Study program / course: Mechanical engineering	
Type and level of study: Master academic studies	
Course: Modern manufacturing systems	
Teachers: Bogdan Nedić, Branko Tadić	
Status of course: Elective module M_1, III semester	
Number of ECTS: 6	
Precondition: none	

The objective of course

Present and explain basic processes, elements and systems of modern manufacturing systems. Generate new knowledge about CNC tool machines, their drive and transmitters, modern cutting tools and standard and flexible squeezing kits. Learn about basic characteristics of programming some CNC tool machines and train students too use computer technology for programming CNC machines.

The outcome of course

Student will become capable to recognize and choose CNC tool machine, proper cutting tool and flexible squeezing kit for determined manufacturing operations, recognize program structure and ways of programming CNC tool machines, use computers and appropriate software for programming CNC machines, manually program tool machines, program CNC machines applying modern CAD/CAM systems for programming CNC machines.

Syllabus

Theoretical study

Modern manufacture processes – characteristics and physics of the process. Basic sorts, division and characteristics of modern manufacture processes. Drive systems and side movement systems. Structure and basics of managing. Modern cutting tools and tool carrier systems. Standard and flexible squeezing kits. NC/CNC technologies. Measuring systems and sensors at CNC machines. Investigation of CNC machine correct work. CNC lathes and working centers. Horizontal and vertical working systems. High speed machines. CNC machines in manufacture by deforming. Programming CNC machines (manual programming, automatic programming, CAPP programming). Structure of NC program (words, blocks, addresses, geometric and technological information). Characteristic points of CNC machines. Absolute and incremental programming. G and M functions. Working cycles. Compensation of tools. CAD/CAM systems for programming CNC machines. Techno-economical effects of use of modern manufacture systems. Optimization of choice of working system in function of manufacture conditions.

Practical classes: Practice, other forms of lectures, research projects

During auditory and laboratory practice students are trained to identify and determine coordinate systems of machine and measuring systems, define cutting tools and flexible squeezing kits and program CNC machines. During research project students are enables for basic research in the area.

Recommended reading

1. Kovačević, R., "Numerički upravljane mašine alatke i njihovo programiranje", Naučna knjiga, Beograd, 1987.
2. Nedić, B., "CNC obradni sistemi, Priručnik za programiranje mašina alatki" (u pripremi), Kragujevac, 2008.

The number of hours of active teaching:				Other classes:
Theory: 3	Practical classes: 1.4	Other forms of teaching: 0.6	Research study: 0	1

Methods of teaching

Evaluation of knowledge				
Pre-final exam obligations	**points**	**Final exam**		**points**
Activities during the classes:	**10**			
Practical classes:	15+15=**30**	Oral exam		**30**
Colloquiums(s) :	15+15=**30**			
Seminar(s) :				