

**RTU Course "Fluid Mechanics"**  
**31000 Faculty of Civil and Mechanical Engineering**

**General data**

Code	BM0443
Course title	Fluid Mechanics
Course status in the programme	Compulsory/Courses of Limited Choice
Responsible instructor	Didzis Avišāns
Academic staff	Guntis Strautmanis Dmitrijs Rusovs
Volume of the course: parts and credits points	1 part, 3.0 credits
Language of instruction	LV, EN
Annotation	Study course gives an overview of the basic questions about liquid and gas flows and the most sufficient calculation model choice. Different kinds of flow are viewed and various processes in nature and machine industry, fluid circuits, especially ones, that work in mobile devices, such as automotive and railway industry products are explained. Study course explains how real fluid circuits work. Mostly pneumatic and hydraulic circuits for movement and force generation for mobile devices are viewed. Components of these circuits are analysed and properties of those components are viewed. Parameters and calculation principles of hydraulic circuits are shown.
Goals and objectives of the course in terms of competences and skills	The study course aim is to provide students with basic knowledge of liquid and gas mechanics, calculation methodology for different flow types at various flow conditions, as well as to improve students' understanding of the various hydro and pneumatic equipment and components. The tasks of the study course are: 1. To develop knowledge about the theory of liquid and gas flow calculation. 2. To create the expertise of hydro and pneumatic equipment design and operation of mobile hydro and pneumatic equipment specifics, as well as practical skills the calculations and charts, as well as the choice of components and operational parameters of alignment.
Structure and tasks of independent studies	Independent work with literature to deepen and strengthen their knowledge. Development of practical work. Homework preparation.
Recommended literature	1. Lielpēters P., Ķirsis T., Kravalis K., Torims T., „Fluīdu mehānika”. 2. izdevums. 2009.g.- 2. Lielpēters P., Dorošenko R., Geriņš Ē.; Fluidtehnika, 2005.g.-183 lpp. 3. Lielpēters P., Geriņš Ē.; Fluid Power; 2008.g. -166 lpp. 4. Lielpeters P., Geriņch E.; Monograph "Calculation of Pneumatic Conduits" - 2007.g.-118 lpp. 5. Dirba V., Uiska J., Zars V. Hidraulika un hidrauliskās mašīnas. 1980.g.-456 lpp. 6. Hidroiekārtas. Laboratorijas darbi./S.Navra, I.Vēveris. 1980.g. - 60 lpp. 7. Hidropiedziņa un hidropneumoautomātika./D.Libermanis, V.Zars u.c. Lekciju konspekts. 1.-4.daļa. 8. Gidropivod i gidroavtomatika./Konspekt lekcii. V.V.Zars, D.A.Liberman, P.J.Lielpeter i.dr. 1990.-1992.
Course prerequisites	Material resistance; Thermodynamics; Physics.

**Course contents**

Content	Full- and part-time intramural studies		Part time extramural studies	
	Contact Hours	Indep. work	Contact Hours	Indep. work
Introduction. Fluid properties. Overview of the fluid mechanics. Statics of fluid.	2	0	0	0
Kinematics of the fluid. Fluid dynamics.	6	0	0	0
Characteristics of real fluid flow. Calculations of laminar flow. Calculations of turbulent flow.	2	0	0	0
Introduction. Fluid properties. Overview of the fluid mechanics. Statics of fluid.	2	0	0	0
Local resistances. Tube system calculation principles. Calculation of gas flows. Fluid flow model.	2	0	0	0
Basics of fluid mechanics. Main rules of fluid machines.	2	0	0	0
Fluid machines.	2	0	0	0
Fluid circuit control.	2	0	0	0
Conditioning. Dynamic fluid machines.	2	0	0	0
1. Practical work. Introduction of fluid circuits.	2	3	0	0
2. Practical work. One side actuating cylinder, 2/2, 3/2 flow distributor.	2	3	0	0
3. Practical work. Double actuating cylinder, hydraulic accumulator.	2	3	0	0
4. Practical work. Pumps characteristics. Pressure release valve characteristics.	2	3	0	0
5. Practical work. Flow control valve. Flow regulator.	2	3	0	0
6. Practical work. Hydraulic lock, differential control.	2	3	0	0
7. Practical work. Calculation of hydraulic cylinders.	2	3	0	0
8. Practical work. Quantitative calculation of flow.	2	3	0	0
Homework. Calculation of hydraulic equipment parameters and selection of components.	2	16	0	0

Total:	40	40	0	0
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#### ***Learning outcomes and assessment***

Learning outcomes	Assessment methods
Knows basic questions of liquid and gas flow calculation – the correct choice of the mathematic model, identification of different types of flow.	Method for the evaluation of the results: exam. Criteria: can link the issues of flow mechanics with theory and calculation methodology.
Knows the components of the hydraulic and pneumatic conduits, their operation principles, and properties.	Method for the evaluation of the results: exam, home work. Criteria: Recognizes the components of hydraulic and pneumatic equipment, understands their operating principles.
Is able to detect already established device operating characteristics and the purpose for which the facility was designed.	Method for the evaluation of the results: exam, practical work. Criteria: Recognizes the characteristics of hydraulic and pneumatic equipment and can describe their operation and application.
Is able to calculate and choose the operating parameters of hydraulic equipment.	Method for the evaluation of the results: exam, practical work, home work. Criteria: Can calculate and select the task required hydraulic system operational and design parameters.

#### ***Evaluation criteria of study results***

Criterion	%
Practical work	33
Home work	33
Exam	34
Total:	100

#### ***Study subject structure***

Part	CP	Hours			Tests		
		Lectures	Practical	Lab.	Test	Exam	Work
1.	3.0	20.0	20.0	0.0		*	