

Discipline	MANUALLY PROGRAMING OF CNC MACHINES , code: 37, summer semester		
Specialties:	1. "Computerized manufacturing technologies", 2. "Manufacturing engineering and technologies", 3. "Production engineering"		
ECTS credits: 5	Form of assessment: Exam - test		
Lecturer	Assoc. Prof. Ph.D. / scientific title/ STOYAN DIMITROV SLAVOV /name/ Room 703M Phone: +359 383 690 E-mail: sdslavov@tu-varna.bg		
Department	MANUFACTURING TECHNOLOGIES AND MACHINE TOOLS		
Faculty	FACULTY OF MANUFACTURING ENGINEERING AND TECHNOLOGIES		
Learning objectives: <p>The primary focus of this course is on manual programming of computer numerical control (CNC) machine tools. Students learn what CNC-machines are, what they can do, and how they do it. Beginning with the basic concepts of program structure, students learn how to write, edit, and debug NC-programs and use the programs on a CNC- machine to produce a part. Programs become more complex as the semester progresses and require more sophisticated programming techniques. Laboratory exercises are conducted in the "CAD/CAM/CNC systems" laboratory of the department, using CNC lathe and CNC-mill machines. The toolpaths described by NC-programs are previously verified by hardware and software simulators, such as HAAS and CIMCO Edit. As an outcome of successful completion of the course, the student should: understand the nature, applications, advantages, and disadvantages of numerical control machine tools. Understand and follow safety-related procedures for part design and machine operation. Manually write, edit, debug, and use NC-programs to produce a piece part. Utilize canned cycles, loops, and subroutines. Set up, communicate with, and safely operate NC-machines. Select cutters, cutting and spindle speeds, and feedrates for both CNC-mill and CNC-lathe programs. Understand basic tooling and part holding requirements.</p>			
CONTENTS:			
	Training Area	Hours lectures	Hours laboratory exercises
	<ul style="list-style-type: none"> • Know your machine from a programmer's viewpoint <ol style="list-style-type: none"> 1: Lathe and mill machine configurations 2: Visualizing program execution 3: Program zero and the rectangular coordinate system 4: Introduction to programming words 	4	4
	<ul style="list-style-type: none"> • You must prepare to write programs 	4	4

5: Preparation steps for programming		
<ul style="list-style-type: none"> • Understand the motion types 6: Programming the three most basic motion types	4	4
<ul style="list-style-type: none"> • Know the compensation types 7: Introduction to compensation 8: Tool length compensation 9: Cutter radius compensation	4	4
<ul style="list-style-type: none"> • You must provide structure to your CNC programs 10: Introduction to program structure 11: Types of program format	4	4
<ul style="list-style-type: none"> • Special features that help with programming of the turning and mill CNC machines 12: Turning and boring canned cycles 13: Threading canned cycles 14: Hole-machining, grooving and cut-off canned cycles 15: Working with subprograms 16: Other special programming features in turn and mill CNC-machines	10	10
TOTAL: 60 h	30	30