



## COURSE DESCRIPTION CARD - SYLLABUS

Course name

Basic of Machin Design

### Course

Field of study

Mechanical Engineering

Area of study (specialization)

Level of study

First-cycle studies

Form of study

full-time

Year/Semester

3/5

Profile of study

general academic

Course offered in

polish

Requirements

compulsory

### Number of hours

Lecture

30

Laboratory classes

Other (e.g. online)

Tutorials

15

Projects/seminars

15

**Number of credit points**

4

### Lecturers

Responsible for the course/lecturer:

dr inż. Dariusz Torzyński

Responsible for the course/lecturer:

### Prerequisites

knowledge of: material strength, materials science, manufacturing techniques, mechanics, metrology;

skills: logical thinking, recording the structure in the form of technical documentation.

### Course objective

Understanding the basics of an engineer's construction knowledge, acquiring construction skills, acquiring the ability to apply basic sciences, strength, materials science and manufacturing techniques to shape objects, learning the general principles of building assemblies and machine components.

### Course-related learning outcomes

Knowledge

1. The student is able to characterize the subject and the design process [K\_W05].

2. The student is able to formulate and analyze construction problems [K\_W05].

3. Has an ordered, theoretically founded general knowledge that allows to define the requirements for construction materials and determine their permissible stresses [K\_W12].



4. The student has knowledge of the application of engineering materials for selected elements of parts of machines and devices [K\_W06, K\_W09].
5. The student should: determine the loads on the structure, shape its form on this basis, determine the strength conditions [K\_W12].
6. The student has the knowledge to determine the techniques of shaping structural elements of machines and devices [K\_W11].
7. The student is able to characterize selected connections, present the construction of machine parts, has knowledge of the principles of operation of selected mechanisms [K\_W05].
8. Has basic knowledge of engineering design and construction notation, allowing to design objects, machine elements; formulate and analyze problems; look for solution concepts; apply engineering calculations [K\_W05].

#### Skills

1. Student is able to perform strength analyzes of machine elements and mechanical systems [K\_U15].
2. The student is able to use analytical methods to shape selected parts of machines and devices [K\_U10].
3. The student is able to present the designed objects taking into account the principles of notation of construction and engineering graphics [K\_U02, K\_U17].
4. Can identify and formulate the specificity of simple engineering tasks of a practical nature [K\_U16].
5. Can design simple devices or objects according to the given specification [K\_U20].
6. The student is able to obtain information from the literature, databases, standards and catalogs regarding materials and machine parts used in the construction [K\_U01].

#### Social competences

1. Understands the need for lifelong learning [K\_K01].
2. The student is aware of the influence and responsibility of the designer for the developed design solutions [K\_K02].
3. The student is able to cooperate and work in project teams [K\_K03].

#### Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture: credit on the basis of tests of general and detailed knowledge presented during classes in the subject, conducted during the semester.

Classes: pass based on tests on solving simple construction tasks.

Project: credit based on the presented effects of own design works and oral justification of their form.



## Programme content

1. Drives - definitions, classification, systematics of energy storage, motor matching, diagrams of drive systems, functions.
2. Loads - mileages in typical stages, distribution of variable working conditions, optimization of the load condition, characteristics of drive motors.
3. Classifications of mechanical transmissions, general basic features of the transmission, range of applications.
4. Basic parameters of drive systems, torques, rotational speeds, powers, efficiency.
5. Toothed gears - configurations, determination of partial gears, geometrical sizes, normalization in gears, meshing theory, profile shift - correction, forces in gears, tooth damage, strength, gear structure, materials for gears, shaping, design solutions, working conditions.
6. Chain gears, chains and transmission elements, geometrical parameters, work kinematics.
7. Belt tension transmissions - structure, geometrical parameters, forces, tension in the belt, design solutions.
8. Shafts and axles - definition, functions, structure, materials, design of axes and shafts, deformations, shaping of shafts, normalization in design, fatigue strength, shaft vibrations.
9. Bearings - definition, purpose, rolling and slide bearings, construction, application, calculation and selection of bearings, normalization, fits, phenomena occurring during operation, friction in bearings, bearing materials.
10. Couplings - tasks, division, construction of rigid, flexible, articulated and frictional couplings; characteristics of flexible couplings, calculations of friction couplings.
11. Brakes - structure, functions, disc, band and rim brakes.

## Teaching methods

1. Lecture: presentation illustrated with examples given on the blackboard.
2. Exercises: problem solving, discussion.
3. Project: solving practical problems, discussion.

## Bibliography

### Basic

1. Podstawy konstrukcji maszyn, praca zb. pod red. Zb. Osińskiego, PWN, W-wa, 1999.
2. Podstawy konstrukcji napędów maszyn, praca zb. pod red. B. Branowskiego, Wydawnictwo Politechniki Poznańskiej, Poznań, 2007.



3. Podstawy konstrukcji maszyn, praca zb. pod red. M. Dietricha, WNT, W-wa, 1999.

Additional

1. Podstawy Konstrukcji Maszyn, pod red. Marka Dietrycha, PWN, Warszawa, 1999

2. G. Pahl, W. Beitz.: Nauka konstruowania, WNT, W-wa, 1984.

3. L. Kurmaz, O. Kurmaz: Podstawy konstruowania węzłów i części maszyn, Wydawnictwo Politechniki Świętokrzyskiej, Kielce 2011.

**Breakdown of average student's workload**

	Hours	ECTS
Total workload	120	
Classes requiring direct contact with the teacher	70	
Student's own work (literature studies, preparation for laboratory classes/tutorials, preparation for tests/exam, project preparation) <sup>1</sup>	50	

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