

RTU Course "Engineering Measurements and Experiments"

31000 Faculty of Civil and Mechanical Engineering

General data

Code	MTH206
Course title	Engineering Measurements and Experiments
Course status in the programme	Compulsory/Courses of Limited Choice
Responsible instructor	Vitālijs Beresņevičs
Academic staff	Ivans Griņevičs Vladislavs Jevstignejevs
Volume of the course: parts and credits points	1 part, 3.0 credits
Language of instruction	LV, EN
Annotation	The study course introduces students to experimental investigations in engineering, such as methods and technical means for measuring physical and mechanical properties of materials (metals, composites), measurements of dynamical parameters of mechanisms and structures (vibration, noise, temperature, pressure, flow, matter structure, concentration, force, velocity, acceleration). The student gets to know different types of experiments and plans, automation of experimental investigations and learns methods for computer analysis and mathematical processing of experimental data.
Goals and objectives of the course in terms of competences and skills	The goal of the study course is to provide students with the skill to perform engineering measurements and experimentation. The objectives of the study course: 1. To acquaint students with the methods for measuring mechanical parameters, technical means and principles of its operation. 2. To teach students to apply practically modern engineering methods and equipment for measuring various physical parameters. 3. To develop competence to evaluate the accuracy and validity of experimental data. 4. To develop skills for performing independent engineering measurements and experiments.
Structure and tasks of independent studies	Studying the main study course themes consulting the lecture materials and recommended literature. Preparing for laboratory works on measuring various technical parameters. Analysis and mathematical processing of laboratory experimental data, forming of the report. Development of homework on specific engineering parameter measuring methods and means.
Recommended literature	Obligātā/Obligatory: 1. Beckwith T.G., Marangoni R.D., Lienhard J.H. Mechanical Measurements. 6th Edition. – New Jersey 07458, Pearson Education Inc., 2007. 2. Morris Alan S., Langari Reza. Measurement and Instrumentation. Theory and Application. - Elsevier Inc., 2012. 3. Jack P. Holman. Experimental Methods for Engineers. McGrawHill Education, 2011. Papildu/Additional: 1. Sergey N. Shevtsov, Arkady N. Soloviev, Ivan a. Parinov et al. Piezoelectric Actuators and Generators for Energy Harvesting. Springer, 2018. 2. Usher M.J. Sensors and Transducers. – London: Macmillan Publishers Ltd, 1985. 3. Miķelsons J., Deruns J. Elektriskie mērījumi. 2. daļa. Rīga: RPI, 1987.
Course prerequisites	Prerequisites in mechanics, physics, mathematics.

Course contents

Content	Full- and part-time intramural studies		Part time extramural studies	
	Contact Hours	Indep. work	Contact Hours	Indep. work
The importance of technical engineering measurements and experiments in the field of mechanical engineering. Classification of physical parameters.	2	2	0	0
Types of measurement errors and methods for assessing them. Random and systemic errors. Errors of indirect measurements.	6	6	0	0
Electric simulation of mechanical processes.	4	4	0	0
Methods and devices for measuring vibration parameters.	4	4	0	0
Experiments on machine diagnostics and testing. Identification experiments.	6	6	0	0
Planning and automation of experiments. Methods for computer analysis and mathematical processing of experimental data.	4	4	0	0
Methods and devices for measuring stresses and deformations.	2	2	0	0
Methods and devices for measuring sound and noise.	4	4	0	0
Methods and devices for measuring motion parameters, pressure and forces.	4	4	0	0
Methods and devices for measuring moisture content in materials.	2	2	0	0
Methods and devices for measuring temperature.	2	2	0	0
Total:	40	40	0	0

Learning outcomes and assessment

Learning outcomes	Assessment methods
Is able to explain the main principles of methods, applied for measuring the mechanical parameters of objects.	Tests. Exam on the core principle of a specific measuring method. Course work on the development measuring algorithms of different physical parameters.
Is able to use technical means and devices for measuring mechanical parameters.	Laboratory work: practical application of measuring device.
Is able to analyse results of measurements and evaluate measuring errors.	Examination test on methods for evaluation of measuring errors. Laboratory work: error evaluation in laboratory measurements.
Is able to do technical measurements and experiments without assistance.	Laboratory work: organizing of experimentation on laboratory installation.

Evaluation criteria of study results

Criterion	%
Performing laboratory experiments and preparing reports	30
Course work	30
Tests	10
Exam	30
Total:	100

Study subject structure

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