



## COURSE DESCRIPTION CARD - SYLLABUS

Course name

Basics of Machine Design [S1Lot2>PKM]

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### Course

Field of study

Aviation

Year/Semester

2/3

Area of study (specialization)

Air Transport Safety

Profile of study

general academic

Level of study

first-cycle

Course offered in

Polish

Form of study

full-time

Requirements

compulsory

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### Number of hours

Lecture

15

Laboratory classes

0

Other

0

Tutorials

0

Projects/seminars

15

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### Number of credit points

2,00

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### Coordinators

### Lecturers

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### Prerequisites

none mathematics, after passing the course within the framework of the study program. The student has the ability to solve problems based on the knowledge they have (mechanics, mathematics, materials science, strength of materials) and the ability to obtain information from indicated sources. The student understands the need to expand their competences, shows readiness to cooperate within the team.

### Course objective

Providing students with knowledge of the basics of machine design, within the scope defined by the program content appropriate for the field of study. 2. Developing students' skills: - calculating and constructing machine elements and assemblies, - documenting and reading technical documentation based on knowledge acquired in the subject of engineering machine graphics, - practical use of knowledge acquired in the subjects: mechanics, strength of materials, machine science, materials science. 3. Shaping students' teamwork skills

### Course-related learning outcomes

Knowledge:

1. has an ordered, theoretically founded knowledge in the field of engineering graphics and machine construction: technical drawing, object projection, basic principles of engineering graphics, the use of CAD (Computer Aided Design) graphic programs in the construction of machines

2. has extended knowledge in the field of material strength, including the theory of elasticity and plasticity, stress hypotheses, methods of calculating beams, membranes, shafts, joints and other structural elements, as well as methods of testing the strength of materials and the state of deformation and stress in structures, and has basic knowledge of the main departments of technical mechanics: statics, kinematics and dynamics of a material point and a rigid body

#### Skills:

1. can solve tasks using basic knowledge of aerodynamics, flight mechanics and flow around a body
2. can analyze objects and technical solutions, can search in catalogs and on manufacturers' websites, ready components of machines and devices, including means and devices, assess their suitability for use in their own technical and organizational projects

#### Social competences:

1. understands that in technology, knowledge and skills very quickly become obsolete
2. is aware of the importance of knowledge in solving engineering problems and knows examples and understands the causes of faulty engineering projects that have led to serious financial and social losses, or to a serious loss of health and even life

### Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Learning outcomes presented above are verified as follows: -  
Written exam on the lecture, passing of exercises.

### Programme content

Basic principles of the design process, mechanism elements, characteristics of load types, definition of loads

and formulation of appropriate strength conditions. Connections and their calculation: soldered, welded, welded, glued; riveted, shaped connections: keyed, pin, Threaded connections. Screw mechanisms: examples

and application, design calculations. Flexible elements: springs, rubber flexible elements

PART - 66 (THEORY - 22.50 hrs.) MODULE 6. MATERIALS AND EQUIPMENT

#### 6.5 Fasteners

##### 6.5.1 Threads

Thread nomenclature;

Thread forms, sizes and tolerances for standard threads used in aircraft;

Thread measurement. [2]

##### 6.5.2 Screws, studs, bolts

Types of screws: specification, identification and marking of aircraft screws, international standards;

Nuts: self-locking, anchors, standard types;

Screws for metal parts: specification of screws used in aircraft;

Studs: types and use, insertion and removal; Self-tapping screws, dowels. [2]

##### 6.5.3 Latches

Spring and tab washers, retaining plates, split pins, single-turn locknuts, wire locking, quick release latches, keys, circlips, pins. [2]

##### 6.5.4 Aircraft Rivets

Types of solid and blind rivets: specification and identification, heat treatment. [2]

#### 6.6 Pipes and Joints

a) Identification and types of rigid and flexible pipes and their couplings used in aircraft. [2]

b) Standard joints in high-pressure water, fuel, oil, pneumatic and air system lines used in aircraft. [2]

#### 6.7 Springs

Types of springs, materials, properties and applications. [2]

#### 6.8 Bearings

Bearing purposes, loads, materials, construction; Types of bearings and their applications. [2]

6.10 Control Cables Types of Cables;

Terminal Equipment, Tension Nuts and Compensating Devices;

Pulleys and Components of Cable Systems;

Bowden Cables;

Flexible Aircraft Control Systems. [2]

MODULE 7A. MAINTENANCE OPERATIONS

7.10 Springs

Inspection and testing of springs. [2]

7.11 Bearings

Testing, cleaning and inspection of bearings; Lubrication requirements for bearings; Bearing failures and their causes. [2]

7.12 Gearbox Inspection of gears, clearance;

Inspection of belts and pulleys, chains and sprocket teeth;

Inspection of screw jacks, lever devices, push-pull rod systems. [2]

### Course topics

Basic principles of the design process, mechanism elements, characteristics of load types, defining loads and

formulating appropriate strength conditions. Connections and their calculation: soldered, welded, bonded; riveted,

shaped connections: keyed, pin, Threaded connections. Screw mechanisms: examples and application, design

calculations. Flexible elements: springs, rubber flexible elements

### Teaching methods

Lecture: multimedia presentation, illustrated with examples given on the board. Exercises: performing tasks given by

the instructor - practical exercises

### Bibliography

Basic:

1. Collective work edited by Z. Osiński, Basics of machine design, PWN, Warsaw, 1999

2. Collective work edited by M. Dietrich: Basics of machine design. Volume 3, WNT, Warsaw, 1999.

3. Osiński Zbigniew, Clutches, PWN, Warsaw 1998

4. Dziama A., Michniewicz M., Niedźwiedzki A.: Toothed gears. PWN, Warsaw, 1989.

5. Ochęduszek K.: Gear wheels, WNT 1985.

6. Dudziak M.: Cable gears. PWN, Warsaw, 1997. Supplementary

1. Niemann G., Maschinenelemente vol. I, II, III, Springer, Verlag Berlin, 1965

2. Müller L., Planetary gears, PWN, Warsaw, 1983

3. Bahl G., Beitz W., Nauka konstruowania, WNT

Additional:

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### Breakdown of average student's workload

	Hours	ECTS
Total workload	55	2,00
Classes requiring direct contact with the teacher	30	1,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	25	1,00