



RTU Course "Fundamentals of Automatics"

15E01 Aeronautikas tehnoloģiju katedra

General data

Code	TAD311
Course title	Fundamentals of Automatics
Course status in the programme	Compulsory/Courses of Limited Choice
Course level	Undergraduate Studies
Course type	Professional
Field of study	Transport
Responsible instructor	Pavelko Igors
Academic staff	Pavelko Vitālijs Ozoliņš Ēriks
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	Main definitions of automatics. Classification and main elements of automatic control systems (ACS) for engines of aircraft and ground transport. Typical links of ACS. Parameters, dynamic characteristics and peculiarities of typical links of ACS. Control objects. Characteristics and peculiarities of control objects. Determination and analysis of linear ACS dynamic characteristics. Quality of the control process. Stability of ACS. Criteria of stability of ACS. Correction of ACS. A structure and operation of typical governors of the powerplants in aviation transport. (JAR-66, mod.15 - 16)
Goals and objectives of the course in terms of competences and skills	To get knowledge on the general regularities of the automatic control theory and on the ways of analysis and synthesis of automatic control systems. To acquaint with structure and operation of typical governors of the powerplants in aviation transport.
Structure and tasks of independent studies	Analysis of automatic control system of the heat engine (5h.) Study of structure and operation of typical governors of the powerplants in aviation transport (5h.) Independent work with literature in accordance with the subject program (6h.)
Recommended literature	1. I. Pavelko. Automātikas pamati / Lekciju konspekts. – Rīga: RTU Izdevniecība, 2006. – 58 lpp. ISBN 9984 – 32 – 648 – 9. 2. I. Pavelko. Gāzturbīnas dzinēju vadība / Lekciju konspekts. – Rīga: RTU Izdevniecība, 2003. – 44 lpp. ISBN 9984 – 690 – 23 – 7. 3. Черкасов Б. А. Автоматика и регулирование воздушно-реактивных двигателей. 3-е изд., перераб. и доп. М.: «Машиностроение», 1988. – 360 стр.: ил. 4. J. Osis. Automātiskā vadība un regulēšana. "Zvaigzne", Rīga: 1969, 268 lpp. 5. Основы теории автоматического регулирования / Под ред. Крутова В. И. «Машиностроение», М.: 1984, 368 стр. 6. В. Ф. Березлев, И. И. Гвоздицкий и др. Системы автоматического управления частотой вращения роторов газотурбинных двигателей. – Киев: 1985. 7. С. М. Дорошко, Е. М. Кальченко. Система автоматического управления двигателем Д-36. – Рига: 1990. 8. Doroshko S. Fundamentals of Automatics. Riga: RTU, 2002. - 82p.
Course prerequisites	Differential and integrated computing basics. Hydrostatic pressure and its properties. Fluid consumption in orifices and nozzles. Consumption equation. Design and operation of a hydraulic amplifier. Classification, design and operation of gas turbine engines. Jet and propeller thrust. Speed and altitude performance of GTE. Electrical voltage, current and resistance. Design and operation of an electric motor.

Course outline

Theme	Hours
Main terms and definitions. Governing principles and main types of control systems.	4
Main components of a governor.	2
Typical components of automatic control systems. Transient responses and frequency responses of typical components.	4
Properties and responses of control objects.	3
Dynamic analysis of the linear automatic control systems.	5
Stability of automatic control system and methods of its estimation.	3
Correction of automatic control systems.	3
A structure and operation of typical governors of the powerplants in aviation transport.	8

Learning outcomes and assessment

Learning outcomes	Assessment methods
Able to execute an analysis of dynamics of the automatic control system with a governor of direct operation.	Control work "Analysis of automatic control system of the heat engine".
Able to understand the principles of control of the specific gas turbine engine and to describe operation of its fuel metering system.	Control work "Automatic control and regulation of the specific GTE".

Able to identify components of the fuel metering system of the specific gas turbine engine and to orientate in their mutual connections.	Control work “Automatic control and regulation of the specific GTE”.
Able to orientate in general questions of the automatic control theory.	Exam.

Study subject structure

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