

## Course description

<b>Course abbreviation:</b>	KKS/KTS	<b>Page:</b>	1 / 4
<b>Course name:</b>	Forming Machine Design		
<b>Academic Year:</b>	2023/2024	<b>Printed:</b>	03.06.2024 07:52

<b>Department/Unit /</b>	KKS / KTS			<b>Academic Year</b>	2023/2024
<b>Title</b>	Forming Machine Design			<b>Type of completion</b>	Exam
<b>Accredited/Credits</b>	Yes, 5 Cred.			<b>Type of completion</b>	Combined
<b>Number of hours</b>	Lecture 2 [Hours/Week] Tutorial 2 [Hours/Week]			<b>Course credit prior to</b>	YES
<b>Occ/max</b>	Status A	Status B	Status C	<b>Counted into average</b>	YES
<b>Summer semester</b>	0 / -	0 / -	0 / -	<b>Min. (B+C) students</b>	10
<b>Winter semester</b>	2 / -	0 / -	1 / -	<b>Repeated registration</b>	NO
<b>Timetable</b>	Yes			<b>Semester taught</b>	Winter semester
<b>Language of instruction</b>	Czech			<b>Internship duration</b>	0
<b>Optional course</b>	Yes			<b>Ev. sc. – cred.</b>	S/N
<b>Evaluation scale</b>	1 2 3 4				
<b>No. of hours of on-premise</b>					
<b>Auto acc. of credit</b>	Yes in the case of a previous evaluation 4 nebo nic.				
<b>Periodicity</b>	K				
<b>Substituted course</b>	None				
<b>Preclusive courses</b>	N/A				
<b>Prerequisite courses</b>	N/A				
<b>Informally recommended courses</b>	KKS/KVS				
<b>Courses depending on this Course</b>	N/A				

### Course objectives:

The aim of this course is to provide students with information about structure and computing analysis of hydraulic forging presses, hammers and rolling mills.

- To inform students of basic classification of hydraulic presses (forging presses, extrusion presses), hammers and rolling mills
- To introduce the basic principles of design and calculations of individual parts of hydraulic forging presses to students
- To introduce the basic principles of design and calculations of hammers to students
- To introduce the basic principles of design and calculations of rolling mills to students

### Requirements on student

Continuous assessment:

fulfilment of project requirements

Final assessment:

combined examination (written and oral)

- To pass the exam, students must successfully finish their seminar project
- The results from seminars will be considered if exam results are inconclusive.
- The exam is in the form of a test. If results are inconclusive the student will be tested orally
- If the student does not agree with the results of the evaluation from the exam, s/he may request an oral exam

### Content

The student gains deeper knowledge in the field of design solutions and computing analysis of hydraulic presses, hammers and rolling equipment.

Topics of lectures according to weeks:

- 1) Introduction (subject content, literature, student requirements). Classification of forming machines.
- 2) Hydraulic forging presses - classification of hydraulic forging presses, requirements for contemporary presses, computing analysis and design solutions for forging hydraulic presses.

- 3) Frames of hydraulic forging presses - design solutions and computing analysis of press frames
- 4) Design of plunger and press cylinder and lifting cylinder
- 5) Drives of hydraulic forging presses - design solutions and computing analysis of press drives
- 6) Extrusion hydraulic presses - direct and indirect extrusion - basic calculations and design solutions
- 7) Hammers - Requirements for present-day hammers, basic calculations and design of hammers, characteristics of presses and hammers
- 8) Hammers - impact theory, hammer efficiency, anvil losses
- 9) Computing analysis of KJH pneumatic-hydraulic hammer
- 10) Rolling mills - requirements for contemporary rolling mills, classification of rolling mills, rolling theory
- 11) Rolling mills - design variants of rolling mills including computing analysis
- 12) Mechanization and automation of presses
- 13) Mechanization and automation of rolling mills

### Fields of study

Studijní opory pro studenty jsou umístěny na COURSEWARE ZČU

### Guarantors and lecturers

- **Guarantors:** Doc. Ing. Jiří Staněk, CSc. (100%)
- **Lecturer:** Doc. Ing. Jan Hlaváč, Ph.D. (50%), Doc. Ing. Jiří Staněk, CSc. (50%)
- **Tutorial lecturer:** Doc. Ing. Jan Hlaváč, Ph.D. (50%), Doc. Ing. Jiří Staněk, CSc. (50%)

### Literature

- **Basic:** Jiří Staněk. *Přednášky z předmětu KTS v elektronické podobě*. ZČU v Plzni, 2012.
- **Basic:** Čechura, Milan; Staněk, Jiří. *Tvářecí stroje : hydraulické lisy*. 1. vyd. Plzeň : ZČU, 1999. ISBN 80-7082-480-8.
- **Basic:** Staněk, Jiří. *Základy stavby výrobních strojů : tvářecí stroje*. 1. vyd. Plzeň : Západočeská univerzita, 2001. ISBN 80-7082-738-6.
- **Extending:** Semiatin, S. L. *Forming and Forging, Volume 14*. USA, ASM International, 1988.
- **Extending:** Semiatin, S.L. *HANDBOOK Metalworking: Bulk Forming*. USA, 2005. ISBN 978-1-62708-185-6.
- **Extending:** Semiatin, S.L. *HANDBOOK Metalworking: Sheet Forming*. USA, 2006. ISBN 978-0-87170-710-9.
- **Extending:** fa. Schuler. *Metal Forming Handbook*. Springer-Verlag, Berlín, 1998. ISBN 3-540-61185-1.
- **Extending:** Kolíbal, Z. *Technologičnost konstrukce a retrofitting výrobních strojů*. Brno : VUTIU, 2010. ISBN 978-80-214-3765-4.
- **Recommended:** Rudolf, Bedřich; Kopecký, Miloslav. *Tvářecí stroje : základy výpočtů a konstrukce*. 2. opr. vyd. Praha : SNTL, 1982.

### Time requirements

#### All forms of study

Activities	Time requirements for activity [h]
Contact hours	52
Individual project (40)	40
Preparation for an examination (30-60)	40
<b>Total:</b>	<b>132</b>

### assessment methods

**Knowledge - knowledge achieved by taking this course are verified by the following means:**

Combined exam

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

Project

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

Project

Combined exam

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

To explain possible design solutions of basic constructional parts of forming machines and its equipment

To explain the basic principles of mechanics, elasticity and strength, machine parts and design fundamentals used in the design of machines and equipment

To explain kinematic diagrams of basic representatives of forming machines

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

To design selected parts of machines and equipment based on the acquired knowledge

To use theoretical knowledge in the field of mechanics, elasticity and strength, machine parts and design fundamentals independently when designing selected design parts of forming machines

To acquire further professional knowledge by independent study of theoretical knowledge of engineering basis

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

N/A

N/A

N/A

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

Individual study

Interactive lecture

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

Practicum

Project-based instruction

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

Lecture with visual aids

Group discussion

**learning outcomes****Knowledge - knowledge resulting from the course:**

To explain possible constructional solutions of basic design parts of hydraulic forging presses at a higher level

To explain possible design solutions of hammers and rolling mills at a higher level

To explain possible design solutions of mechanical presses at a higher level

To explain basic terms and calculations of rolling mills

To explain basic terms and calculations of hammers

**Skills - skills resulting from the course:**

To acquire additional professional skills independently on the basis of practical experience in the field of design exercises and literature

To apply their theoretical knowledge in the field of mechanics, elasticity and strength, machine parts and design fundamentals to solve individual components of a hydraulic forging press

To design selected parts of hydraulic forging press based on acquired theoretical knowledge with use of modern software

To design basic parameters of rolling mill

To design basic parameters of hammer

**Competences - competences resulting from the course:**

N/A

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.
Design Engineering of Machines and Technical Devices	Postgraduate Master	Full-time	Design Engineering of Manufacturing Machines and Equipment	1	2020	2023	Compulsory courses	A	2	ZS
Design Engineering of Machines and Technical Devices	Postgraduate Master	Combined	Design Engineering of Manufacturing Machines and Equipment	1	2020	2023	Compulsory courses	A	2	ZS
Design Engineering of Machines and Technical Devices	Postgraduate Master	Combined	Design Engineering of Health and Cooperative Technology	1	2020	2023	Elective courses	C	2	ZS
Design Engineering of Machines and Technical Devices	Postgraduate Master	Full-time	Design Engineering of Health and Cooperative Technology	1	2020	2023	Elective courses	C	2	ZS
Design Engineering of Machines and Technical Devices	Postgraduate Master	Combined	Design Engineering of Vehicles and Handling Machinery	1	2020	2023	Elective course	C	2	ZS
Design Engineering of Machines and Technical Devices	Postgraduate Master	Full-time	Design Engineering of Vehicles and Handling Machinery	1	2020	2023	Elective course	C	2	ZS