COURSE DESCRIPTION CARD - SYLLABUS

Course name

Avionics systems

Course

Field of study

Aerospace Engineering

Year/Semester

3/6

Area of study (specialization)

Onboard 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

Other (e.g. online)

Tutorials

Projects/seminars

15

Number of credit points

3

Lecturers

Responsible for the course/lecturer:

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Faculty of Environmental Engineering and Energy

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Responsible for the course/lecturer:

Prerequisites

He has basic knowledge necessary to understand the profile subjects and specialist knowledge about the construction, methods of construction, manufacturing, operation of aviation technology, management of safety systems, impact on the economy, society and the environment in the field of aviation for selected specialties: Aviation Engineering.

Has general knowledge related to selected issues in the field of building avionics systems for manned and unmanned aerial vehicles, including their main components.

Has basic ordered, theoretically founded knowledge of: avionic on-board systems, aircraft propulsion, on-board and ground systems supporting the operation of aircraft, systems for analyzing and decoding flight parameters.

Has a basic knowledge of frequency and voltage converters, power electronics as well as automation systems, microcontrollers, control algorithms, electronic navigation systems used in machines in the aviation industry.

He has general knowledge covering key issues in the field of on-board systems as well as on-board and terrestrial electronic communication systems.

Course objective

The aim of the course is to provide students with specialist knowledge and the necessary skills in the field of construction and design of avionic systems, navigation, communication, flight control, telemetry used in civil and military aviation on manned and unmanned aircraft.

Course-related learning outcomes

Knowledge

Student has detailed knowledge related to selected issues in the field of manned and unmanned aerial vehicles, including on-board systems and their main components. Has extended knowledge of technical vocabulary, in particular specialized terminology used in aviation engineering. Has an ordered, theoretically founded knowledge of mathematics used to analyze the results, create mathematical models and adapt them to the numerical code. Has a basic knowledge of frequency and voltage converters, power electronics as well as automation systems, microcontrollers, control algorithms, electronic navigation systems used in machines in the aviation industry. Has ordered, theoretically founded general knowledge covering key issues in the field of on-board systems as well as on-board and terrestrial electronic communication systems.

Skills

Can use the language sufficiently to understand technical texts in the field of aviation (knowledge of technical terminology). Can prepare and present a short verbal and multimedia presentation devoted to the results of an engineering task. He can use one additional foreign language in verbal communication at the level of everyday language, he can describe in this language the issues related to the field of study he is studying. He can organize and plan the process of designing and maintenance of an uncomplicated on-board device, machine or technical flying object from the group covered by the selected specialty. Has the ability to self-educate with the use of modern didactic tools, such as remote lectures, internet sites and databases, teaching programs, e-books. Can communicate using various techniques in the professional and other environments using the formal notation of construction, technical drawing, concepts and definitions of the field of study studied. He can obtain information from literature, the Internet, databases and other sources. Can integrate the obtained information, interpret and draw conclusions from it. Can develop a safety instruction for a simple and medium complex on-board unit, machine or technical flying object under certain environmental conditions. He can create a system diagram, select elements and perform basic calculations of the mechanical, aerodynamic, automatic, electric and electronic components of a machine or aviation equipment. Can assess material and

environmental costs as well as labor costs for the implementation of aviation modules and on-board devices. Can use basic technical standards for safety.

Social competences

Student can think and act creatively and enterprisingly. Is aware of the importance of the proposed rules of operation and understands the effects of engineering activities, including its impact on flight safety. Is able to properly define the priorities in the operation of the airframe and aircraft engine with regard to ensuring an appropriate level of flight safety while maintaining the required economic criterion.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

The knowledge acquired during the lecture is verified by two 45-minute tests carried out during the 15th and 30th lecture. Each test consists of 5 (open) questions, with different scores. Passing threshold: 70% of points. Passing issues on the basis of which the questions are developed do not go beyond the content presented during the lectures. As part of the project classes, students prepare a presentation on the basis of a selected problem in the field of aircraft avioics systems and present it during classes. At the end of the course, they present a description of the design of a technical solution in the field of avionics and submit it for evaluation.

Programme content

- Construction of avionics systems, some terms / definitions. Avionic system analysis "levels"

- Flight control systems

- Determining the requirements and structure of the bottom-up approach

- Sensors and effectors of avionic systems

- Construction of VOR / DME, TACAN, ILS, NDB navigation systems, basic characteristics of the processed signals

- Communication systems construction and design

- Inertial platforms and navigation data processing algorithms

- Data exchange buses design solutions and design

- Construction and design of navigational information display systems

- Avionic systems programming

- Autopilot examples of solutions for the design of flight control systems

- Terrestrial segment of avionic systems, telemetric data exchange

Teaching methods

Lecture: multimedia presentation, illustrated with examples given on the board.

Project: presentation by the audience on a selected technical problem. Development of an exemplary technical solution of avionics systems and presenting it in the form of a technical description.

Bibliography

Basic

Bilski J., Polak Z., Rypulak A., Awionika, przyrządy i systemy pokładowe, WSOSP, Dęblin 2001

Bociek S., Gruszecki J., Układy sterowania automatycznego samolotem, Oficyna Wydawnicza Politechniki Rzeszowskiej, 1999

Grabiec R., Lotnicze systemy zobrazowania informacji, skrypt WAT, 1996

Kopecki G., Projektowanie lotniczych systemów sterowania uwzględniających sytuacje zwiększonego ryzyka, Oficyna Wydawnicza Politechniki Rzeszowskiej 2019

Kayton M., Fried W.R., Avionic Navigation Systems, Second Edition, John Wiley, 1996,

Moir I., Seabridge A., Aircraft Systems, Longman Scientific & Technical, London, 1992

Dokumentacja techniczna systemów awioniki wybranych statków powietrznych

Additional

Thomas Eismin, Aircraft Electricity and Electronics, McGraw-Hill Education 2019

Mike Tooley i inni, Aircraft Communications and Navigation Systems: Principles, Maintenance and Operation, Butterworth-Heinemann 2007

Mike Tooley i inni, Aircraft Electrical and Electronic Systems: Principles, Maintenance and Operation 1st Edition, Maintenance and Operation, Butterworth-Heinemann 2008

Pallet E.H.J., Aircraft Instrument Systems, IAP, 1993

Pallet E.H.J., Aircraft Instruments and Integrated Systems,Longman Scientific and Technical Series, 1992

Stola M., Wyposażenie samolotów, Wydawnictwo PW, Warszawa, 1978

Tomczyk A., Pokładowe cyfrowe systemy sterowania samolotem, Oficyna Wydawnicza Politechniki Rzeszowskiej, Rzeszów 1999.

Parchański J. Miernictwo elektryczne i elektroniczne, WSiP

John R. Newport, Avionic Systems Design, CRC Press 1994

Shri P.N.A.P. Rao, Avionics Systems Design Development and Integration, DESIDOC 2019

Guoqing Wang Wenhao Zhao, The Principles of Integrated Technology in Avionics Systems, Academic Press 2020

R. P. G. Collinson, Introduction to Avionics Systems, Springer, Boston, MA 2003

Breakdown of average student's workload

	Hours	ECTS
Total workload	74	3,0
Classes requiring direct contact with the teacher	49	2,0
Student's own work (literature studies, preparation for classes, preparation for tests) [1]	25	1,0

[1] delete or add other activities as appropriate