COURSE DESCRIPTION CARD - SYLLABUS

Course name
Numerically controled machine tools

Course

Field of study
Mechanical Engineering

Year/Semester
3/6

Area of study (specialization)

Profile of study
general academic

Level of study
First-cycle studies

Course offered in
polish

Form of study
full-time

Requirements
compulsory

Number of hours

Lecture
15

Laboratory classes
15

Other (e.g. online)

Tutorials

Projects/seminars
15

Number of credit points

3

Lecturers

Responsible for the course/lecturer:
dr hab. inż. Andrzej Gessner

Responsible for the course/lecturer:
dr inż. Wojciech Ptaszyński

Prerequisites

A student starting this subject should have basic knowledge in the field of machine science, machine parts, engineering graphics and other areas of education in the field of study, as well as basic knowledge about cutting tools and metalworking and electrical engineering. Ordered theoretical knowledge in the field of study.

Course objective

The aim of the course is to learn the principles of construction, operation and operation of OSN as well as their controls and programming of machining.

Course-related learning outcomes

Knowledge

1. The student should be able to characterize the construction and operating principles of numerically controlled machines and technological devices.

2. The student should be able to describe the main, feed and auxiliary drives of CNC machine tools.

Skills

1. The student should be able to choose CNC machines and devices for the implementation of product production processes, analyze and evaluate their construction, select components, plan and supervise maintenance tasks to ensure reliable operation.

Social competences

1. Student is able to cooperate in a group.

2. Student understands the need for lifelong learning due to the constant development of CNC machine tools.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture: Credit on the basis of an exam consisting of test and open questions. Credit in the case of obtaining at least 50% of the possible points.

Laboratory: credit based on verification of knowledge before starting the exercise and reports made.

Project: Credit based on the completed project.

Programme content

Lecture:

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.

Lab: 1. Basics of dialog programming in the Heidenhain control system 2. Servo drive simulation tests 3. Research on the dynamics of rotary table positioning in the range of small displacements 4. Machining on a CNC milling machine 5. Electronic gear 6. Controllers in NC machine tools Design: 1. Programming the machining of simple shapes. 2. Programming machining using tool radius compensation. 3. Programming of machining using machining cycles. 4. Programming machining in the ShopMill system. 5. Programming multi-stage shaft machining. 6. Programming shaping machining in the ShopTurn system

Teaching methods

Lecture illustrated by a multimedia presentation containing the discussed program content.

Laboratory: practical exercises.

Project: independent student's work.

Bibliography

Basic

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

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

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

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

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

6. Podstawy konstrukcji maszyn, Zbigniew Osiński, PWN 2012

Additional

1. Programowanie ISO Podręcznik użytkownika Heidenhain, 1994 (w języku polskim, angielskim i niemieckim).

2. Kief Hans B.: NC/CNC Handbuch, Carl Hanser, Verlag Munchen, 1998.

3. Gessner A., Fotogrametria i skanowanie w technologii korpusów obrabiarkowych, WPP, 2015.

4. Gessner A.,Teoretyczne i doświadczalne podstawy doboru korpusów w zespoły obrabiarkowe, WPP 2016.

Breakdown of average student's workload

	Hours	ECTS
Total workload	90	3,0
Classes requiring direct contact with the teacher	62	2,0
Student's own work (literature studies, preparation for laboratory classes/tutorials, preparation for tests/exam, project preparation) [1]	25	1,0

[1] delete or add other activities as appropriate