



RTU Course "Fluid Mechanics"
15515 Materiālu apstrādes tehnoloģijas katedra

General data

Code	MMI101
Course title	Fluid Mechanics
Course status in the programme	Compulsory/Courses of Limited Choice
Course level	Undergraduate Studies
Course type	Academic
Field of study	Mechanics, Mechanical Engineering, Machine Building
Responsible instructor	Geriņš Ēriks
Academic staff	Strautmanis Guntis Kravalis Kalvis Pikurs Guntis
Volume of the course: parts and credits points	1 part, 2.0 Credit Points, 3.0 ECTS credits
Language of instruction	LV, EN, RU
Possibility of distance learning	Not planned
Abstract	Subject 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 are explained. Subject explains how real fluid circuits work. Mostly pneumatic and hydraulic circuits for movement and force generating are overviewed. Components of these circuits are analyzed and properties of those components are viewed. Parameters and calculation principles of hydraulic circuits are shown. Hydraulic circuits for movement generation are analyzed.
Goals and objectives of the course in terms of competences and skills	The aim of the course is to give the knowledge about calculation principles for different kinds of flows at different circumstances. Knowledge about different pneumatic and hydraulic circuits and their components is given. During the training process students gain knowledge about theory of flow calculation, and main principles of hydraulic and pneumatic circuit work. They gain abilities to calculate and assess hydraulic and pneumatic circuits. After the course student is able to create hydraulic circuit for movement generation.
Structure and tasks of independent studies	Literature analysis to improve and consolidate the knowledge.
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., Gerinch 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. Гидропривод и гидроавтоматика./Конспект лекций. В.В.Зарс, Д.А.Либерман, П.Я.Лиелпетер и др. 1990.-1992.
Course prerequisites	Material rigidity, thermodynamics, physics

Course outline

Theme	Hours
Introduction. Fluid properties. Overview of the fluid mechanics. Statics of the fluid.	2
Kinematics of the fluid. Fluid dynamics.	2
Characteristics of real fluid flow. Calculations of laminar flow. Calculations of turbulent flow.	2
Local resistances. Tube system calculation principles. Calculation of gas flows. Fluid flow model.	2
Basics of fluid mechanics. Main rules of fluid machines.	2
Fluid machines.	2
Fluid circuit control.	2
Conditioning. Dynamic fluid machines.	2
1. Practical work. Introduction to fluid circuits.	2
2. Practical work. One side actuating cylinder, 2/2, 3/2 flow distributor.	2
3. Practical work. Double actuating cylinder, hydraulic accumulator.	2
4. Practical work. Pump characteristics. Pressure release valve characteristics.	2
5. Practical work. Flow control valve. Flow regulator.	2
6. Practical work. Hydraulic lock, differential control.	2
7. Practical work. Calculation of hydraulic cylinders.	2
8. Practical work. Quantitative calculation of flow.	2

Learning outcomes and assessment

Learning outcomes	Assessment methods
Student must have knowledge in basic questions of liquid and gas flow calculation – correct choice of mathematic model, identification of different types of flow, finding the roots of different phenomenon in nature and machine industry equipment.	Methods of result evaluation: exam. Criteria: student can connect questions of flow mechanics theory with calculation methods.
Student must be able to find appropriate method to calculate laminar and turbulent flows in channels with a different shape, to evaluate the influence of local resistances to the qualitative and quantitative parameters of the flow and do calculations of simple hydraulic circuit.	Methods of result evaluation: exam. Criteria: student can connect questions of flow mechanics theory with calculation methods.
Student must recognize components of the hydraulic and pneumatic conduits, their work principles and properties. Student has to have knowledge to create hydraulic circuit with necessary properties. Student also must recognize already built hydraulic circuits.	Methods of result evaluation: practical work, exam. Criteria: Student recognizes components of hydraulic and pneumatic circuits, their characteristics and can characterize their use and working principles. Student is able to design hydraulic circuit, which corresponds to the given data.
Must have knowledge to chose and calculate working parameters of hydraulic circuits.	Methods of result evaluation: practical work, exam. Criteria: can choose and calculate necessary working and constructive parameters of hydraulic components.

Study subject structure

Part	CP	ECTS	Hours per Week			Tests		
			Lectures	Practical	Lab.	Test	Exam	Work
1.	2.0	3.0	1.0	1.0	0.0		*	