COURSE DESCRIPTION CARD - SYLLABUS

Course name
Advanced manufacturing technologies [N2ZiIP2>ZTW]

Course

Field of study
Management and Production 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
elective

Number of hours

Lecture
24

Laboratory classes
24

Other
0

Tutorials
0

Projects/seminars
0

Number of credit points

6,00

Coordinators

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Lecturers

Prerequisites

Basic in the field of basic machine construction, technology of production and processing of materials and technological devices.

Course objective

Learning about advanced plastics processing technologies, modern methods of melting and refining metals and alloys as well as special casting methods, new plastic processing and machining technologies.
Learning the principles of construction, operation and operation of numerically controlled devices as well as their controls and processing programming.

Course-related learning outcomes

Knowledge:
The student has extended knowledge of manufacturing techniques.
The student has knowledge of development trends in manufacturing techniques
The student knows modern plastics processing technologies, special casting methods, plastic processing and machining
The student is able to indicate areas of application of advanced manufacturing technologies

The student is able to characterize the structure and principles of operation of numerically controlled machines and technological devices

Skills:
The student is able to notice and identify problems occurring in systems and production processes, and select and use methods and tools appropriate to solve them.
The student is able to select a manufacturing technique for the production of products
The student is able to justify the use of advanced manufacturing technologies
The student is able to select CNC machines and devices to implement product manufacturing processes

Social competences:
The student understands the need to make changes in production processes and in the enterprise
The student understands the need for continuous learning; can inspire and organize the learning process of team members
The student is aware of the role of advanced manufacturing technologies in the economy and human life
The student demonstrates an active attitude in implementing new manufacturing technologies

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture: Assessment based on a written examination consisting of 5 general questions (Assignment of grades to percentage ranges of results: <90–100> very good; <80–90) good plus; <70–80) good; <60–70) satisfactory plus; <50–60) satisfactory; <0–50) unsatisfactory.) conducted at the end of the semester.
Laboratory exercises: Assessment criteria based on reports from laboratory exercises carried out in accordance with the instructions of the instructor.

Programme content

Presentation of the latest loss and loss-free technologies. Get to know the current ones development trends in the processing of polymer materials, foundry and plastic processing, and machining.

Course topics

Lecture:
Part 1
1. Development trends in the processing of polymer materials, foundry and metal working
2. Setting and monitoring the stability of the injection process
3. Flat foil production technologies.
4. Rotational moulding technology
4. Characteristics of selected special methods of producing castings.
5. Modeling and simulation of the casting process
6. Making castings from titanium alloys used in technology and medicine (implants).
7. Use of Rapid Prototyping methods in foundry.
Part 2
1. Development trends in machining.
2. Micro machining and super-precision machining.
3. Monitoring the cutting process.
4. Selected aspects of electrical discharge machining.
Part 3
1. Introduction, definitions, division of machine tools, parameters, drives, axis marking
2. Kinematic and geometric structures of machine tools
3. Construction, functional units, additional options of machine tools
4. Cost structure of machine tools
5. Division, principles and methods of programming CNC machine tools
6. Trends in the design of CNC machine tools Laboratory exercises :
Laboratory exercises:
Part 1
1. Simulation of the casting process in NovaFlow&Solid.
2. Optimization of the casting feeding conditions using simulation of the casting process.

3. Analysis of the stress state of injected products manufactured under variable processing process conditions using the elasto-optical method.
4. Precision injection and stability of the injection process.
5. Rotational moulding technology.
Part 2
6. Monitoring the condition of the blade.
7. Precision machining of materials that are difficult to cut.
8. Comparison of electrical discharge drilling and cutting for various materials and object shapes.
Part 3
1. Basics of dialogue programming in the Heidenhain control system
2. Servo drive simulation tests
3. Study of the dynamics of the positioning of the rotary table in the range of small displacements
4. Machining on a CNC milling machine
5. Electronic transmission

Teaching methods

Lecture: multimedia presentation illustrated with examples given on the board, solving tasks.
Laboratory exercises: operating processing machines and machine tools, performing experiments, solving tasks, discussion, team work. Working at computer workstations.

Bibliography

Basic:
1. Tochowicz St., Klisiewicz Z., Metalurgia próżniowa stali, Wyd.”Śląsk”, Katowice 1979
2. Praca zbiorowa. Poradnik „Odlewnictwo”, - t.1.Wyd. STOP, Kraków 2014
3. Mazanek T., Tochowicz St., Elektrometalurgia stali, Wyd.”Śląsk”, Katowice 1973
4. Tabor A., Odlewnictwo, Wyd. Politechniki Krakowskiej, Kraków 2007
5. Sikora R., Przetwórstwo tworzyw wielkocząsteczkowych, WE, Warszawa 1993.
6. Olszak W.: Obróbka skrawaniem. WNT Warszawa 2008
7. Grzesik W.: Podstawy skrawania materiałów konstrukcyjnych, WNT Warszawa 2010.
8. Filipowski R., Marciniak M., Techniki obróbki mechanicznej i erozyjnej, Oficyna Wydawnicza Pol. Warszawskiej, Warszawa 2000.
9. Kosmol J.: Serwonapędy obrabiarek sterowanych numerycznie, WNT Warszawa, 1998.
10. Kosmol J.: Automatyzacja obrabiarek i obróbki skrawaniem, PWN Warszawa, 2000.

Additional:
1. Czasopisma: Przegląd Odlewnictwa, Plastics Review, Rubber Review, Plast News, Tworzywa Sztuczne, Przetwórstwo Tworzyw. Czasopismo/a z obróbki skrawaniem.
2. Sikora R., Przetwórstwo tworzyw wielkocząsteczkowych, Wyd. Pol. Lubelskiej 2006
3. Zawistowski H., Zięba S. Ustawianie procesu wtryskiwania tworzyw termoplastycznych, PLASTECH, Warszawa 2015
4. Popielarski P., NF&S - Symulacja procesu odlewania. Instrukcja w formacie PDF dostępna na stronie internetowej laboratorium CAD/CAE Zakładu Odlewnictwa InstytutuTechnologii Materiałów.
5. Cichosz P.: Narzędzia skrawające. WNT Warszawa 2006.
6. Praca pod redakcją Żebrowskiego H.: Techniki wytwarzania. Obróbka wiórowa, ścierna i erozyjna. Oficyna Wydawnicza Politechniki Wrocławskiej, Wrocław 2004.
7. Hassan El-Hofy: Fundamentals of Machining Processes. Conventional and Nonconventional Processes. CRC Press 2019.
8. Programowanie ISO Podręcznik użytkownika Heidenhain, 1994 (w języku polskim, angielskim i niemieckim).
9. Gessner A., Fotogrametria i skanowanie w technologii korpusów obrabiarkowych, WPP, 2015.
10. Gessner A.,Teoretyczne i doświadczalne podstawy doboru korpusów w zespoły obrabiarkowe, WPP 2016.

Breakdown of average student's workload

	Hours	ECTS
Total workload	150	6,00
Classes requiring direct contact with the teacher	48	2,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	102	4,00