RTU Course "Aeroelasticity"

15E03 Lidaparātu teorijas un konstrukcijas katedra

General data

Code	TAS313
Course title	Aeroelasticity
Course status in the programme	Compulsory/Courses of Limited Choice
Course level	Undergraduate Studies
Course type	Professional
Field of study	Mechanics, Mechanical Engineering, Machine Building
Responsible instructor	Pavelko Vitālijs
Academic staff	Pavelko Igors
Volume of the course: parts and credits points	1 part, 2.0 Credit Points, 3.0 ECTS credits
Language of instruction	LV, EN, RU
Possibility of distance learning	Not planned
Abstract	Problems and fundamentals of aeroelasticity are examined. The first part includes the aircraft structure mechanics: bending and torsion of the beam-form structure. The second part includes analysis of fundamentals and methods of steady and unsteady aerodynamics. The problems of static aeroelasticity are considered in the third part: divergence of a wing, decreasing of ailerons efficiency. Phenomena of dynamic aeroelasticity is examined in the forth part (flutter of a wing, dynamic reaction).
Goals and objectives of the course in terms of competences and skills	Main goal: Provide an opportunity to learn modern analytical and experimental research methods at the level of application for approximate estimation of aircraft aeroelastic parameters.
Structure and tasks of independent studies	Course Work Part 1: Elastic structure properties (2h). Course Work Part 2: Divergence of a wing and decreasing of ailerons efficiency (4h). Course Work Part 3: The critical speed of flutter of a wing (4h) 3.Work with literature - (6h)
Recommended literature	1. V.Pavelko. Aeroelastības pamati: Mācību līdzeklis. - Rīga: RTU, 2008, 60 lpp. 2. Bisplinghoff, R. L., Ashley, H., and Halfman, R. L., Aeroelasticity, Dover, New York, 2006, 850pp. 3. Airworthiness. An Introduction to Aircraft Certification: A Guide to Undestending JAA, EASA and FAA Standards. By Filippo De Florio. First edition. Esevier, 2006, 247pp. 4. Jitendra R. Roal, Jatinder Singh. Flight mechanics, modeling and analysis. CRC Press, 2008. 416 pp. (iespiešanā) 5. Aircraft Systems & Components: Topical Maintenance Books. - Jeppesen Publish. 2000.- 215 pp. 6. V. Pavelko. Konstrukciju dinamika. Kursa darba uzdevumi un izpildīšanas metodiskie norādījumi – Rīga: RTU, 2005. – 10 lpp. 7. Vibration problems in engineering, By S.Timoshenko.-Toronto, 1984.
Course prerequisites	Mechanics, Aircraft aerodynamics, Strength of materials, Structural analysis of thin-walled structure, Computer aided design, Dynamics of Structure

Course outline

Theme	Hours
Problems of aeroelasticity. Elastic performance of aircraft components.	2
Bending and torsion of the beam-form structure.	2
Dynamic characteristics: natural frequencies and modes.	2
The methods of analysis.	4
Some fundamentals of aerodynamics. Steady and unsteady aerodynamics.	2
Static aeroelasticity. Divergence of a wing.	4
Decreasing of ailerons efficiency.	2
Phenomena of dynamic aeroelasticity.	2
Bending-torsion flutter of a wing.	2
Calculation of the critical speed of flutter. Others kinds of flutter.	4
Dynamic reaction. Effect of the dynamic performance to stresses and strain state of a structure.	4
Experimental methods of aeroelasticity.	2

Learning outcomes and assessment

Learning outcomes	Assessment methods
Be able to estimate elasticity and dynamics properties of the aircraft structure.	The first part of the course work: Elastic structure properties.-Exam.
Be able to analyse the problems of static aeroelasticity using simple methods.	Course Work Part 2: Divergence of a wing and decreasing of ailerons efficiency.-Exam.

Be able to analyse the problems of dynamic aeroelasticity using simple methods.	Course Work Part 3: The critical speed of flutter of a wing.-Exam.

Study subject structure

Part	CP	ECTS	Hours per Week			Tests		
			Lectures	Practical	Lab.	Test	Exam	Work
1.	2.0	3.0	1.0	0.5	0.5		*	