COURSE DESCRIPTION CARD - SYLLABUS

Course name

Eircraft systems

Course

Field of study

Aviation

Year/Semester

3/6

Area of study (specialization)

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

15

Other (e.g. online)

Tutorials

Projects/seminars

Number of credit points

4

Lecturers

Responsible for the course/lecturer:

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Faculty of Transport Engineering

ul. Piotrowo 3; 60-965 Poznań

Responsible for the course/lecturer:

Prerequisites

1 Knowledge: Basic knowledge in the field of mechanics, airframe construction, metrology, strength of materials, non-destructive testing.

2 Skills: He can apply the scientific method in solving problems, carrying out experiments and gain conclusions

3 Competence: He knows the limits of his knowledge and skills; can precisely formulate questions, understands the need for further education

Course objective

- Knowledge of the purpose, construction and principles of operation of the basic technical parameters of devices and systems. Ability to read and interpret indications of on-board equipment.

Course-related learning outcomes

Knowledge

1. has ordered and theoretically founded general knowledge in the field of key technical issues and detailed knowledge of selected issues related to air transport, knows the basic techniques, methods and tools used in the process of solving tasks related to air transport, mainly of an engineering nature

2. has basic knowledge of research methods and how to prepare and conduct research, and knows the rules of editing a scientific work

3. the student has knowledge of aviation safety and management. The student knows the concept of the human factor and methods of assessing human reliability, has detailed knowledge related to selected issues in the field of human capabilities and limitations during aircraft operation in flight, its impact on health and the ability to perform air operations, as well as the possibility of improving physical condition

4. has the ability to self-study with the use of modern teaching tools, such as remote lectures, websites and databases, teaching programs, e-books

Skills

1. is able to obtain information from various sources, including literature and databases, both in Polish and in English, integrate them properly, interpret them and make a critical evaluation, draw conclusions and exhaustively justify the opinions they formulate

2. is able to properly use information and communication techniques, applicable at various stages of the implementation of aviation projects

3. is able to properly plan and perform experiments, including measurements and computer simulations, interpret the obtained results, and correctly draw conclusions from them

4. can, when formulating and solving tasks related to civil aviation, apply appropriately selected methods, including analytical, simulation or experimental methods

5. student can use theoretical probability distributions. Student is able to analyze and interpret statistical data. Student is able to use the methods and tools of mathematical statistics in engineering practice

6. is able to prepare a short research paper while maintaining the basic editorial rules. He can choose appropriate methods for the conducted research and is able to carry out a basic analysis of the results.

7. 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 task set by himself or others

8. 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

1. is aware of the social role of a technical university graduate, in particular understands the need to formulate and provide the society, in an appropriate form, with information and opinions on engineering activities, technological achievements, as well as the achievements and traditions of the engineer profession

2. correctly identifies and resolves dilemmas related to the profession of an aerospace engineer

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

- Written test

- Oral test

Programme content

- Pilot and navigation equipment. Power, electric, hydraulic and pneumatic equipment. Diagnostic, communication and location equipment. Specialized equipment: human safety, safety of the flying vessel.

PART - 66 (THEORY - 22.5 hours, PRACTICE - 11.25 hours)

MODULE 7A. MAINTENANCE ACTIVITIES

7.7 Electrical Connection System (EWIS)

Continuity, insulation and joining techniques and testing;

Use of crimpers: manually and hydraulically operated;

Testing of crimp connections;

Insertion and removal of connection plugs;

Coaxial cables: safety measures for testing and installation;

Marking of cable types, criteria for their inspections and damage tolerance

Electrical installation protection techniques: cable bundling and cable harness support, cable clamps,

techniques of protective sleeves with heat shrink wrapping, shielding.

EWIS installation, inspection, repair, maintenance and cleaning standards. [2]

7.9 Pipes and lines

Bendable and bent / open aircraft pipes;

Inspection and testing of aircraft pipes and hoses;

Installation and fastening of pipes. [2]

MODULE 11B. PISTON AIRPLANE AERODYNAMICS, STRUCTURES AND SYSTEMS

11.4 Cab air conditioning and pressure boosting (ATA 21)

Pressure boosting and air conditioning systems;

Cab pressure control device, protection and warning devices;

Heating systems. [3]

11.5 Aviation Electronics Instruments / Systems

11.5.1 Instrument Systems (ATA 31)

Pilot devices: altimeter, airspeed indicator, vertical speedometer;

Gyro devices: artificial horizon, position indicator, direction indicator, situation indicator

horizontal, turn and slip indicator, rotation coordinator;

Compasses: direct reading, remote reading;

Angle of attack indication, stall systems;

Glass cockpit;

Other aircraft indicators. [2]

11.5.2 Aviation electronics systems

Basics of system layouts and operation;

- Autopilot (ATA 22);

- Communication (ATA 23);

- Navigation Systems (ATA 34). [1]

11.6 Electrical Power (ATA 24)

Battery installation and operation;

Direct current generation;

Voltage regulation;

Power distribution;

Circuit protection;

Inverters, transformers. [3]

11.7 Equipment and Furnishings (ATA 25)

a) Emergency equipment requirements;

Seats, straps and belts. [2]

b) Cabin layout;

Equipment placement;

Installation of cabin equipment;

Cabin entertainment equipment;

Kitchen installation;

Cargo handling and storage equipment;

Stairs. [1]

11.8 Fire Protection (ATA 26)

(a) Fire and smoke detection and warning systems;

Fire extinguishing systems;

System Tests. [3]

b) Portable fire extinguisher.

11.9 Flight Controls (ATA 27)

Basic controls: aileron, elevator, rudder;

Balance tabs;

Lifting devices;

System Action: Manual;

Gust locks;

Balancing and setting;

Stall protection system. [3]

11.10 Fuel Systems (ATA 28)

System layout;

Fuel tanks;

Delivery systems;

Cross feed and transfer;

Markings and Warnings.

Refueling and emptying fuel tanks. [3]

11.11 Hydraulic Power (ATA 29)

System layout;

Hydraulic fluids;

Hydraulic tanks and accumulators;

Pressure build-up: electrical, mechanical;

Filters

Pressure regulation;

Power distribution;

Detection and warning systems; [3]

11.12 Ice and Rain Protection (ATA 30)

Ice formation, classification and detection;

De-icing systems: electrical, hot air, pneumatic and chemical;

Heating probes and drains;

Wiper systems. [3]

11.13 Landing Gear (ATA 32)

Construction, depreciation;

Extension and retraction systems: normal and emergency;

Markings and warnings;

Wheels, brakes, anti-skid and auto-braking;

Tires;

Targeting;

Air-ground sensors. [3]

11.14 Lights (ATA 33)

Exterior: navigation, anti-collision, landing light, taxi projector, frost protection;

Internal: in the cabin, in the cockpit, in the hold;

Emergency. [3]

11.15 Oxygen (ATA 35)

System layout: cockpit, cabin;

Source, storage, loading and distribution;

Supply regulation;

Markings and Warnings. [3]

11.16 Air Supply / Vacuum (ATA 36)

System layout;

Source: Engine / APU, Compressors, Reservoirs, Grounding;

Pressure regulation;

Distribution;

Markings and Warnings.

Interfaces with other systems. [3]

11.17 Water / Waste (ATA 38)

Water system layouts, supply, distribution, maintenance and drainage;

Toilet system, flushing and maintenance;

Corrosion issues. [3]

MODULE 17A. PROPELLER

17.1 Fundamentals

Propeller theory;

High / low propeller angle, reverse angle, angle of attack, rotational speed;

Propeller slip;

Aerodynamic force, centrifugal force and thrust force;

Torque;

Relative air flow against the propeller thrust;

Vibration and resonance. [2]

17.2 Propeller Construction

Construction methods and materials used in wooden, composite and metal propellers;

Blade drive, pressure side, blade holder, suction side and seat assembly;

Constant jump, controllable jump, constant speed propeller;

Fitting the propeller / propeller cap. [2]

17.3 Propeller Pitch Control

Speed control and pitch change methods, mechanical and electrical / electronic;

Propeller shifting to a flag and negative pitch;

Overspeed protection. [2]

17.4 Propeller Synchronization

Synchronization and phase matching equipment. [2]

Teaching methods

Lectures

Bibliography

Basic

Basic literature:

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

2. Gosiewski Z., Ortyl A., „Inercjalny, bezkardanowy system orientacji przestrzennej i nawigacji – zasada

3. działania”, Wyd. Instytut Lotnictwa, 1999

4. Grabiec R., „Lotnicze systemy zobrazowania informacji”, skrypt WAT, 1996

5. Kazana J, Lipski J., „Budowa i eksploatacja pokładowych przyrządów pokładowych”, Wydawnictwa Komunikacji i Łączności, Warszawa 1983

6. Narkiewicz J., „Podstawy układów nawigacyjnych”, WKŁ, 1999

7. Narkiewicz J., „GPS – Globalny System Pozycyjny”, WKŁ, 2003

8. Stola M., „Wyposażenie samolotów”, Wydawnictwo Politechniki Warszawskiej, Warszawa, 1978

9. Szczepański C., „Symulatory lotu”, Wydawnictwo Politechniki Warszawskiej, Warszawa, 1990

10. Farrell, Jay A., „The Global Positioning System and Inertial Navigation”,1997

11. Grewal, Mohinder S., „Global positioning systems, inertial navigation, and integration”, 2001

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

13. Moir I., Seabridge A., „Aircraft Systems”; Longman Scientific & Technical, London, 1992

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16. Moir I., „Civil Avionics Systems”, 2003

17. Neese W., “Aircraft Hydraulic Systems”, Krieger Publishing Company, 1991

18. Pallet E.H.J., “Aircraft Instrument Systems”, IAP, 1993

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

20. Spitzer, Cary R. Red., „The avionics handbook”, 2001

21. Titterton, David H., „Strapdown Inertial Navigation Technology”, 1997

Additional

1. Technical Order, F-16, C-130 Herkules, B737, ERJ-145, G550

Breakdown of average student's workload

	Hours	ECTS
Total workload	100	4,0
Classes requiring direct contact with the teacher	58	2,3
Student's own work (literature studies, preparation for tutorials, preparation for tests) [1]	42	1,7

[1] delete or add other activities as appropriate