

Study program / course: Mechanical Engineering			
Type and level of study: Bachelor academic studies			
Course: Machines and tools in metal forming			
Lecturers: Milentije C. Stefanovic, Vesna M. Mandic			
Status of course: Obligatory course for module M _I , VI semester			
Number of ECTS: 6			
Precondition: Engineering tools and Production technologies			
The objective of course <ul style="list-style-type: none"> - learn various processing techniques for metals (sheet and bulk) using special and general-purpose machines and tools - learn the basics of tool design including sketching, drawing, computer aided design, presentation and design communication skills - introduce students to proper selection machines for different bulk and sheet metal forming processes. 			
The outcome of course <p>At the end of this course the student will be expected to be able to:</p> <ul style="list-style-type: none"> • Know the principles of modern trends in production technologies • Be able to explain the elements of tool construction for various forming processes • Be able to use guidelines in constructing related to technological ability of parts • Be able to design technology and construct the tools for sheet metal forming, i.e. bulk forming • Be able to use C-tools in designing • Know 3D modelling in some of CAD systems • Be able to explain the elements of machines for sheet metal forming and bulk forming • Be able to perform the selection of machine for suitable forming operation • Recommend technological procedure for product manufacturing by application of various forming processes 			
Syllabus <p>Theoretical study: Introduction. Technological capacity of sheet metal parts. Design of stamping tools - General principles, leading, bordering, clearance, tolerances. Tools for fine stamping. Design of bending tools - "U" and "V" profiles. General principles, leading, ejecting, calibration. Design of deep drawing tools - Axis-symmetrical and irregular part shapes. Combined tools. Tools for successive forming. Tools for integrated operations. Classification of machines according to type and kind of forming. Mechanical presses. Crankle presses. Knuckle-joint and eccentric presses. Hydraulic presses for sheet metal forming. Special, automatic presses.</p> <p>Design of tools for hot forming. Classification of forged products and tools. Design of tools for forging on hammer. Design of tools for forging on forging presses Tools for cutting of flesh. Design of tools for cold forming - Extrusion – forward, backward, combined. Application of new virtual technologies in tool design for metal forming. Forging hammers. Forging presses. Friction presses. Hydraulic presses.</p> <p>Practical Studies: Exercises in PC classroom, visits to industrial plants, seminar work.</p>			
Recommended reading <ol style="list-style-type: none"> 1. B. Devedžić, Plasticity and metal forming, Mechanical Engineering Faculty, Naučna knjiga, Beograd 1992. 2. B. Musafija, Metal forming, "Svjetlost", Sarajevo 1988. 3. M. Stefanović, Machines and tools in metal forming, sscript, MFK, 2002. 4. V. Mandić, Modelling and simulation in metal forming, Mechanical Engineering Faculty, Kragujevac 2005. 5. V. Mandić, POT II, User manual, MFK, 1993 			
The number of hours of active teaching:			Other classes:
Theory: 3	Practical classes: 1.6	Other forms: 0.4	Research study: 0
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Methods of teaching <p>Teaching approach through lessons, exercises, independent work of students. Apart from PPT presentations, other multimedia contents are applied. Lessons and exercises are adjusted. Within exercises, students use CATIA software and standard CAD parts, as well as MathCad and POT II software for calculations and automatic tool design.</p>			
Evaluation of knowledge			
Pre-final exam obligations	points	Final exam	points
Activities during the classes:	10	Oral exam	30
Colloquiums(s) :	40		
Seminar(s) :	20		