. Assessment of the influence of the parameters of thermoplastic polymers shaping processes on the properties and structure of final products. The use of modern test methods to assess the properties of products shaped in various technological conditions.
Review of knowledge in metal forming technology. Directions of technology development: - the use of new or modified construction materials in the construction of machines and other parts (e.g. automotive, in machines), - the use of drives and new generation in machines and technological innovations (e.g. CNC centers for punching, bending pipes and bars), mechanical and liquid stamping), - use of metal powder on products and tools, - use of ecological lubricants, etc. Automated production lines and computer systems.

Laboratory:
Designing casting technology using CAD / CAE systems. Computer simulation of the casting process in NovaFlow & Solid. Optimization of the casting supply conditions using the simulation of the casting process.
The use of elastooptics to assess the stress state of injection-molded products. Getting to know the construction of a modern injection molding machine and its control system. Color analysis of injection molded products. Getting knowledge about the construction of the technological line for shaping the cast foil and assessing the properties of the foil. Implementation of technological processes using variable parameters and polymer materials.
Preparation of the station and making connections of various materials in the form of sheets by clinching method. The use of rubber and other materials as tools for shaping metal sheets in plastic working. Shaping the edges of holes with the technology of thermal drilling.

Teaching methods

1. Lecture: multimedia presentation.
2. Laboratory exercises: performing exercises, discussion, team work.

Bibliography

Basic
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Additional
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Breakdown of average student's workload

	Hours	ECTS
Total workload	50	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