**Numerically Controlled Machines (ECTS credits: 6)**

Language: the course is offered in English, Serbian and Hungarian.

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**Course description:**

The course includes the following topics:

Overview of the technological systems from the aspect of their level of automation. The structure of CNC machines. Overview of the subsystems of CNC machines: the driving system, the measuring system, the control system, the tooling system and the clamping systems of CNC machines. Programming of CNC machines. Examples of programming a CNC Turning machine. Examples of programming a CNC Milling machine. Industrial robots and manipulators.

1. The level of the automation at different machine tools
2. Base principle of the work of the actuators (motors) used in CNC machines
3. Elements of the moving system at CNC machines
4. Base principles of the measuring systems at CNC machines
5. Base principles of the control system at CNC machines
6. Absolute and incremental coordinate system
7. Characteristic points of a turning and a milling CNC manufacturing system
8. Tool corrections
9. G codes, M codes
10. Examples of some simple turning parts
11. Examples of some complex turning parts
12. Examples of some simple milling parts
13. Examples of some complex milling parts
14. Toll path generation with a CAM module
15. Basics of the programming of industrial robots

**Aims:**

To learn the structure of numerically controlled technological systems.

To learn to program CNC machines and industrial robots.

**Learning outcomes:**

The students will

* be able to plan CNC program for a given machine element, and to work out the needed NC documentation.
* be able to project some simple subsystem for CNC machines.