

Study program: Mechanical engineering			
Type and level of studies: Master studies			
Course unit: Structural and stress analysis			
Teacher in charge: prof. dr Mile Savković			
Language of instruction: English			
ECTS: 6			
Prerequisites: Mathematics 1, Strength of materials			
Semester: Winter			
Course unit objective: Basic objectives of this course are: 1) introduction to finite element method and applications in design of steel structures, machine parts and assemblies, 2) implementation of the practical skills for 2D and 3D modeling and simulation of steel structures, machine parts and assemblies.			
Learning outcomes of the Course unit Students gain the practical skills for modeling and analysis of structural systems and develop critical approach in design. Also, they get knowledge in common used software packages in design of steel structures.			
Course unit contents <i>Theoretical classes</i> Introduction to finite element method. The FEM analysis process for beams and truss elements. Member stiffness matrix. Coordinate transformation. Master stiffness matrix. Force vector. Solving for displacements. Recovery of internal forces and stresses. Examples of finite element models of steel structures. Modeling of 2D and 3D frames and trusses. 3D solid finite elements, modeling and simulations. <i>Practical classes</i> Matrix method for calculation of displacements, internal forces and stresses in 2D truss system. Modeling the characteristic steel structures in finite element software (beams, trusses, frames). Preparation for input data. Steel structure geometry input options. Materials definition. Selection groups definition. Custom cross-section design. Modeling the structural boundary conditions and load cases. Analysis and design of steel structures. Analysis of output results. 3D finite element analysis of parts and assemblies.			
Literature O.C.Zienkiewicz, R.L.Taylor, J.Z.Zhu, "The Finite Element Method ", Elsevier, 2005. Huei-Huang Lee, Finite Element Simulations with ANSYS Workbench 14, SDC Publications, 2012.			
Number of active teaching hours			Other classes
Lectures: 2	Practice: 1	Other forms of classes: Independent work: 2	
Teaching methods Lectures are carried out in a standard classroom, using multimedia presentations and lecture board. Exercises are carried out in a computer classroom under the supervision of teacher. Each student practices examples of finite element analysis of steel structure, machine part and assembly autonomously, with consultations with the teacher.			
Examination methods (maximum 100 points)			
Exam prerequisites	No. of points:	Final exam	No. of points:
Student's activity during lectures	10	oral examination	
practical classes/tests	30	written examination	30
Seminars/homework		
Project	30		
Other			
Grading system			
Grade	No. of points	Description	
10	91-100	Excellent	
9	81-90	Exceptionally good	
8	71-80	Very good	
7	61-70	Good	
6	51-60	Passing	
5	Less than 50	Failing	