



RTU Course "Theory of Elasticity, Viscoelasticity and Plasticity"

15325 Teorēt.mehānikas un materiālu pretestības katedra

General data

Code	MMP518
Course title	Theory of Elasticity, Viscoelasticity and Plasticity
Course status in the programme	Courses of Free Choice
Course level	Post-graduate Studies
Course type	Academic
Field of study	Mechanics, Mechanical Engineering, Machine Building
Responsible instructor	Krasņikovs Andrejs
Volume of the course: parts and credits points	1 part, 4.0 Credit Points, 6.0 ECTS credits
Language of instruction	LV, EN, RU
Possibility of distance learning	Not planned
Abstract	Mechanical vibrations. Elastic potential. Energy potehtial principles. Numerical methods. Approximations. Ritz method. 2D and 3D problems. Plates and shells. FEM. Plates stability and vibrations. Computers software. Theory of plasticity, main hypothesis. Main postulates. Viscoplastic matherial models. Creep. Stress relaxation. Vibration damping.
Goals and objectives of the course in terms of competences and skills	The aim of the study course is to teach students: to analyze the design of flexible plastic and viscoelastic materials, determine the design strength, set design deformed state, the design engineer.
Structure and tasks of independent studies	During the course students should be able to perform the independent work on the themes: 1). Flexible material and konstrukcijas.Sijas, plates, cups, 2). Plastic material. Plastic beam, shaft, 3). viscoelastic materials. Creep and stress relaxation.
Recommended literature	1. Л. Качанов Теория вязкоупругости. М. 1986. 2. Л. Качанов Теория пластичности. М. 1989. 3. R.M. Christensen Theory of Viscoelasticity, N-Y. 2003.
Course prerequisites	Resistance of materials, theoretical mechanics, mathematics, physics

Course outline

Theme	Hours
Stress, strain, Hook Law, anisotropy, large and small deformation.	12
Resilient materials and design. Beams, plates, shells.	10
Plastic material. Plastic beam, shaft drive. Drucker postulate, Treska's and Mizess hypotheses.	16
Viscoelastic materials. Creep and stress relaxation. Referred Mr Voigt and Kelvin models. Linear and nonlinear elasticit	10

Learning outcomes and assessment

Learning outcomes	Assessment methods
Knowledge of: Hook laws for flexible, plastic and viscoelastic materials	Test work on: Hook laws for flexible, plastic and viscoelastic materials
Knowledge of: deformed state for plastic construction	Assessment test
Knowledge of: a linear viscoelastic material	Test work on: a linear viscoelastic material

Study subject structure

Part	CP	ECTS	Hours per Week			Tests			Tests (free choice)		
			Lectures	Practical	Lab.	Test	Exam	Work	Test	Exam	Work
1.	4.0	6.0	2.0	1.0	0.0		*				