COURSE DESCRIPTION CARD - SYLLABUS

Course name
Machine programming [N1MiBM2>PrM]

Course

Field of study
Mechanical Engineering

Year/Semester
4/8

Area of study (specialization)
–

Profile of study
general academic

Level of study
first-cycle

Course offered in
Polish

Form of study
part-time

Requirements
elective

Number of hours

Lecture
8

Laboratory classes
16

Other (e.g. online)
0

Tutorials
0

Projects/seminars
0

Number of credit points

4,00

Coordinators

Lecturers

Prerequisites

Basic knowledge of control, programming, especially of cutting machines, the basics of machining. Ability to think logically and read technical drawings. Understanding the need to learn and acquire new knowledge in the field of machine programming

Course objective

Getting to know the methods of advanced programming of machines, with particular emphasis on numerically controlled machine tools. Including the use of special functions (cycles), subprograms and parametric programming. Getting acquainted with the operation of control systems and methods of entering programs into control systems.

Course-related learning outcomes

Knowledge:
The student should know the methods of programming machines, especially numerically controlled machine tools. The student should know the basic addresses and functions of the machining program. The student should know the basic symbols used in numerically controlled machines.

Skills:
The student is able to independently program the machining of objects with the use of machining cycles,

subprograms and elements of parametric programming. The student is able to prepare a numerically controlled machine tool for machining. The student is able to perform basic operations on a numerically controlled machine tool.

Social competences:
The student is able to work in a group. The student is aware of the possibilities of modern numerically controlled machines and the possibilities of their programming. The student is able to use advanced software to operate numerically controlled machines.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture: Passing on the basis of a test consisting of a minimum of 15 questions with single or multiple choice and one open question. A pass if the number of points is more than half of the possible points.
Laboratory: Credit based on partial grades for correctly performed individual exercises.

Programme content

Lecture:
1. Introduction to programming numerically controlled machines with Heidenhain, Siemens and Fanuc control systems.
2. Machining programming using simple machining cycles, free contour programming and free contour machining in individual controls.
3. Parametric machining programming and using mathematical functions and program loops.
4. Programming of multi-axis machining (4 and 5 axes) on CNC milling machines.
5. Lathe programming in G codes (ISO) and ShopTrain system.
6. Basics of operation and work on CNC machine tools with the use of special instrumentation, workpiece measuring probes, tool measuring devices.
Laboratory:
1. Programming free contours in the Fanuc control system.
2. Programming the lathe in the ShopTrain system.
3. Programming of machining 3+2 in the Heidenhain control system.
4. Preparation of the machine tool with the Fanuc control system for machining (measurement of tools, workpiece, program update) and performing test machining.
5. Preparation of the machine tool with the Sinumerik control system for machining (measurement of tools, workpiece, program update) and performing test machining.
6. Preparation of the machine tool with the Heidenhain control system for 3+2 machining (tool and workpiece measurement, program update) and test machining.

Course topics

none

Teaching methods

Lecture illustrated with multimedia presentations.
Practical laboratory at the workshop with numerically controlled machine tools with Heidenhain, Sinumerik and Fanuc control systems.

Bibliography

Basic:
1. PUT didactic materials for the Machine Programming course available on the eKursy platform
2. Grzesik W., Niesłony P., Bartoszuk M.: Programowanie obrabiarek NC/CNC. WNT 2006.
3. Proste toczenie przy pomocy ShopTurn. Siemens 20

Additional:
1. Feld. M.: Projektowanie i automatyzacja procesów technologicznych. WNT 1994.
2. Kosmol J. : Automatyzacja obrabiarek i obróbki skrawaniem. WNT 2000.

Breakdown of average student's workload

	Hours	ECTS
Total workload	100	4,00
Classes requiring direct contact with the teacher	24	1,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	76	3,00