COURSE DESCRIPTION CARD - SYLLABUS

Course name

Eircraft systems

Course

Field of study

Aerospace Engineering

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:

Dr eng. Wojciech Prokopowicz

email: wojtek379@wp.pl

phone +48 606 638 410

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 detailed knowledge related to selected issues in the field of manned and unmanned aircraft systems, including applicable structural systems, materials, equipment and on-board systems. -

2. has expanded knowledge in the field of manufacture, construction and operation of aircraft systems. Has skills in interpreting data recorded by flight data recorders. Is able to independently analyze the operation of aircraft systems and knows how to diagnose some malfunctions arising during the operation of an aircraft.

3. has ordered, theoretically founded general knowledge covering the principles of using indicators of on-board devices and systems, exchange of telemetry data related to the operation of airplanes, helicopters and unmanned aerial vehicles in individual flight phases. He can determine the basic errors of reading indicators and on-board systems.

Skills

1. student knows how to use technical documentation regarding the construction of aircraft systems. Is able to develop recommendations and guidelines regarding changes in the construction of selected aircraft system. Is able to use English to a degree enabling understanding of technical texts in the field of aviation (knowledge of technical terminology) using the formal notation of construction, technical drawing, concepts and definitions of the studied area

2. is able to create and analyze an aircraft systems diagram, select devices and perform basic calculations for avionics, electric, hydraulic, life support, fuel, automation of wing and chassis mechanization.

3. is able to use commercially available construction solutions in the field of aviation with particular emphasis on aircraft systems. Knows the criteria of suitability of elements of on-board systems for use in own technical projects and is able to propose the process of their assembly, production and operation.

Social competences

1. is aware of the importance of the human factor in the design and operation of aviation technology and of compliance with professional ethics

2. is able to properly define the priorities of the process of manufacturing and operating of aircraft systems in the selected aviation organization for the implementation of tasks specified by him or others based on available knowledge

3. understands the need for continuous verification and deepening of their knowledge in the field of aircraft systems for their manufacture and operation.

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

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

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

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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,

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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