



## COURSE DESCRIPTION CARD - SYLLABUS

Course name

Basics of Machine Design I

### Course

Field of study

Aerospace Engineering

Area of study (specialization)

Level of study

First-cycle studies

Form of study

full-time

Year/Semester

2/3

Profile of study

general academic

Course offered in

polish

Requirements

elective

### Number of hours

Lecture

30

Laboratory classes

Tutorials

15

Projects/seminars

Other (e.g. online)

### Number of credit points

2

### Lecturers

Responsible for the course/lecturer:

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Responsible for the course/lecturer:

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### Prerequisites

The student has knowledge of physics (mechanics in the field of: statics, kinematics and dynamics), mathematics, after passing as part of the study program.

The student has the ability to solve problems based on their knowledge (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 a team.

### Course objective

1. Providing students with knowledge of the basics of machine construction, to the extent specified by the curriculum content appropriate to the field of study.



## 2. Developing students' skills:

- calculating and constructing machine components and assemblies,
- documenting and reading technical documentation based on knowledge gained in the subject of machine engineering graphics,
- practical use of knowledge gained in the subjects: mechanics, strength of materials, machine science, material science.

### Course-related learning outcomes

#### Knowledge

Has structured, theoretically founded knowledge of engineering graphics and machine construction: technical drawing, object projection, basic principles of engineering graphics, the use of CAD (Computer Aided Design) in machine design

Has basic knowledge of the main departments of technical mechanics: kinematics, material point dynamics and rigid body

Has basic knowledge of the strength of materials, including the basics of the theory of elasticity and plasticity, effort hypotheses, methods for calculating beams, membranes, shafts, joints and other simple structural elements, as well as methods for testing material strength and the state of deformation and stress in structures

#### Skills

Is able to communicate using various techniques in a professional environment and other environments using the formal record of construction, technical drawing, concepts and definitions of the field of study being studied

Is able to create a system diagram, select elements and perform basic calculations of the mechanical, aerodynamic, automatic, electrical and electronic systems of machine components or aviation devices

Is able to analyze facilities and technical solutions, is able to search in the catalogs and on the manufacturers' websites ready components of machines and devices, including means of transport and storage, assess their suitability for use in own technical and organizational projects

#### Social competences

Is aware of the importance of maintaining the principles of professional ethics

Understands the need for a critical assessment of knowledge and continuous learning

is aware of the importance and understands the non-technical aspects and effects of engineering activities, including its impact on the environment, and the associated responsibility for decisions

### Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Written exam from the lecture, passing the exercises.



## Programme content

Basic principles of the construction process, elements of the mechanism, characteristics of load types, definition of loads and formulation of appropriate strength conditions. Connections and their calculation: soldered, welded, glued; riveted connections, shaped connections: key and bolt, threaded connections. Screw mechanisms: examples and applications, structural calculations. Flexible components: springs, flexible rubber components

PART - 66 (THEORY - 33.75 hours)

### MODULE 6. MATERIALS AND EQUIPMENT

#### 6.5 Fasteners

##### 6.5.1 Threads

Nomenclature relating to threads;

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

Measuring threads. [2]

##### 6.5.2 Bolts, studs, screws

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

Nuts: self-locking, anchors, standard types;

Screws for metal parts: specification of screws used on ships  
airborne;

Studs: types and use, insertion and removal;

Self-tapping screws, dowels. [2]

##### 6.5.3 Latches

Spring and deflected washers, retaining plates, split pins, locknuts  
single coil, wire protection, quick release latches, keys,  
snap rings, pins. [2]

##### 6.5.4 Aircraft rivets

Types of full and one-side closed rivets: specification and identification, processing



thermal. [2]

#### 6.6 Pipes and joints

a) Identification and types of rigid and flexible pipes and their couplings used in ships

airborne. [2]

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

#### 6.7 Springs

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

#### 6.8 Bearings

Bearing purposes, loads, materials, construction;

Types of bearings and their application. [2]

#### 6.10 Steering lines

Types of lines;

End fittings, turnbuckles and compensating devices;

Pulleys and cable system components;

Bowden links;

Flexible aircraft control systems. [2]

### MODULE 7A. MAINTENANCE ACTIVITIES

#### 7.10 Springs

Spring examination and testing. [2]

#### 7.11 Bearings

Testing, cleaning and examination of bearings;

Bearing lubrication requirements;

Bearing failures and their causes. [2]

#### 7.12 Gearbox

Examination of gears, backlash;

Examination of belts and pulleys, chains and sprocket teeth;



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

### Teaching methods

Lecture: multimedia presentation, illustrated with examples on the board.

Exercises: performance of tasks given by the teacher - practical exercises

### Bibliography

Basic

1. Praca zbiorowa pod red. Z. Osińskiego, Podstawy konstrukcji maszyn, PWN, W-wa, 1999
2. Praca zbiorowa pod red. M. Dietricha: Podstawy konstrukcji maszyn. Tom 3, WNT, Wa-wa, 1999.
3. Osiński Zbigniew, Sprzęgła, PWN, Warszawa 1998
4. Dziama A., Michniewicz M., Niedźwiedzki A.: Przekładnie zębate. PWN, Wa-wa, 1989.
5. Ochęduszek K.: Koła zębate, WNT 1985.
6. Dudziak M.: Przekładnie cięgnowe. PWN, Warszawa, 1997.

Additional

1. Niemann G., Maschinenelemente t. I, II, III, Springer, Verlag Berlin, 1965
2. Müller L., Przekładnie obiegowe, PWN, Warszawa, 1983
3. Bahl G., Beitz W., Nauka konstruowania, WNT, Warszawa 1984

### Breakdown of average student's workload

	Hours	ECTS
Total workload	60	2,0
Classes requiring direct contact with the teacher	45	1,5
Student's own work (literature studies, preparation for tutorials, preparation for tests/exam) <sup>1</sup>	15	0,5

<sup>1</sup> delete or add other activities as appropriate