RTU Course "Mechanics of Composite Materials"

15325 Teorēt.mehānikas un materiālu pretestības katedra

General data

Code	MMP532
Course title	Mechanics of Composite Materials
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	Kalinka Juris
Academic staff	Krasņikovs Andrejs 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
Abstract	Composite materials. Fibers. Matrix materials. Types of composite materials. Calculation of the streses and strains in composite materials. The methods and models of micromechanics of composites. The model of the unidirectional composite. The model of the composite, armed with short fibers. FEM apliccation in the micromechanics of composite materials. Macromechanics of composites. Strength and fracture in composites.
Goals and objectives of the course in terms of competences and skills	Introduce students to the specifics of mechanics of composite materials. The folloving tasks should be solved: 1.Calculation of strength and stress; 2.Application of the methods of micromechanics; 3.Application of FEM using computer software; 4.Calculation of strength of composite materials; 5.Experiments with composite materials
Structure and tasks of independent studies	Individual work to be done applying the FEM software (SolidWorks/COSMOSWorks) 1.Calculation of stress and strength in the macromodel of composite material, which consists of fiber matrix 2.Calculation of elastic constants of the composite material 3.Calculation of construction of the composite material 4.Experiments performed with composite materials
Recommended literature	E.Lavendelis "Materiālu pretestība".Rīga.1986.Krishan K.Chawla.Composite materials.USA.1987.
Course prerequisites	Theoretical mechanics. Strength of materials. Physics. Mathematics.

Course outline

Theme	Hours
Composite materials, components of composite materials	4
Fibers and matrix	4
Calculation of streses and strains	4
Methods of micromechanics	4
Models of micromechanics	4
Yield of unidirectional compozites	4
Bending of beam made of compozite material	4
Stress calculation in composite , armed with short fibers	4
The micromechaics of thin vall constructions	4
The precise micromechanics	4
Usage of finite element method (FEM) for calculation of micromechanic models	4
The Hook`s law	4
The macromechanics	4
Strength calculation of materials	4
Specifics of experiments	4
Appliance of specifics of constructions	4

Learning outcomes and assessment

Learning outcomes	Assessment methods
Students will be able to use micromechanical proceses in the loading of composite materials	Questions at the examination
Students will be able to use micromechanic methods in calculation of composite materials	Questions at the examination
Students will be able to calculate the strength of composite materials	Questions at the laboratory works
Students will be able to create composite materals with the preconditioned qualities	Questions at the seminars

Students will be able to create optimal construction projects with composite materials	Questions at the seminars
Students will be able to conduct an experiment taking into account the specifics of composite materials	Questions at the laboratory works

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	1.0		*	