COURSE DESCRIPTION CARD – SYLLABUS

Course name

Introduction to automation

Course

Field of study

Aerospace Engineering

Year/Semester

2/4

Area of study (specialization)

On-board systems and aircraft propulsion

Profile of study

general academic

Level of study

first-cycle studies

Course offered in

polish

Form of study

full-time

Requirements

compulsory

Number of hours

Lecture

30

Laboratory classes

30

Other (e.g. online)

Tutorials

Projects/seminars

Number of credit points

4

Lecturers

Responsible for the course/lecturer:

dr inż. Andrzej Kwapisz

Faculty of Environmental Engineering and Energy

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tel. 616652282

Responsible for the course/lecturer:

Prerequisites

Student starting this course should have knowledge of mathematics and selected physics departments (mechanics, thermodynamics, electrodynamics). He should also have knowledge of signal processing in the time and frequency domains, basic programming and modeling.

Can use a mathematical apparatus to describe selected physical phenomena.

Can show initiative in acquiring new knowledge.

Course objective

Gaining knowledge of the basic elements of automation and automatic control and regulation systems, learning the basics of control systems. Getting to know the methods of synthesis and analysis of the operation of continuous automation systems using analytical methods and digital modeling, with particular emphasis on systems used in aircraft.

Course-related learning outcomes

Knowledge

1. Has a knowledge of the purpose and operation of control systems and automatic regulation. He knows the methods of analysis and optimization of the operation of automatic control systems.

Skills

357 / 5000

Translation results

Has the ability to use the available knowledge resources in electronic form and to independently improve professional qualifications.

Can build a control system and describe its operation.

Can read information from catalogs, manuals and device documentation also in English and prepare documentation for the tasks performed

Social competences

Understands the need to act in accordance with the principles of professional ethics, can work in a diverse group and organize teamwork.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture

Passing the lecture in the form of a written exam includes test questions or problem tasks related to the topic of classes conducted as part of the subject, assessed on a scale from 0 to 100%, additionally, activity in classes is rewarded.

Laboratory

Verification of individual preparation for classes including material from a single one exercises or a block of exercises, evaluation of individual reports on exercises made by the student himself, a test at the end of the semester includes test questions or problem tasks, all grades on a scale from 0 to 100%, final grade based on the weighted average of all obtained component grades.

Programme content

Lecture

Basic concepts related to the control theory, types of objects and control systems. Mathematical description of linear control systems, operator and spectral transfer function, variable state space. Basic automation elements - time and frequency properties. Block diagrams and methods of transforming block diagrams. Properties and selection of regulators and control systems, selection of regulator settings. Stability of continuous linear systems, studies of stability conditions. Nonlinear elements in control systems. Control system quality assesment.

Laboratory

Determination of step and impulse responses of basic automation elements, frequency characteristics. Converting and simplifying flowcharts. Modeling of control and regulation systems, selection of regulator settings, two-position and cascade regulation, determination of quality indicators of regulation. Investigation of the influence of disturbances on the operation of objects and control systems. Windup compensation. Analysis of phenomena occurring in simple control and regulation systems with the use of specialized software.

Teaching methods

Lecture

Multimedia and interactive presentation presenting important issues related to the subject, didactic discussion based on the literature on the subject, informative lecture, problem lecture, case analysis, work on source materials.

Laboratory

Implementation of problem tasks, use of computer tools to support the didactic process, encouraging independent search for optimal solutions.

Bibliography

Basic

1. Brzózka J., Regulatory i układy automatyki, MIKOM 2004
2. Dębowski A., Automatyka - Podstawy teorii, WNT 2008
3. Findeisen W., Technika regulacji automatycznej, PWN 1978
4. Mazurek J. Vogt H. Żydanowicz W., Podstawy automatyki, OWPW 2002
5. Rumatowski K., Podstawy automatyki. Część 1. Układy liniowe o działaniu ciągłym, WPP 2004
6. Rumatowski K., Podstawy regulacji automatycznej, WPP 2008
7. Węgrzyn S., Podstawy automatyki, PWN 1980
8. Żelazny M., Podstawy automatyki, PWN 1976
9. Horla D., Podstawy automatyki. Ćwiczenia laboratoryjne, WPP, 2014

Additional

1. Byrski W., Obserwacja i sterowanie w systemach dynamicznych, UWND AGH Kraków 2007
2. Dorf R.C. Bishop R.H., Modern Control Systems, Upper Saddle River: Prentice Hall, 2001
3. Nise N.S., Control System Engineering. 3th edition, John Wiley & Sons, 2000
4. Ogata K., Modern Control Engineering. 4th edition, Prentice Hal 2002
5. Holejko D. Kościelny W. Niewczas W., Zbiór zadań z podstaw automatyki, OWPW 1985
6. Horla D., Podstawy automatyki. Ćwiczenia rachunkowe. Część 1, WPP, 2014
7. Próchnicki W., Dzida M. Zbiór zadań z podstaw automatyki, WPG 1993
8. Mrozek B. Mrozek Z., Matlab i Simulink. Poradnik użytkownika. Wydanie II, HELION 2004

Breakdown of average student's workload

	Hours	ECTS
Total workload	100	4
Classes requiring direct contact with the teacher	65	2,5
Student's own work (literature studies, preparation for laboratory classes, preparation of reports, preparation for tests)	35	1,5