



## COURSE DESCRIPTION CARD - SYLLABUS

Course name

Basics of technical diagnostics [S1Lot2-BSP>PDT]

### Course

Field of study

Aviation

Year/Semester

3/5

Area of study (specialization)

Unmanned Aerial Vehicles

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

30

Laboratory classes

15

Other

0

Tutorials

0

Projects/seminars

0

### Number of credit points

4,00

### Coordinators

dr hab. inż. Grzegorz Szymański prof. PP  
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### Lecturers

### Prerequisites

Wiedza: Podstawowa wiedza o technikach pomiaru wielkości mechanicznych oraz modelowaniu.

Umiejętności: Potrafi analizować wzajemne zależności pomiędzy skutkami i przyczynami zjawisk i zdarzeń wynikających z praw fizyki. Kompetencje społeczne: Przygotowany do pracy zespołowej.

### Course objective

To learn the theoretical problems of technical diagnostics of means of transport and methods and ways of solving the issues of assessing their technical condition and forecasting.

### Course-related learning outcomes

Knowledge:

has structured, theoretically based general knowledge in the field of technology and various means of air transport,  
about the life cycle of means of transport, both hardware and software, and in particular about the key processes occurring in them

has structured and theoretically based general knowledge in the field of key issues of technology and

detailed

knowledge in the field 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

**Skills:**

is able to properly plan and perform experiments, including measurements and computer simulations, interpret the

obtained results, and correctly draw conclusions from them

use the knowledge obtained - formulate and solve complex and atypical problems and perform tasks in conditions

that are not fully predictable, formulating and solving tasks related to civil aviation, apply appropriately selected

methods, including analytical, simulation or experimental methods

is able to design - in accordance with the given specification - and make simple devices, objects, systems or

implement processes typical for the field of study, using appropriately selected methods, techniques, tools and

materials means of transport with appropriate external requirements (e.g. regarding environmental protection)

is able to critically analyze technical objects and solutions, is able to search in catalogs and on manufacturers'

websites for ready-made components of machines and devices, including means and devices, assess their suitability for use in one's own technical and organizational projects

**Social competences:**

understands that in technology, knowledge and skills very quickly become outdated

is aware of the recognition of the importance of knowledge in solving cognitive and practical problems and of

seeking expert opinions in the event of difficulties with an independent solution and knows examples and understands the causes of malfunctioning engineering projects that have led to serious financial or social losses or

to a serious loss of health or even life

is aware of the social role of a graduate of a technical university, in particular understands the need to formulate and

communicate to the public, in an appropriate form, information and opinions on engineering activities, technical

achievements, as well as the achievements and traditions of the engineering profession, co-organizing activities for

the benefit of the social environment" and initiating activities for the public interest

correctly identifies and resolves dilemmas related to the performance of the profession of aviation engineer, compliance with the principles of professional ethics and requiring the same from others

## Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

The knowledge acquired in the lecture is verified by a 45-minute colloquium conducted at the 7th lecture. The colloquium consists of questions (test and open), variously scored. Threshold pass mark: 50% of the points.

Skills acquired in laboratory classes are verified on the basis of a credit colloquium consisting of tasks variously scored depending on their degree of difficulty .

Credit threshold: 50% of the points.

## Programme content

The concept of the term diagnostics.

The essence of technical diagnostics.

Structure of the object vs. diagnostic signal, the concept of structure,

Structure parameters describing the state of the object. Diagnostic parameters and their division. The concept of limit and permissible value of symptoms.

Methodology of diagnostic tests.

## Course topics

The concept of the term diagnostics, diagnostics as a measurement method, conditions for diagnosing objects technical. The essence of technical diagnostics, tasks and objectives of technical diagnostics. The concept of entropy in diagnostics, properties of entropy, relative entropy. Phases of object existence, diagnostics in individual phases of object existence. Diagnostics in the system of vehicle operation, diagnostics in the subsystem of use and operation. Diagnostic system. Analysis of the object of diagnosis, models diagnostic (determined and undetermined), a set of characteristics of the object state, a set of parameters output (working and accompanying). Object structure vs. diagnostic signal, the concept of structure, Structure parameters describing the state of the object. Conditions that an output parameter must meet in order to be considered a diagnostic parameter. Diagnostic parameters and their division.

Symptoms

of the condition technical condition. The concept of limit and permissible value of symptoms, methods of estimation of limits. Classification of technical states of an object, two-, three- and four-state classification. Classification of diagnostic state parameters, general and specific parameters. Methods Diagnosis, information synthesis method, information analysis method. Diagnostic methods vehicles, instrumental and supervision of the state of the object, genesis of occurred states (past), forecasting of future states. Diagnostic experiments, passive experiment, active experiment, active-passive experiment, passive-independent experiment. Vulnerability Diagnostic susceptibility of vehicles. Effectiveness of application of diagnostics in vehicle operation. Methodology Diagnostic tests.

## Teaching methods

1. Lecture: multimedia presentation illustrated by examples given on the blackboard.
2. Laboratory exercises: multimedia presentation illustrated by examples given on the on the blackboard and performance of tasks given by the instructor - practical exercises

## Bibliography

Basic:

1. Bukowski J., Łucjanek W., Propeller propulsion. Theory and construction, Wyd. MON, Warsaw 1986r.
  2. Mysłowski J., Doładowanie silników, Wyd. Komunikacji i Łączności, Warsaw 2006r.
  3. Nizinski S. Michalski R.: Diagnostics of technical objects. Monographic publishing series Library of Problems of Exploitation, Warsaw - Sulejówek - Olsztyn - Radom, 2002.
  - 4 B. Żółtowski: Fundamentals of machine diagnostics. Publisher. Uczelniane Akademii Techniczno-Rolniczej in Bydgoszcz, Bydgoszcz 1996.
  5. C. Cempel, F. Tomaszewski: Diagnostics of Machines. General principles, examples of application. M.C.N.E.M.T, Radom 1992
- Supplementary
- 1 R.B. Randall: Vibration based condition monitoring, Wiley, 2011.

Additional:

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## Breakdown of average student's workload

|   | Hours | ECTS |
|---|-------|------|
| Total workload  | 100   | 4,00 |
| Classes requiring direct contact with the teacher   | 47    | 2,00 |
| Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation) | 53    | 2,00 |