RTU Course "Technical System Vibration and Stability"

15325 Teorēt.mehānikas un materiālu pretestības katedra

General data

Code	MTM409
Course title	Technical System Vibration and Stability
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	Vība Jānis
Academic staff	Zakrževskis Mihails
Volume of the course: parts and credits points	1 part, 4.0 Credit Points, 6.0 ECTS credits
Language of instruction	LV, RU
Possibility of distance learning	Not planned
Maximum auditorium capacity	25
Maximum number of students per semester	50
Abstract	Composition of motion differential equations for technical systems. Stability of equilibrium. Vibration of linear discreet systems. Parametric vibrations. Stability. Free and forced vibration of rods, shafts, beams. Non-linear cases. Simple vibrations of discs plate and shells. Vibration of rotors. Stability.
Goals and objectives of the course in terms of competences and skills	To acquaint students with the fundamentals of technical fluctuations. In order to achieve this aim the following tasks should be fulfilled: 1st Analyse the fundamental relationships of the discrete and distributed system vibrations. 2nd Teach students how to solve the task on oscillations and vibrations applying the computer programs. 3rd Improve students' knowledge of physics related to the fields of vibrotechnics and vibromachinery 4th Teach students the skills required to be proficient in the calculation of the vibration of the technical and engineering facilities.
Structure and tasks of independent studies	Within the framework of the present course the students should perform independent work on the following themes: 1st Solving the tasks on static and dynamic stability applying the MathCAD program. 2nd Modelling the ribbon mechanism vibration tasks applying the Working Model. 3rd Calculating the dynamic power of vibration applying the Solid Work Program.
Recommended literature	O. Kepe J. Vība, Teorētiskā mehānika, Rīga, Zvaigzne, 1982.g., 577lpp; O. Kepe J. Vība, Teorētiskā mehānika, Dinamika I., Rīga, RTU, 1981., 259.lpp. O. Kepe J. Vība, Teorētiskā mehānika, Dinamika II., Rīga, RTU, 1996. g. 173. lpp; J. Vība, Vibrodinamisko mašīnu optimizācija un sintēze, Rīga, "Zinātne", 1988. g., 252.lpp.
Course prerequisites	Math. Mechanics. Physics.

Course outline

Theme	Hours
Introduction to vibration and stability.	8
Linear Theory of fluctuations.	8
Discrete oscillation system modeling with computers.	8
Non-linear system analysis, optimization and synthesis by computer.	8
Rod tensile and torsional oscillation modeling.	8
The beam bending fluctuation analysis and simulation modeling.	8
Simplest vibro machine oscillation motion simulation	8
Fluctuations in the system for use in consumer and technology	8

Learning outcomes and assessment

Learning outcomes	Assessment methods
At the end of the course students will be able to evaluate the fluctuation/vibration processes in nature in different forms.	Laboratory work.
At the end of the course students will be able to provide examples on the technical movements and stability.	Questions in the practical work
At the end of the course students will be able to analyze major changes of the mechanisms and machinery.	Questions at the end of the lecture.
At the end of the course students will be able to distinguish between fluctuations/vibrations and the stability of technical and engineering tasks.	Assessment test
At the end of the course students will be able to formulate a mechanical object resonance tasks.	Assessment test

At the end of the course students will be able to assess the impact of fluctuations and stability on the machine dynamics and technological processes.	Exam

Study subject structure

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