

COURSE DESCRIPTION CARD

Faculty of Mechanical Engineering									
Field of study								Degree level and programme type	Bachelor's degree Master's degree
Specialization/ diploma path								Study profile	
Course name	Design of Hydraulic Power Systems							Course code	IS-FME-002012W
								Course type	Elective
Forms and number of hours of tuition	L	C	LC	P	SW	FW	S	Semester	Winter
			30	30				No. of ECTS credits	6
Entry requirements									
Course objectives	<p>The course provides students with knowledge of the basic terms, principles and calculation methods for hydraulic power systems. Its purpose is to present a piece of rational and well-balanced information about hydraulic systems and their components, their principles and features of work. The main types and construction of hydraulic pumps, motors, actuators, valves and ancillary hydraulic equipment are systematically considered. The course also explains the principles of exploitation and service of hydraulic systems. Another goal of the course is to teach students skillfully to read and draw hydraulic schemes and choose the hydraulic equipment that suits best for the exact purpose. The emphasis of the course is on the achieving of skills to efficiently schematise, analyse and solve typical tasks of hydraulic power systems design.</p>								
Course content	<p>Laboratory: Introduction. Basics of power hydraulics. Principles of operation of hydraulic systems and their terminology. Hydraulic diagrams and symbols. Hydraulic cylinders - structures, basics of calculations and design. Directional control valves - classification, construction, types of control and features of connections to hydraulic power systems. Determination of real static characteristics of hydraulic valves. Development and construction of a hydraulic control system using known hydraulic devices.</p> <p>Project: Hydraulic power systems design and calculation. Design the hydraulic schemes. Types, construction, and basics of calculation hydraulic elements like cylinders, rotary actuators, and valves (check, pressure, flow control, directional control). Choose suitable hydraulic equipment, for designed hydraulic systems, from the producers' catalog.</p>								
Teaching methods	<p>Regular laboratory: connecting hydraulic systems at the teaching stand, discussions.</p> <p>Regular project: blackboard classes, work at the computer, discussions.</p> <p>Work at home: home assignments, preparation for classes, preparation reports.</p>								
Assessment method	In-class test and discussions, home assignment reports,								
Symbol of learning	Learning outcomes							Reference to the learning outcomes for	

outcome		the field of study
LO1	Student correctly identifies hydraulic symbols of basic components of hydraulic drive and control systems.	K_U03, K_U12
LO2	Student assembles and tests basic hydraulic control systems.	K_U03, K_U12
LO3	Student can draw hydraulic circuit diagram of automatic system.	K_U03, K_U12
LO4	able to work in a team	K_K04
Symbol of learning outcome	Methods of assessing the learning outcomes	Type of tuition during which the outcome is assessed
LO1	Reports, test	LC
LO2	Reports, test	LC
LO3	Reports, test	LC
LO4	observation of work during laboratory classes	LC
Student workload (in hours)		No. of hours
Calculation	participation laboratory classes	30
	preparation for laboratory classes	40
	working on reports	60
	participation in student-teacher sessions related to the classes	40
	TOTAL:	170

Quantitative indicators	HOURS	No. of ECTS credits
Student workload – activities that require direct teacher participation	70	6
Student workload – practical activities	100	
Basic references	<ol style="list-style-type: none"> 1. P. Chapple, Principles of hydraulic systems design, 2nd ed., Momentum Press, 2015. 2. R. Doddannavar, A. Barnard, J. Ganesh, Practical hydraulic systems operation and troubleshooting for engineers and technicians, Newnes, 2005 3. H. Exner, R. Freitag et al., The hydraulic trainer. volume 1: Basic principles and components of fluid technology, Mannesmann Rexroth GmbH, 1991 4. A. Parr, Hydraulics and pneumatics: A technician's and engineer's guide, Butterworth Heinemann, 2013 	
Supplementary references	<ol style="list-style-type: none"> 1. R. B. Walters, Hydraulic and electro-hydraulic control systems, Elsevier applied science London and New York, 1991 2. P. Drexler, H. Faatz, F. Feicht, Dr. Ing et. al., The hydraulic trainer. Volume 3: Planning and design of hydraulic power systems, Wiesmann Mannesmann Rexroth AG, 1988 3. R. Ewald, J. Hutter, D. Kretz et. al., The hydraulic trainer. Volume 2: Proportional and servo valve technology, Wiesmann Mannesmann Rexroth AG, 1989 4. R. Kordak, Hydrostatic drives with secondary control, 2nd ed., Mannesmann Rexroth GmbH, 1996 	

Organisational unit conducting the course	Department of Robotics and Mechatronics	Date of issuing the programme
Author of the programme	Rafał Grądzki PhD	11.01.2023

L – lecture, C – classes