



## RTU Course "Fatigue and Damages of Materials of Mechanical Engineering Constructions"

15325 Teorēt.mehānikas un materiālu pretestības katedra

### General data

Code	MTH413
Course title	Fatigue and Damages of Materials of Mechanical Engineering Constructions
Course status in the programme	Compulsory/Courses of Limited Choice
Course level	Post-graduate Studies
Course type	Academic
Field of study	Mechanics, Mechanical Engineering, Machine Building
Responsible instructor	Krasņikovs Andrejs
Academic staff	Gonca Vladimirs
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
Maximum auditorium capacity	100
Maximum number of students per semester	100
Abstract	Fatigue crack initiation at static and dynamic loads. Crack initiation at aggressive environment, contact corrosion. Thermal fatigue durability. Methods for understructure control of material. Experimental testing of fatigue, calculation of fatigue.
Goals and objectives of the course in terms of competences and skills	Preliminary knowledge in Mathematics and Strength of materials is necessary. Main goals of this subject are to obtain skill in machine structures design and current statement evaluation. After this course students will be able to design machinebuilding structures and structural elements subjected to creep and fatigue loading conditions.
Structure and tasks of independent studies	Home works will be planned in the course.
Recommended literature	1. G. Ziegeler. Maschin en dynamik Gemany. 1990. 2. W. Callister. Materials Science and Engineering. UK. 1985.2. W. Wosnizok. Werkstoffe. Gem. 1996. 3. R. Maksimov. Ustalostj i vinoslivostj meterialov. ?. 1978. 4. Crouch. New materials in mechanical engineering. UK. 1999.
Course prerequisites	Mathematics, Strength of materials.

### Course outline

Theme	Hours
Main definitions for solid state deformable bodies mechanical behaviour: stresses, strains, forces, bending moments. Tasks and boundary conditions.	4
Machinebuilding materials mechanical behaviour. Elastic materials. Metals, polymers, ceramics.	6
Machinebuilding plastic and quaziplastic materials. Metals. Damage theory. Quaziplastic polymers, ceramics and concrete behaviour.	8
Viscoelastic material behaviour. Creep and relaxation. Models and non-linear Hook's law.	8
Creep. Fatigue. Forms of cycles. Veller law. Baily law.	10
Cracks under cyclic loads.	12

### Learning outcomes and assessment

Learning outcomes	Assessment methods
Stress and strain in elastic, plastic and visco-elastic bodies.	Verification work.
Oscillations in systems having one and more degrees of freedom. Resonance. Material behaviour under cickling loads.	Verification work.
Damage accumulation theory under creep and fatigue loading conditions.	Verification work.
Fatigue life and durability of structures and structural elements.	Verification work.

### Study subject structure

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