



## COURSE DESCRIPTION CARD - SYLLABUS

Course name

Basics of Drive Systems Design

### Course

Field of study

Construction and exploitation of means of transport

Area of study (specialization)

Level of study

First-cycle studies

Form of study

part-time

Year/Semester

3/5

Profile of study

general academic

Course offered in

polish

Requirements

compulsory

### Number of hours

Lecture

18

Laboratory classes

Tutorials

9

Projects/seminars

18

Other (e.g. online)

### Number of credit points

6

### Lecturers

Responsible for the course/lecturer:

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Responsible for the course/lecturer:

Institute of Transport

### Prerequisites

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

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

### Course objective

1. Learning the general principles of building units and elements of machine drive systems, learning the basics of engineering design knowledge, acquiring the ability to construct, acquiring the ability to apply the acquired knowledge in the field of shaping objects and drive systems.

2. Developing students' skills: - calculating and constructing elements and assemblies of machines, - documenting and reading technical documentation based on the acquired knowledge in the field of machine graphics, - practical use of knowledge in the following subjects: mechanics, strength of materials, machine science, materials science, manufacturing techniques, basics of machine design.



3. Developing students' teamwork skills.

### Course-related learning outcomes

#### Knowledge

1. Has basic knowledge of the basics of machine design and the theory of machines and mechanisms, including mechanical vibrations.
2. Has basic knowledge of the standardized rules of recording structures and engineering graphics.
3. Has basic knowledge of the strength of materials, including the basics of the theory of elasticity and plasticity, stress hypotheses, calculation methods for beams, membranes, shafts, joints and other simple structural elements, as well as methods of testing the strength of materials and the state of deformation and stress in mechanical structures.

#### Skills

1. Can plan and carry out the process of constructing uncomplicated machinery units or machines and formulate requirements for electronic components and automatic control systems for industry specialists in mechatronic systems.
2. Can perform basic functional and strength calculations of machine elements such as traction, gear, friction, bearings, rolling and sliding gears, clutches, brakes.
3. Can prepare a technical descriptive and drawing documentation of an engineering task.

#### Social competences

1. Is ready to critically assess his knowledge and received content.
2. Is ready to recognize the importance of knowledge in solving cognitive and practical problems and to consult experts in case of difficulties in solving the problem on his own.
3. Is willing to think and act in an entrepreneurial manner.

### Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

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

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

Projects: 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. Tutorials: problem solving, discussion.
3. Projects: 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. Collins J.: Mechanical Design of Machine Elements and Machines, John Wiley & Sons, 2003.
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	150	6,0
Classes requiring direct contact with the teacher	45	2,0
Student's own work (literature studies, preparation for laboratory classes/tutorials, preparation for tests/exam, project preparation) <sup>1</sup>	105	4,0

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