



RTU Course "Dynamics and Control of Machines (for Master Degree students)"

15325 Teorēt.mehānikas un materiālu pretestības katedra

General data

Code	MTH502
Course title	Dynamics and Control of Machines (for Master Degree students)
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
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
Maximum auditorium capacity	25
Maximum number of students per semester	50
Abstract	The main groups and structure of controlled machines with dynamic load. Control as dynamic process with a definite goal. Typical mathematical models of the actuating mechanisms and drive systems of machines. Linearization and reduction of equations. Essentially nonlinear elements. Principles, algorithms, implementation methods of the automatic control, their classification. System stability and functioning quality, basic methods of analysis and synthesis. Concepts of extremal, adaptive, hierarchical control systems.
Goals and objectives of the course in terms of competences and skills	To acquaint students with the fundamentals of machine dynamics and control. This aim is achieved fulfilling the following tasks: 1st Analyzing the fundamental relationships of dynamics and control; 2nd Teaching students how to solve the task on machine dynamics applying the computer software. 3rd Improving students' knowledge of physics and mechanics in the fields related to vibrotechnics and machinery. 4th Providing students with the skills required to be proficient in the calculations of technical and mechanical engineering objects.
Structure and tasks of independent studies	Within the framework of the present study subject the students should perform the independent work on the following themes: 1st Solving machine dynamic tasks applying the MathCAD program. 2nd Modelling the machine management tasks applying the Working Model simulation software. 3rd Calculating the machine element power applying the Solid Work software 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 machine dynamics and management	8
Optimization Theory	8
Electromechanical system modelling applying the computer software	8
Adaptive system analysis, optimization and synthesis	8
Vibro technological machinery modelling	8
Self-leading process modelling	8
Simplest vibro machine modelling	8
Vibrotechnics application for the household and technical needs	8

Learning outcomes and assessment

Learning outcomes	Assessment methods
At the end of the course the students are able to examine the dynamics and control processes in nature in different forms.	Laboratory work.
At the end of the course students will be able to provide examples of site management positions.	Practical tasks.
At the end of the course students will be able to analyze the mechanism and machine control options.	Questions at the end of the lecture.
At the end of the course students will be able to distinguish between machine dynamics and machine control tasks.	Assessment test.
At the end of the course students will be able to formulate a mechanical object control tasks.	Assessment test.
At the end of the course students will be able to evaluate the mechanical engineering problems.	Exam.

Study subject structure

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