

<b>Study program:</b> Mechanical engineering			
<b>Type and level of studies:</b> Bachelor studies			
<b>Course unit:</b> Computer integrated technology			
<b>Teacher in charge:</b> Aleksandra Petrović, Vladan Grković			
<b>Language of instruction:</b> English			
<b>ECTS:</b> 6			
<b>Prerequisites:</b> none			
<b>Semester:</b> summer			
<b>Course unit objective:</b> Acquiring basic knowledge required for programming of numerically controlled machine tools using manual programming methods, using the APT programming language and using modern CAM systems.			
<b>Learning outcomes of the course unit</b> Mastering the procedure and modern methods and techniques of programming CNC machine tools for the processing of rotary workpieces that are machined by lathes and prismatic workpieces that are machined by milling machines.			
<b>Course unit contents</b> <i>Theoretical classes</i> Basic principles of NC programming, NC program development methodology, clamping plan, machining plan, tool plan, program sheet, syntax and semantics of NC programs, G and M functions, program code, characteristic examples of NC programming, APT programming language, elements of APT, APT geometry, APT kinematics, tool movement management in APT, program structure in APT, typical examples of programming in APT, CAM systems and automatic NC code generation. <i>Practical classes</i> During the exercises, NC programming methodology is developed and examples of manual NC programming and NC programming in APT are developed. In laboratory exercises, examples of manual programming done in auditory exercises are checked and the methodology of NC code generation in one of the CAM systems is elaborated. Project tasks from manual programming and application of the CAM system are done.			
<b>Literature</b> 1. J.Madison: CNC Machining Handbook, Industrial Press, New York, 1996 2. K.Evans: Programming of CNC Machines, Industrial Press, New York, 2003 3. R.Hannam: Computer Integrated Manufacturing: From Concepts to Realisation, Prentice Hall, 1997			
<b>Number of active teaching hours</b>			<b>Other classes</b>
Lectures: 30	Practice: 30	Other forms of classes: Independent work: 15	
<b>Teaching methods</b> Theoretical classes in the form of lectures is conducted in the classroom. Practical teaching is realized through exercises that are performed in the classroom and laboratory exercises that are performed in the production engineering laboratory and in the computer laboratory.			
<b>Examination methods ( maximum 100 points)</b>			
<b>Exam prerequisites</b>	<b>No. of points:</b>	<b>Final exam</b>	<b>No. of points:</b>
Student's activity during lectures	5	oral examination	/
practical classes/tests	25	written examination	40
Seminars/homework	/	.....	
Project	30		
Other	/		
<b>Grading system</b>			
<b>Grade</b>	<b>No. of points</b>	<b>Description</b>	
<b>10</b>	<b>91-100</b>	Excellent	
<b>9</b>	<b>81-90</b>	Exceptionally good	
<b>8</b>	<b>71-80</b>	Very good	
<b>7</b>	<b>61-70</b>	Good	
<b>6</b>	<b>51-60</b>	Passing	
<b>5</b>	<b>Less than 51</b>	Failing	