COURSE DESCRIPTION CARD - SYLLABUS

Course name
Introduction to automation [S1Lot2-SLiPL>WdA]

Course

Field of study
Aviation

Year/Semester
2/4

Area of study (specialization)
Aircraft Engines and Airframes

Profile of study
general academic

Level of study
first-cycle

Course offered in
Polish

Form of study
full-time

Requirements
elective

Number of hours

Lecture
15

Laboratory classes
30

Other
0

Tutorials
0

Projects/seminars
0

Number of credit points

3,00

Coordinators

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Lecturers

Prerequisites

Basic knowledge of mathematics, physics, mechanics, fluid mechanics, thermodynamics, electronics. Ability to think analytically in solving problems. Independence in acquiring and improving knowledge and skills.

Course objective

Getting to know the principles of operation, purpose and service of currently used industrial automatic control devices, with particular emphasis on the automation and control systems used in aircraft. Acquisition of skills in using computer control systems

Course-related learning outcomes

Knowledge:
has a structured and theoretically founded general knowledge in the field of key technical issues and detailed knowledge in the field of selected issues related to air transport
has a basic knowledge of the mechanisms and laws governing human behavior and psyche

Skills:

can obtain information from various sources, including literature and databases, both in Polish and in English, integrate them properly, interpret and critically evaluate them, draw conclusions and exhaustively justify their opinions
the student knows how to use theoretical probability distributions. The student is able to analyze and interpret statistical data. The student is able to use the methods and tools of mathematical statistics in engineering practice
can analyze facilities and technical solutions, can search in catalogs and on manufacturers' websites, ready components of machines and devices, including means and devices, assess their suitability for use in their own technical and organizational projects
is able to organize, cooperate and work in a group, assuming various roles in it, and is able to properly define priorities for the implementation of a specific task
is able to plan and implement the process of own permanent learning and knows the possibilities of further education (2nd and 3rd degree studies, postgraduate studies, courses and exams conducted by universities, companies and professional organizations)

Social competences:
understands that in technology, knowledge and skills very quickly become obsolete
is aware of the social role of a graduate of a technical university, in particular understands the need to formulate and convey to the society, in an appropriate form, information and opinions on engineering activities, technological achievements, as well as the achievements and traditions of the engineer profession

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture
Assessment of activity in class, assessment of homework, final test in writing at the end of the semester, colloquium includes test questions or problem tasks, written exam covering the subject of the subject assessed on a scale of 0 to 100%, the final grade lectures given by more than one lecturer based on weighted average, final grade for more than one component grade based on weighted average.
Laboratory
Verification of individual preparation for classes, including material from a single exercise or block of exercises, assessment of individual exercise reports made by the student, colloquium at the end of the semester, colloquium includes test questions or problem tasks, all grades on a scale of 0 to 100%, final grade based on the weighted average of all component ratings

Programme content

Basics of computer science, data transmission standards in microprocessor systems. Applications of logic and electronic circuits.
Introduction to control theory, basic elements and dynamic systems, construction, operation and application of control systems.

Course topics

Introduction to automation. Basic concepts of automation. Types of control. Types of automation systems. Mathematical model of a dynamic system. Transmittance of a dynamic linear system. Characteristics of linear systems in time and frequency domain. The concept of dynamic system state. The method of state variables. Dynamic object equations: state equation and output equation. Matrix of transmittance. Steerability and observability. Model of the regulation system. Regulator signals. Properties of automatic control systems. Static and astatic regulation system. Adjustment indicators. Regulation stability. Rules for selecting regulators.
PART - 66 (THEORY - 22.5 hours, PRACTICE - 22.5 hours)
MODULE 5. ELECTRONIC INSTRUMENT SYSTEMS, DIGITAL TECHNIQUES
5.1 Electronic instrument systems
Typical system layout and cockpit layout of electronic instrument systems [2]
5.2 Numbering systems
Numbering systems: binary, octal and hexadecimal;
Demonstrate conversions between decimal and binary, octal and hexadecimal, and vice versa. [-]
5.3 Data Conversion

Analog data, digital data;
Operation and application of analog to decimal, decimal to analog converters, inputs and outputs, restrictions of various types. [-]
5.4 Data bus
Operation of data buses in aircraft systems, including knowledge of ARINC and other specifications.
Aircraft network / Eternet [-]
5.5 Logic circuits
a) Identifying commonly used symbols of gates, tables and peer circuits;
Applications used in aircraft systems, schematic diagrams. [-]
b) Interpretation of logical diagrams. [-]
5.6 Basic computer structure
a) Computer technology (including bits, bytes, software, hardware, central processing unit (CPU), integrated circuits (IC) and various memory tools such as RAM, ROM, PROM);
Computer technology (used in aircraft systems). [-]
b) Computer related terminology;
Operation, layout and interface of the main components of a microcomputer and their associated bus systems;
Information contained in the words of single and multi-address orders;
Terms relating to memory;
Operation of typical memory devices;
Operation, advantages and disadvantages of various data archiving systems.

Teaching methods

Lecture in the form of a presentation
Laboratory classes in the form of solving thematic problems

Bibliography

Basic:
1. Pawlak W.I., Wiklik K., Morawski J.M., Synteza i badanie układów sterowania lotniczych silników turbinowych metodami symulacji komputerowej, Wyd. Biblioteka Naukowa Instytutu Lotnictwa, Warszawa, 1996 r
2. Bodner W. A., Automatyka silników lotniczych. Wyd. MON, Warszawa, 1958 r
3. Balicki W., Szczeciński S., Diagnozowanie lotniczych silników turbinowych, Wyd. Biblioteka Naukowa Instytutu Lotnictwa, Warszawa, 2001 r
4. H. Orłowski - Komputerowe układy automatyki, WNT, Warszawa, 1987

Additional:
1. Staniszewski R. Sterowanie zespołów napędowych, Wyd. Komunikacji i Łączności Warszawa, 1980 r
2. Niederliński - Systemy komputerowe automatyki przemysłowej, t. 1 i 2, WNT, Warszawa, 1984
3. Elementy, urządzenia i układy automatyki , Kostro Jerzy, WsiP, Warszawa, 2008

Breakdown of average student's workload

	Hours	ECTS
Total workload	75	3,00
Classes requiring direct contact with the teacher	45	2,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	30	1,00