Course description

Course abbreviation:	KMM/TTV Theory of Motel Forming	Page:	1/3			
Academic Year:	2023/2024 Printed:	14.07.2025	22:55			
Department/Unit /	KMM / TTV Academic Year	2023/2024				
Title	Theory of Metal Forming Type of completion	Exam				
Accredited/Credits	Yes, 4 Cred. Type of completion	Combined				
Number of hours	Lecture 2 [Hours/Week] Tutorial 2 [Hours/Week]					
Occ/max	Status A Status B Status C Course credit prior to	Yes				
Summer semester	8 / - 4 / - 3 / - Counted into average	YES				
Winter semester	0/- $0/ 0/-$ Min. (B+C) students	10				
Timetable	Yes Repeated registration	NO				
Language of instruction	Czech Semester taught	Summer se	emester			
Optional course	Yes Internship duration	0				
Evaluation scale	1 2 3 4 Ev. sc. – cred.	S N				
No. of hours of on-premise						
Auto acc. of credit	Yes in the case of a previous evaluation 4 nebo nic.					
Periodicity	every year					
Specification periodicity						
Substituted course	KMM/TTV*					
Preclusive courses	N/A					
Prerequisite courses	N/A					
Informally recomm	nended courses KMM/TTSS					
Courses depending	on this Course KMM/ZSZT1					

Course objectives:

The tutorial deals with the theoretical fundamentals of stress and force computation in metal forming technology. The students are acquainted with principles and laws of plastic strain mechanics. The state of stress, mathematic relations for small strain computation, the compatibility equations and plasticity conditions are analyzed. Equilibrium differential equations for forming processes are derived and the methods of strain force and power determination are specified. In the user-oriented part, the stress conditions and forces are calculated for upsetting, rolling, wire, and tube drawing using equilibrium equations and the plasticity condition formula. The slip line method is interpreted and several selected tasks are calculated by this method.

Requirements on student

Credits: The laboration of the final calculation test Examination: The succesfull elaboration of the written part and graduation of the verbal part of the exam

Content

Mechanics of plastic deformation, derivation of partial differential equations of equilibrium. Small deformations and strain rate, compatibility conditions. Methods for determining deformation forces, plasticity conditions. Stress ratios at the contact surface during compaction. Rolling theory. Theory of wire and tube drawing. Deformation behavior of metallic materials during volume and surface forming. Deformation behavior of plastics.

Fields of study

Guarantors and lecturers

• Guarantors:	Ing. Soňa Benešová, Ph.D. (100%)
• Lecturer:	Ing. Soňa Benešová, Ph.D. (50%), Dr. Ing. Hana Jirková, Ph.D. (50%)
• Tutorial lecturer:	Ing. Soňa Benešová, Ph.D. (50%), Dr. Ing. Hana Jirková, Ph.D. (50%)

Literature

• Basic:	Žídek M. Metalurgická tvařitelnost ocelí za tepla a za studena. Praha, Aleko, 1995.
• Basic:	Počta, B. Základy teorie tváření kovů. Praha: SNTL, 1966.
• Recommended:	Altan, T., Ngaile, G., Shen, G. <i>Cold and Hot Forging, Fundamentals and Applications</i> . ASM International, 2005.
• Recommended:	Altan, T., Tekkaya A.E. Sheet Metal Forming, Fundamentals. ASM International, 2012.
• Recommended:	Mojžíš, Antonín. Teorie a technologie tváření kovů. 1. vyd. Plzeň : VŠSE, 1977.

Time requirements

4 11 0

All forms of study					
Activities		Time requirements for activity [h]			
Preparation for an examination (30-60)		50			
Contact hours		40			
Preparation for comprehensive test (10-40)		10			
	Total:	100			

assessment methods

Knowledge - knowledge achieved by taking this course are verified by the following means	Knowledge - kno	wledge achieve	d by taking this co	urse are verified by	the following means:
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Combined exam

Test

Skills - skills achieved by taking this course are verified by the following means:

Skills demonstration during practicum

Competences - competence achieved by taking this course are verified by the following means:

Oral exam

prerequisite

Knowledge - students are expected to possess the following knowledge before the course commences to finish it successfully:

Use trigonometric functions. Find solutions to simple integrals. Rearrange mathematical equations. Use and know the meaning of a differential.

Skills - students are expected to possess the following skills before the course commences to finish it successfully:

Draw schematics. Use spatial ability.

Competences - students are expected to possess the following competences before the course commences to finish it successfully:

N/A

teaching methods

Knowledge - the following training methods are used to achieve the required knowledge:

Practicum

Interactive lecture

Lecture

Multimedia supported teaching

Skills - the following training methods are used to achieve the required skills:

Skills demonstration

Multimedia supported teaching

Competences - the following training methods are used to achieve the required competences:

Lecture

Multimedia supported teaching

learning outcomes

Knowledge - knowledge resulting from the course:

Describe the stress state in plastic deformation.

Give a list of basic forming factors.

Interpret the relationship between stress and strain.

Define exact partial differential balance of forces in orthogonal and cylindrical coordinate systems.

Calculate stresses and forces for selected forming operations.

Skills - skills resulting from the course:

Know the meaning of basic forming factors in hot and cold forming. Calculate the forming velocity profile for a press and a power hammer. Apply yielding conditions and analyze stress state using Mohr circle.

Competences - competences resulting from the course:

N/A

Course is included in study programmes:

Study Programme	Type of	Form of	Branch	Stage St.	plan v.	Year	Block	Status	R.year	R.
Mechanical Engineering	Bachelor	Full-time	Engineering Materials and Technology	1 1 2	2020	2023	Compulsory courses	А	3	LS
Design Engineering of Machines and Technical Devices	Postgraduat e Master	Combined	Design Engineering of Manufacturing Machines and Equipment	12	2020	2023	Core elective courses "B"	В	2	LS
Design Engineering of Machines and Technical Devices	Postgraduat e Master	Full-time	Design Engineering of Manufacturing Machines and Equipment	1 2	2020	2023	Core elective courses "B"	В	2	LS
Mechanical Engineering	Bachelor	Combined	Engineering Materials and Manufacturing Technolog	d 12 sy	2020	2023	Core elective courses	В	3	LS