



COURSE DESCRIPTION CARD - SYLLABUS

Course name

Technological machines [https://usosadm.prv.put.poznan.pl/usosadm/przedmioty/przedmioty.jsf#\[S1ZiIP2>MTe\]](https://usosadm.prv.put.poznan.pl/usosadm/przedmioty/przedmioty.jsf#[S1ZiIP2>MTe])

Course

Field of study

Management and Production Engineering

Year/Semester

2/4

Area of study (specialization)

–

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

30

Other

0

Tutorials

0

Projects/seminars

0

Number of credit points

3,00

Coordinators

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Lecturers

Prerequisites

Basic knowledge in the field of theory of machines, machine parts, engineering graphics and other areas of education in the field of study. Basic knowledge of cutting tools and machining, and electrical engineering. Orderly theoretical knowledge in the field of study. Ability to use literature (acquiring knowledge from the indicated sources) and the Internet, has the ability to work in a team. Understanding the need for learning, acquire and improve skills throughout life and the importance of team collaboration.

Course objective

The student should obtain knowledge of technological machines tools and basics NC machine tools construction and exploitation principles, and their kinematic chains, forming systems, drives and control systems

Course-related learning outcomes

Knowledge:

The student has general knowledge of manufacturing technologies used mainly in enterprises of the mechanical industry and which refers to metallurgy and casting, plastic forming, plastics processing,

heat treatment, heat and chemical treatment, welding, swarf machining, grinding and eroding. The student has detailed knowledge relating to fundamental and auxiliary processes in the construction of machines. Has knowledge allowing to design production flow (forms of production flow). Has knowledge indispensable for organizing the work of a production system depending on its type. Has knowledge indispensable for the assessment of the work of a production system. Has knowledge indispensable for developing a technological process of typical parts of machines. Has knowledge enabling to evaluate the capabilities of a given process. Knows systems of computer aided process design

Skills:

Drawing upon norms, procedures and instructions, can write a simple program for the operation of a numerical control machine tool.

Able to select and apply manufacturing technologies to shape the form, structure and properties of products.

Able to select technological machines and devices to realize products manufacturing processes, analyze and evaluate their construction taking into account the principles of ergonomics, select machine parts, plan and supervise maintenance tasks to ensure reliable operation of machines and devices.

Social competences:

Understand the need for lifelong learning; able to inspire and organize learning process of other people. Able to cooperate and working in the group, taking different roles.

Is open to discussion of complex technical problems and is capable of communicating its knowledge in an understandable way.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture: acquired knowledge is verified by a final test. The test consists of 8 open questions. Credit in the case of correct answers to min. half of the questions (50% threshold).

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.

Laboratory classes: acquired knowledge and skills are verified on the basis of an oral or written answer regarding the content of each laboratory exercise performed, reports on each laboratory exercise. To get a laboratory credit, all exercises must be completed and passed (positive assessment of responses and reports).

Programme content

Definitions of machine, machine tools.

Machine drives, applications.

Mechanisms and components of machines.

Machines and machine tools.

Course topics

Lecture:

Division and comparison of conventional machine tools and NC machine tools. Machine tool drives.

Characteristics of drives and electric motors. Universal machine tools. Unit-construction machines.

Machining centers and machine tool lines. Gear generating machines. Electrical Discharge Machining machines.

Trends in the construction of CNC machine tools. Kinematic and geometrical structures, construction, functional assemblies, additional machine tools options. Errors in machine tools. Thermal deformation.

Control systems, Industry 4.0, intelligent machine tools, collisions in machine tools. Selected aspects of machine tool design. Installation issues and service aspects. Ergonomics of use. Optimization of shape and rigidity of machine tools. Cost structure of machine tools. Division, principles and methods of programming CNC machine tools. Structure and construction of control systems and systems.

Programming using special functions, subroutines and machining cycles.

Laboratory classes:

Preparing and machining of parts on a CNC lathe

Preparing and machining of parts on a CNC milling machine.

Thread cutting by machine on CNC machine tools
 Measurement of clearance in the mechanical gearbox of the rotary axis of machine tool feed drive
 Testing the efficiency of the mechanical transmission
 Cutting the cylindrical gears on the milling machine
 Programming the machining of simple shapes
 Programming machining using tool radius compensation
 Programming of machining using machining cycles
 Programming machining in the ShopMill system
 Programming multi-stage shaft machining
 Programming shaping machining in the ShopTurn system

Teaching methods

Lecture: multimedia presentation, discussion.

Laboratory classes: independent performance of practical exercises, devices, materials, tools, apparatus, measuring instruments, discussion.

Bibliography

Basic:

Wrotny L. T., Obrabiarki skrawające do metali, WNT, Warszawa 1979.

Honczarenko J., Obrabiarki sterowane numerycznie, WNT, Warszawa 2009.

Kosmol J., Automatyzacja obrabiarek i obróbki skrawaniem, PWN, Warszawa, 2000.

Kosmol J., Serwonapędy obrabiarek sterowanych numerycznie, WNT Warszawa, 1998.

Singh N.: CNC programming and control, by John Wiley & sons, Inc. London, 1996.

Metody twórczego rozwiązywania problemów inżynierskich, Branowski B., Wyd. WKT NOT, 1999.

Podstawy Konstrukcji Maszyn (tom 2), pod red. Marka Dietrycha, PWN, Warszawa, 1999.

Podstawy konstrukcji maszyn, Zbigniew Osiński, PWN 2012.

Krzysztof Netter, Maszyny i urządzenia technologiczne w obróbce ubytkowej. Laboratorium, Wydawnictwo Politechniki Poznańskiej, Poznań 2021.

Additional:

Poradnik inżyniera mechanika. T.3. Zagadnienia technologiczne, rozdz. III, VI, VII. WNT, Warszawa 1970.

Kosmol J., Napędy mechatroniczne, WNT Warszawa, 2013.

Pritschow G., Technika sterowania obrabiarkami i robotami przemysłowymi. Oficyna Wydawnicza Politechniki Wrocławskiej, 1995.

Pająk E., Zaawansowane technologie współczesnych systemów produkcyjnych, Wydawnictwo Politechniki Poznańskiej, Poznań 2000.

Skoczyński W., Sensory w obrabiarkach CNC, Wydawnictwo Naukowe PWN SA, Warszawa, 2018.

Breakdown of average student's workload

	Hours	ECTS
Total workload	75	3,00
Classes requiring direct contact with the teacher	45	2,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	30	1,00