

Study program / course: Mechanical Engineering			
Type and level of study: Master academic studies			
Course: Engineering software tools II			
Lecturers: Jovicic R. Gordana, Devedzic B. Goran, Jovicic M. Nebojsa, Marjanovic J. Nenad			
Status of course: Obligatory, joint for all modules, I semester			
Number of ECTS: 6			
Precondition: none			
The objective of course The aim of the course is the acquisition of skills for independent implementation of computer simulation and analysis in the typical engineering practice, as well as the embedment of engineering knowledge necessary for proper design and implementation of products, using specialized software CATIA V5 and advanced modules: DMU Kinematics, Part Structural Analysis generative, Generative Assembly Structural Analysis, Knowledgeware.			
The outcome of course Upon completion of the course students will be able to 1) understand the importance and possibilities of application of computer simulation of engineering, 2) conduct independently computer simulations using specialized software, 3) present the results of computer simulation with the help of modern multimedia tools, 4) understand the essence and the role of Knowledgeware technology, 5) define and use formulas, rules, laws, checks and macros.			
Syllabus Theoretical study: Introduction. Technology of modern engineering. CAD/CAM/CAE. Overview of typical numerical methods in the field of computer-aided engineering; Characteristics of specialized modules for computer simulation in the commercial CAD software. - Tools for kinematics simulation of mechanisms. Overview of kinematics pairs/joints. - Basics of finite elements method (FEM). Types of engineering problems which can be solved using FEM in CATIA V5 Generative Structural Analysis software. - Description of the work environment of specialized modules for structural analysis in CATIA V5 software (GSA workbench). Steps in the structural analysis: Pre-processor, Processor, Post-processor. CATIA V5 GSA modalities of structural analysis: a) static analysis of parts, b) frequency analysis of parts, c) Structural analysis of assemblies, d) frequency analysis of assemblies. - Defining the parameters and properties of the mesh, defining constraints and loads, calculation and visualization of results. - Determination of the general level of acceptable engineering approximations. Methodology of the evaluation of the accuracy of the numerical results. - Theoretical foundations of dynamic analysis. Description of working environment of specialized modules for dynamic analysis in CATIA V5 software. - Structural analysis of assemblies. Defining the connection between the assembly components for structural analysis. Defining the reaction between the assembly components. - Introduction to Knowledgeware technology and expert systems. Representation of knowledge. Systems based on rules. Intelligent CAD/CAE/CAM systems. Parametric modeling and family (design) tables. Formulas. - Rules, laws and checks. Knowledge embedded templates. Description of Knowledgeware modules (Knowledge Advisor, Knowledge Expert, Product Knowledge Template). - Macros: creation, application, modification. CATScript, VBScript and Java3D languages. Practical Studies: - Kinematic analysis – CATIA V5 DMU Kinematics Simulation of mechanisms which perform: translational motion, rotational motion. - Structural analysis of parts – CATIA V5 Generative Structural Analysis (Parts). Defining mesh parameters and properties. Define constraints and loads; Calculation and visualization of results. Interpretation of results obtained by computer simulation (stresses, displacements, deformations). Generation of analysis report. The influence of selection of discretization of the geometric model (finite elements mesh density) to the obtained numerical results. Frequency analysis of a part. - Structural analysis of assemblies - CATIA V5 Generative Structural Analysis (Assembly) - Static and frequency analysis of assemblies. - Knowledgeware technology – CATIA V5 Knowledgeware Formulas, rules, laws, checks and macros. Knowledge embedded templates			
Recommended reading 1. Jovicic G., N Jovičić.: "Basics of computer simulation", the material in electronic form, Faculty of Mechanical Engineering, University of Kragujevac, 2007. 2. G. Devedžić: "CAD/CAM technologies", Faculty of Mechanical Engineering, 2009. (in Serbian) 3. Zamani N., Weave J., CATIA V5 – Mechanisms Design and their animation, KB, Čačak, 2007.			
The number of hours of active teaching:			Other classes:
Theory: 2	Practical classes: 1.6	Other forms: 0.4	Research study: 0.5
Teaching methods Teaching approach through lessons, lab exercises independent work of students.			
Assessment			
Pre-final exam obligations	points	Final exam	points
Activities during the classes:	10	final exam	35
Colloquiums(s) :	2x15=30		
Seminar(s) :	25		