RTU Course "Resistance of Materials"

15325 Teorēt.mehānikas un materiālu pretestības katedra

General data

Code	MMP107
Course title	Resistance of 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	Strautmanis Guntis Kalinka Juris Beresņevičs 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
Maximum auditorium capacity	25
Maximum number of students per semester	50
Abstract	Basic hypotheses. Calculation chart. Stress. Deformations. Theory of strength. Strain (compression). Twisting. Bend. Dispacement. Stress changing from time. Calculation of plates and pipes. Calculus of approximations. Calculable programs.
Goals and objectives of the course in terms of competences and skills	The aim of the study course is to provide studying ability to calculate and analyse beams, and squared beams, taking technical constructions attention the set requirements and criteria. The task is to estimate stress and stability set for a beam.
Structure and tasks of independent studies	Studying the main topics of the study subject and preparing for test works on the beam construction. Development of the study project consulting recommended literature and attending the tutorials of the lecturer.
Recommended literature	1. E. Lavendelis. Materiālu pretestība. Rīga. 1986. 2. E. Lavendelis., A. Valdmanis. Materiālu pretestība. Rīga. 1976. 3. R.C. Hibbeler. Mechanics of materials. USA. 2000. 4. S. Timoshenko. Strength of materials. USA. 1985. 5. V. Gonca, S. Gluhihs. Mehānika. Galīgo elementu metode. Rīga.2002.
Course prerequisites	Mathematics, physics, theoretical mechanics.

Course outline

Theme	Hours
Basic tasks.	2
Mechanical verifications of materiāls. Deformations, stress.	4
Internal forces. Verifications of epures. Algorithms of calculation of resistance.	6
Strain (compression). Permissible strain. Deformed state of beam. Scale effects.	4
Bend. Hypotheses. Stress and deformations of bend. Complete checking of beam for strength and stiffness.	6
Theory of strength. Potential energy of deformation.	6
Twisting of round and unround beams. Hypotheses. Stress and deformations. Membran's analogy.	4
Calculation of strength of beam(squared beam) at a difficult ladening. Center of bend. Stiffness of construction's el.	6
Mora integral. Ritz method.	4
Statically indefinable constructions. Drafting of three groups of equalizations. Frames with the closed contour.	6
Finite element method. FEM and Ritz method for beam.	4
Buckling failure (loss of stability) Cross-bending. Algorithm of Euler's method. „?" method.	6
Dynamic loading. Method of forces. Method of displacement. Resonances. Harmful and useful vibrations.	6

Learning outcomes and assessment

Learning outcomes	Assessment methods
A student can analyse the ladening of a beam and cored construction.	Task on examination: epures of forces and moments. determination of dangerous section.
A student can analyse and calculate deformations and stress at strain, at twisting and at bend.	Assessment test and task in examination on the algorithm of calculation of strength.
A student can analyse statically indefinable constructions.	Assessment test and task in examination: solving the statically indefinable cored systems, using canonical equalizations.

A student can analyse and calculate beam’s buckling.	Assessment test and task in examination: Eulera un ? methods algorithms.
A student can realize methodology for calculation of beam fully.	Study project: complete calculation of beam at a difficult ladening.

Study subject structure

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