



RTU Course "Machine Dynamics and Strength"

15325 Teorēt.mehānikas un materiālu pretestības katedra

General data

Code	MTH301
Course title	Machine Dynamics and Strength
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	Beresnevičs Vitālijs
Volume of the course: parts and credits points	1 part, 3.0 Credit Points, 4.5 ECTS credits
Language of instruction	LV, EN, RU
Possibility of distance learning	Not planned
Abstract	Mechanism, machine, classification. Dynamics of machines and mechanisms. Free, forced and parametric oscillations of machine elements. Vibration protection of machines. Friction in machines. Motion irregularity of machine elements. Analysis and calculations of machine elements on reliability, stability, fatigue strength, impact load. Creep and stress relaxation in machine elements. Practical application of vibration effects in engineering (technological vibromachines, vibrodiagnostics of defects, etc).
Goals and objectives of the course in terms of competences and skills	The goal of the study course is to provide students with the skills required to perform machine element calculations on strength and durability under the dynamic load. Students will obtain a competence to evaluate strength and durability of machine or its elements in real working conditions.
Structure and tasks of independent studies	Studying the main study subject themes and solving the practical tasks consulting the lecture materials and recommended literature as well as attending the lecturer tutorials.
Recommended literature	<ol style="list-style-type: none"> 1. Dresig H., Holzweibig F. Dynamics of Machinery. Theory and Applications. - Springer, Berlin, 2010. 2. Norton R.L. Machine Design. An Integrated Approach. 3rd edition. - Worcester, Massachusetts, Worcester Polytechnic Institute, Pearson Education International, 2006. 3. Пановко Я.Г. Основы прикладной теории упругих колебаний и удара. - Ленинград, Политехника, 1990. 4. Штейнвольф Л.И. Динамические расчеты машин и механизмов. - Киев, Машгиз, 1961. 5. Цыфанский С.Л., Бересневич В.И., Лушников Б.В. Нелинейная вибродиагностика машин и механизмов. - Рига: Изд-во РТУ, 2008. 6. Ziegler G. Maschinendynamik, 1990. 7. Tsyfanskyy S., Beresnevich V., Lushnikov B. Methods and means of nonlinear vibrodiagnostics. - Riga: RTU Publishing House, 2011.
Course prerequisites	Ability to do dynamic analysis of mechanical systems. Theoretical mechanics. Strength of materials.

Course outline

Theme	Hours
Mechanism, machine, classification. Static and dynamic calculations	2
Oscillations in machines and mechanisms. Classification of oscillations	2
Analysis of free oscillations. Methods for determination of natural frequencies of machine elements	6
Forced oscillations of machine members: analytical calculations and experimental investigation	8
Parametric oscillations in machines and mechanisms	4
Vibration protection of machines and machine elements	4
Calculations of machine elements on fatigue strength under the variable stresses	6
Calculations of machine elements on impact load. Stability of machine elements	6
Creep and stress relaxation in machine elements	4
Practical application of vibration effects in engineering (technological vibromachines, vibrodiagnostic systems, etc)	6

Learning outcomes and assessment

Learning outcomes	Assessment methods
Ability to do mathematical description and analysis of oscillations of type machine members	Examination test on methods applied for mathematical analysis of oscillations / Test work on mathematical description and analysis of vibrations
Ability to do calculations of machine elements on strength and durability under the dynamic load	Individual test work - task on calculation of dynamic stresses in machine element and evaluation of its fatigue strength / Examination test on machine element fatigue strength evaluation

Ability to calculate strength of machine elements on impact load	Individual test work - task on calculation of machine element strength under the impact load / Examination test on engineering methods for calculation of impact stresses
Ability to calculate strength of machine elements, taking into account creep deformations	Individual test work - task on calculation of machine element strength, taking into account of creep deformations / Examination test on engineering methods applied for calculation of creep deformations
Ability to apply vibration effects in mechanical engineering	Examination test on possibilities of application of vibration effects in vibroprotecting systems, technological vibromachines and vibrodiagnostics.

Study subject structure

Part	CP	ECTS	Hours per Week			Tests		
			Lectures	Practical	Lab.	Test	Exam	Work
1.	3.0	4.5	2.0	1.0	0.0		*	