COURSE DESCRIPTION CARD - SYLLABUS

Course name
Construction and diagnostics of aircraft engines [S1Lot2-SLiPL>BiDSL]

Course

Field of study
Aviation

Year/Semester
3/6

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
15

Other
0

Tutorials
0

Projects/seminars
0

Number of credit points

2,00

Coordinators

dr hab. inż. Grzegorz Szymański prof. PP
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Lecturers

Prerequisites

• Basic knowledge of mechanics, metrology, material strength, and machine construction. • Ability to apply the scientific method in problem-solving, conducting experiments, and drawing conclusions. • Awareness of the limitations of one's knowledge and skills, ability to ask precise questions, and understanding of the importance of continuous learning.

Course objective

• Understanding the theoretical and practical aspects of aircraft engine testing and diagnostics. • Learning about engine testing methods, diagnostic modeling, and predicting future engine conditions.

Course-related learning outcomes

Knowledge:
Knows how to present research results in tabular and graphical form, as well as perform measurement uncertainty analysis.
Has advanced knowledge of material strength, including elasticity and plasticity theories, stress hypotheses, beam and shaft calculations, and methods for evaluating deformations and stress states in structures.

Understands basic properties of metallic, non-metallic, and composite materials used in aircraft construction, including manufacturing processes, heat and thermochemical treatments, and the impact of plastic processing on material strength. Also has knowledge of fuels, lubricants, technical gases, and refrigerants.

Skills:
Can gather information from various sources, including literature and databases in Polish and English, integrate them, critically evaluate them, and justify conclusions comprehensively.
Can plan and conduct experiments, including measurements and computer simulations, correctly interpret the results, and draw appropriate conclusions.
Can select appropriate materials for simple aviation structures and identify differences between aviation fuels.
Can design transport systems while considering external requirements (e.g., environmental protection).
Social Competencies:
Understands that knowledge and skills in technology become outdated very quickly.
Recognizes the importance of knowledge in solving engineering problems and understands examples of faulty engineering projects that led to financial, social, or health-related losses, including fatalities.
Correctly identifies and resolves dilemmas related to the profession of an aviation and aerospace engineer.

Social competences:
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Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

• Lecture Assessment:
• 45-minute test during the 7th lecture.
• Contains multiple-choice and open-ended questions, graded with varying weights.
• Passing threshold: 50% of total points.
Laboratory Assessment:
• Final test with practical tasks, graded based on difficulty level.
• Passing threshold: 50% of total points.

Programme content

• Basic stages of engine testing.
• Role and scope of ground and in-flight engine testing.
• Determining operational parameters and engine characteristics.
• Recording and processing test results.
• Fundamentals of technical diagnostics.
• Techniques for detecting and repairing engine failures.

Course topics

• Basic stages of engine testing.
• Role and scope of ground and in-flight engine testing.
• Engine braking methods and performance evaluation.
• Technical means used in engine testing.
• Methods for ground and in-flight engine testing.
• Determining operational parameters and engine characteristics.
• Recording and processing test results.
PART-66 (Theory - 11.25 hours, Practice - 11.25 hours)
• Module 6 - Materials and Equipment
• 6.4 Corrosion
• Chemical fundamentals.
• Corrosion due to galvanic processes, microbiological factors, and pressure effects.
Module 7A - Maintenance Practices
• 7.18 Disassembly, Inspection, Repair, and Assembly Techniques
• Types of damage and visual inspection techniques.

• Corrosion removal, evaluation, and reapplication of protective coatings.
• General repair methods and structural repair manuals.
• Aging, fatigue, and corrosion control programs.
• Non-destructive testing techniques: dye penetrant, radiographic, eddy current, ultrasonic, and borescope inspections.

Teaching methods

Lecture: Multimedia presentation with examples explained on the board.
Laboratory: Multimedia presentation, board examples, and practical hands-on exercises.

Bibliography

Basic:
Bukowski J., Łucjanek W. - Propeller Propulsion: Theory and Construction, MON Publishing, Warsaw, 1986.
Mysłowski J. - Turbocharging Engines, Transport and Communication Publishing, Warsaw, 2006.
R.B. Randall - Vibration-Based Condition Monitoring, Wiley, 2011.
Niziński S., Michalski R. - Technical Object Diagnostics, Monograph Series, Library of Exploitation Problems, Warsaw-Sulejówek-Olsztyn-Radom, 2002.
Marciniak J. - Technical Diagnostics of Railway Vehicles, WKiŁ, Warsaw, 1982.
Żółtowski B. - Fundamentals of Machine Diagnostics, University Press, Technical and Agricultural Academy, Bydgoszcz, 1996.
Cempel C., Tomaszewski F. - Machine Diagnostics: General Principles and Application Examples, MCNEMT, Radom, 1992.

Additional:
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Breakdown of average student's workload

	Hours	ECTS
Total workload	50	2,00
Classes requiring direct contact with the teacher	30	1,50
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	20	0,50