

Study program / course: Mechanical Engineering			
Type and level of study: Bachelor academic studies			
Course: CAD/CAM/CAE 1			
Lecturers: Devedzic B. Goran, Vesna M. Mandic			
Status of course: Elective course for module M ₁ , VI semester			
Number of ECTS: 6			
Precondition: Engineering tools and Production technologies			
The objective of course The main goal is the acquisition of subject knowledge and skills in the areas of CAD, CAE and CAM technology in the development, design, analysis and optimization of products and machining processes . Knowledge and skills comprehend design and application of complex surfaces, specific techniques of tool design, forming on CNC machines and engineering analysis. Significance and role of concurrent engineering concept are demonstrated in innovative engineering design.			
The outcome of course At the end of this course the student will be expected to be able to: • Apply the principles of parametric CAD modeling in family of parts generation • Model and apply complex surfaces in parts and tools creation • Apply specific techniques for tooling modeling • Model machining operations for CNC machines, generate NC programs and technological documentation • Understand application of CAE numerical tools in design, analysis and optimization of forming processes • Define successfully input parameters for FE/FV numerical analysis of processes • Interpret results of CAE modeling and transfer it into industrial processes			
Syllabus Theoretical study: Introduction. The importance and role of CA technologies in integrated product and process development. Parametric modeling and family (design) tables. Surface modeling. Tooling modeling principles. Product and process data exchange. Introduction to CNC machining systems. Modeling machining operations for CNC machines. Generating NC programs and technological documentation. Significance of modelling and simulation in process and tools design, Numerical tools, Basics of finite element method, Defining of input parameters for numerical simulation of process, Material models - material flow curves and influential factors, Contact friction, heat transfer and boundary conditions, Improvement of process and tool design in metal forming by means of modelling and FE/FV simulation, Analysis and transfer of modelling and simulation results into industrial processes. Practical Studies: Exercises in PC classroom: CAD/CAM modeling, CAE analysis and optimization of processes. Visits to industrial plants, toolmakers and design offices. Seminar work.			
Recommended reading 1. G. Devedžić, J. Maksić, S. Čuković, S. Petrović: "3D product modeling – problems collection", Faculty of Mechanical Engineering, CIRPIS center, Kragujevac, 2009. (in Serbian) 2. G. Devedžić: "Softverska rešenja CAD/CAM sistema", Faculty of Mechanical Engineering, Kragujevac, 2004. (in Serbian) 3. G. Devedžić: "CAD/CAM technologies", Faculty of Mechanical Engineering, WUS Austria, 2009. (in Serbian) 4. V. Mandić: "Modeling and simulation in metal forming", Mechanical Engineering Faculty, WUS Austria, Kragujevac, 2005. (in Serbian) 5. V. Mandić: "Virtual Engineering", Mechanical Engineering Faculty, WUS Austria, Kragujevac, 2007. (in Serbian) 6. K. Lee: "Principles of CAD/CAM/CAE Systems", Addison-Wesley Longman 1999.			
The number of hours of active teaching:			Other classes: 7
Theory: 3	Practical classes: 1.6	Other forms: 2	
Research study:			
Teaching methods Teaching approach through lessons, exercises, independent work of students. Available CAD/CAM software (CATIA, DELCAM PowerMill), software for FE/FV numerical process simulation (Simufact, Stampack, CAMPform). Obligatory visits to industry.			
Assessment			
Pre-final exam obligations	points	Final exam	points
Activities during the classes:	10	Written exam	
Practical classes:		Oral exam	30
Colloquiums(s) :	40		
Seminar(s) :	20		