RTU Course "Parametric Modelling of Mechanical Objects"

15E03 Lidaparātu teorijas un konstrukcijas katedra

General data

Code	TAS511
Course title	Parametric Modelling of Mechanical Objects
Course status in the programme	Compulsory/Courses of Limited Choice; Courses of Free Choice
Course level	Post-graduate Studies
Course type	Academic
Field of study	Mechanics, Mechanical Engineering, Machine Building
Responsible instructor	Kuzņecovs Sergejs
Academic staff	Pavelko Vitālijs
Volume of the course: parts and credits points	2 parts, 4.0 Credit Points, 6.0 ECTS credits
Language of instruction	LV, EN, RU
Possibility of distance learning	Not planned
Abstract	Creating and editing of parametric sketches using geometrical and dimensional constraints. Creating three-dimensional working drawings from separate parts. Assembly drawings from complex parts, subassemblies, and using databases for control of modification of parts. Fundamentals of the strategy and tactics of making sculptural forms. Test calculations and determination of dimensions of elements. Formation of multiview drawings of details and assembly drawings of machines and mechanisms.
Goals and objectives of the course in terms of competences and skills	Acquire skills to develop three-dimensional working drawings and assembly drawings of complex hardware. To learn to use databases for control of modification of the parts.
Structure and tasks of independent studies	Computer aided strength calculation of a crank mechanism (8h.) Development of the multiview and assembly drawings of a crank mechanism (8h.) Design and calculation of gas distribution mechanism elements (4h.) Analysis of the strength calculation results and elaboration of values of structural dimensions (4h.) Development of multiview and assembly drawings of a gas distribution mechanism (8h.)
Recommended literature	1. COMPUTER-AIDED DESIGN, ENGINEERING, AND MANUFACTURING: Systems Techniques And Applications, 2001 by CRC Press LLC Boca Raton London New York Washington, D.C. , -285 pages. 2. Traktoru un automobiļu motoru konstrukcija, teorija un aprēķins LLA lauksaimn. mehanizācijas fak. studentiem [J. Blīvis, V. Gulbis, J. Kažoks, V. Kleins, G. Melgalvs, L. Ozoliņa, L. Pēks, G. Pommers] J. Kažoka, G. Melgalva red. Rīga: Zvaigzne 1980 - 373 lpp. 3. M. Banovs, I. Pavelko. Virszemes transporta dzinēju stiprība (Virzuļu dzinēju stiprība)/ Lekciju konspekts. – Rīga: AI RTU, 2001. – 58 lpp. ISBN 9984-690-16-4 4. "AutoDesk Inventor" help. 5. "Mechanical Desktop" help. 6. Books / LabVIEW Digital Signal Processing.// Hardcover: Publisher: McGraw-Hill Professional; 1 edition (May 6, 2005), Language: English, ISBN: 0071444920, -205 pages.
Course prerequisites	Tension, compression, bending, torsion calculations. Permissible stress and factor of safety. Tolerances, allowances, quality of surface processing. Using computer aided analysis of machines and mechanisms. Fundamentals of the finite element method.

Course outline

Theme	Hours
Connecting rod strength calculation by the finite element method. Analysis of results. Elaboration of dimension values.	6
Piston group strength calculation by the finite element method. Analysis of results. Elaboration of dimension values.	6
Cylinder liner strength calculation by the finite element method. Analysis of results. Elaboration of dimension values.	6
Multiview and assembly drawings of machines and mechanisms. Tolerances and allowances. Quality of surface processing.	4
Formation of multiview and assembly drawings of a crank mechanism.	10
Ways of constructive arrangement of the gas distribution mechanism. Preliminary determination of dimensions of elements.	2
Cam profiling. Development of computer aided model of the camshaft.	4
Development of computer aided model of the pusher and reciprocating lever.	3
Calculation of dimensions and development of computer aided model of the compression spring.	3
Development of computer aided model of the admission valve and atmospheric valve.	2
Development of computer aided model of the cylinder head.	4
Test calculations of a gas distribution mechanism elements. Analysis of results. Elaboration of dimension values.	6
Development of multiview and assembly drawings of a gas distribution mechanism.	8

Learning outcomes and assessment

Learning outcomes	Assessment methods
Able to calculate strength of the elements of a crank mechanism by the finite element method.	Test. Computer aided calculation of strength of a crank mechanism.

Able to develop multiview and assembly drawings of a crank mechanism according to the results of calculation, to determine tolerances and allowances correctly.	Computer aided design of a crank mechanism.
Able to develop computer aided models of gas distribution mechanism elements and its assembly.	Test. Design and calculation of gas distribution mechanism' elements.
Able to develop multiview and assembly drawings of a gas distribution mechanism according to the results of calculation, to determine tolerances and allowances correctly.	Computer aided design of a gas distribution mechanism.
Able to use modern software products to solve the tasks of the specific objects modelling.	Exams.

Study subject structure

Part	CP	ECTS	Hours per Week			Tests			Tests (free choice)		
			Lectures	Practical	Lab.	Test	Exam	Work	Test	Exam	Work
1.	2.0	3.0	1.0	1.0	0.0		*				
2.	2.0	3.0	1.0	1.0	0.0		*				