



RTU Course "Mechanics of Composite and Elastic Materials"

15325 Teorēt.mehānikas un materiālu pretestības katedra

General data

Code	MMP343
Course title	Mechanics of Composite and Elastic Materials
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	Gonca Vladimirs
Academic staff	Kononova Olga Krasņikovs Andrejs
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	Classification of elastomers. Creep and relaxation. Mechanical models. Walter principle. Hysteresis. Creep phenomenon for metal structures. composite material properties. Reinforcement structures. Composites manufacturing technology. Stress approaches. Strength criteria. Material structure optimization.
Goals and objectives of the course in terms of competences and skills	The aim of the study course is to help students to acquire skills required to calculate and analyze beams and bars of engineering construction, taking into account assigned requirements and criteria. The task - to assess the strength and stability for designed construction.
Structure and tasks of independent studies	Studying the main topics of the study subject and preparing for the assessment tests and experiments on the application of the typical materials, applying the computer program. Development of the study project consulting recommended literature and attending the tutorials of the lecturer.
Recommended literature	1. E.Lavendel. Расчет резинотехнических изделий. М., 1976.232 s. 2. E.Lavendel. Прикладные методы расчета изделий из высокоэластичных материалов. Рига. 1980. 237. 3. S. Krishan, K. Chaula. Composite materials. USA. 1982. 4. S. Timoshenko. Strength of materials. USA. 1985. 5. R. M. Jones. Mechanics of composite materials. USA. 1989
Course prerequisites	Mathematics, physics, mechanics.

Course outline

Theme	Hours
Elastomer and its models. Classification. The basic assumptions. Mathematical model. Physical equations.	3
An experimental method of elastomer study.	2
Viscous elastic properties of materials compliance in calculations. Relaxation. Creep. Hysteresis. Mathematic's models.	4
Material fatigue at the time variable stresses. Temperature factors.	2
Rheology. Models of description of properties. Theory of cracks. Mechanics of destruction.	4
ESM software application for predicting the properties of materials and durability calculations.	4
Composite materials classification and properties. Mathematical model. Physical equations.	3
Reinforcement of composite structures. Manufacturing technologies. Stress calculation method.	3
Strength criteria. Experiments.	3
ESM software application for the prediction of composite material properties and durability calculations.	4

Learning outcomes and assessment

Learning outcomes	Assessment methods
Students are able to analyze the elastomer and composite material mathematical models and physical equations.	Test and examination tasks on elastomer and composite material models and physical equations.
Students are able to perform and analyze the experimental studies of elastomers and composite materials.	The exam: applying the experimental results a student should get a physical equation and make conclusions on elastomer and composite materials.
Students are able to design the material composition in terms of temperature, time and temporary strength requirements.	Study project: elastomers, and composite material properties and survivability prediction calculations with computer software programs.

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	*		