

# Course description

<b>Course abbreviation:</b>	KKS/TKMA	<b>Page:</b>	1 / 4
<b>Course name:</b>	Hydraulic and Pneumatic Mechanisms		
<b>Academic Year:</b>	2023/2024	<b>Printed:</b>	03.06.2024 08:55

<b>Department/Unit /</b>	KKS / TKMA			<b>Academic Year</b>	2023/2024
<b>Title</b>	Hydraulic and Pneumatic Mechanisms			<b>Type of completion</b>	Pre-Exam Credit
<b>Accredited/Credits</b>	Yes, 2 Cred.			<b>Type of completion</b>	Combined
<b>Number of hours</b>	Tutorial 2 [Hours/Week]				
<b>Occ/max</b>	Status A	Status B	Status C	<b>Course credit prior to</b>	NO
<b>Summer semester</b>	0 / -	0 / -	3 / -	<b>Counted into average</b>	YES
<b>Winter semester</b>	0 / -	0 / -	2 / -	<b>Min. (B+C) students</b>	10
<b>Timetable</b>	Yes			<b>Repeated registration</b>	NO
<b>Language of instruction</b>	English			<b>Semester taught</b>	Winter, Summer
<b>Optional course</b>	Yes			<b>Internship duration</b>	0
<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>	KKS/TKM				
<b>Preclusive courses</b>	N/A				
<b>Prerequisite courses</b>	N/A				
<b>Informally recommended courses</b>	N/A				
<b>Courses depending on this Course</b>	N/A				

## Course objectives:

The aim of the course is to give student basic facts about fluid power. To introduce student to applied methods for the design and analysis of fluid power systems for machines.

## Requirements on student

Continuous assessment: fulfilment of requirements on seminars, test  
Active participation on seminars, submission of the project (0-50points), test (0-50points)

## Content

The course is intended to give students a good insight into the following areas:  
basic components, principles and calculations; generators and motors, power control components, accumulators, multipliers; their characteristics, use and structure; efficiency; elementary parameters of energy media, especially oils; cleaning, packing and cooling of fluids; effects of gas on the behaviour of hydraulic circuit mechanisms, placing and linking of components; control of motor speeds, hydrodynamic shock, dynamics of hydraulic mechanisms, hydraulic and pneumatic moving seatings; design of hydraulic circuit functional diagrams.

1. Organization of the course. Importance of the subject for the practice. Definition of the power fluid mechanism (PFM), its structure. Fundamental equations. Introduction of the PFM. Advantages and disadvantages of the PFM. Classification of PFM according to energy carrier and technological requirements.
2. - 5. Pneumatic and electropneumatic systems. Pneumatic elements, classification, applications.  
Graphical symbols of fluid system components. Principles of function of the selected pneumatic and hydraulic elements.  
Rules for creation of diagrams for hydraulic and pneumatic circuits.  
Pneumatic circuits creation.
- 6.-8. Practical tasks - connecting of pneumatic circuits (FESTO Didactic, SMC Pneu panel).  
Electropneumatic circuits - fundamental circuits, logical functions, combinational and sequential circuits.  
Control of electropneumatic circuits. Combinational and sequential circuits. Programming PLCs via functional blocks.
9. Selection and dimensioning of elements of pneumatics and electropneumatics circuits.
10. Fluid based transmission systems. Open and closed hydraulic circuits (HC). Hydrogenerators (HG) and hydromotors (HM).

Transmission systems according to the HM motion. Energy carriers and their main parameters. Loading of fluids, requirements and proper selection. Seals and gaskets, cleaning. Fluid properties. Energy transfer by means of fluids. Distribution of pressurised fluid in the HC. Tanks. Losses in the HC.  
 11.-12. Hydraulic elements, classification, applications. Design of complex hydraulic circuit.  
 13. Control of hydraulic mechanisms. Electrohydraulic servovalves.

## Fields of study

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## Guarantors and lecturers

- **Guarantors:** Ing. Roman Čermák, Ph.D. (100%)
- **Tutorial lecturer:** Ing. Roman Čermák, Ph.D. (100%)

## Literature

- **Basic:** SMC E-learning - <http://www.smctraining.com> >
- **Extending:** Matthies, Hans Jürgen; Renius, Karl Theodor. *Einführung in die Ölhydraulik*. Vieweg Taubner Verlag, 2006. ISBN 3835100513.
- **Recommended:** Hydraulics and Pneumatics (Parr Andrew)
- **Recommended:** Industrial Hydraulic Systems & Circuits (Gupta, Bhagwati Prasad)
- **Recommended:** Pneumatic Drives (Beater Peter)

## Time requirements

### All forms of study

Activities	Time requirements for activity [h]
Individual project (40)	40
Contact hours	26
<b>Total:</b>	<b>66</b>

## assessment methods

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

Test  
N/A

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

Project  
Skills demonstration during practicum  
N/A

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

Individual presentation at a seminar  
N/A

## prerequisite

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

Knowledge in the range of the previous study at the university is supposed.  
to gain further professional knowledge by self-study

to use his/her professional knowledge at least in one foreign language

to use independently theoretical knowledge from mechanics, stress and strain, machine elements and fundamentals of design in designing of machines and equipment

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

to gain further professional knowledge by self-study

to use his/her professional skills at least in one foreign language

to use independently his/her knowledge of fundamental theoretical disciplines in solving of practical tasks in the field of designing machines and equipment

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

N/A

N/A

N/A

Apply knowledge and skills gained in the previous study

**teaching methods**

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

Lecture supplemented with a discussion

Self-study of literature

Individual study

One-to-One tutorial

Interactive lecture

E-learning

Project-based instruction

Students' portfolio

N/A

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

Practicum

Skills demonstration

E-learning

Project-based instruction

Students' portfolio

N/A

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

Practicum

N/A

**learning outcomes**

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

to communicate information about problems connected with applications of power fluid mechanisms

to evaluate pros and cons of power fluid systems

to gain further professional knowledge by self-study

to use his/her professional knowledge at least in one foreign language

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

to gain further professional experience

to use his/her theoretical knowledge to solve practical tasks

to design selected power fluid subsystems with use of gained theoretical and practical knowledge

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

N/A

N/A

Apply knowledge and skills gained in the course

**Course is included in study programmes:**

Study Programme	Type of	Form of	Branch	Stage	St. plan	v.	Year	Block	Status	R.year	R.
Design of Power Machines and Equipment	Postgraduate Master	Full-time	Manufacturing Machines and Technologies	1	2021	2023		Elective course	C	1	ZS