COURSE DESCRIPTION CARD - SYLLABUS

Course name
Theory of mechanisms and elements of numerical analysis [N1MiBM2>TMEAN]

Course

Field of study
Mechanical Engineering

Year/Semester
3/5

Area of study (specialization)
–

Profile of study
general academic

Level of study
first-cycle

Course offered in
Polish

Form of study
part-time

Requirements
compulsory

Number of hours

Lecture
8

Laboratory classes
8

Other
0

Tutorials
0

Projects/seminars
0

Number of credit points

2,00

Coordinators

Lecturers

Prerequisites

Basic knowledge of physics and knowledge of mechanics including statics, kinematics of a material point, rotary motion, planar motion, complex motion, dynamics of rotary motion and planar motion. In-depth knowledge in advanced mathematics including algebra, trigonometry, vector calculus, differential calculus, integral calculus, necessary to describe the physical phenomena accompanying machine operation.

Course objective

To obtain knowledge of the theory of machines and mechanisms needed to solve technical problems related to the design, construction and operation of machines.

Course-related learning outcomes

Knowledge:
1. The student is able to explain the importance of structural analysis of mechanisms, apply physical laws to describe and analyze the motion of mechanisms, formulate the principles of motion transfer and forces in machines, analyze the motion of machines under the action of forces.
2. The student is able to explain the limitations of the simplified mathematical models used to describe the operation of machines and indicate their potential effects, make a critical analysis of theoretical calculations.
3. The student is able to use computer programs that support kinematic and dynamic analysis of

mechanical systems.
4. The student is able to indicate the current directions of development of the theory of machines and mechanisms and the current directions of development of computer programs supporting kinematic and dynamic analysis of complex mechanical systems.
5. The student is able to apply the scientific method in solving technical problems related to the design and operation of machinery, adapt the knowledge and methodology of mechanism theory, as well as applied theoretical methods to related scientific disciplines.

Skills:
1. The student is able to find the necessary information in the literature, both from databases and other sources; is able to reproduce the reasoning described in the literature, taking into account the assumptions and approximations made.
2. The student uses appropriate analytical and simulation methods to formulate and solve engineering tasks.
3. The student communicates effectively with both specialists and non-specialists on a given subject matter.
4. The student identifies directions for further improvement of knowledge and skills (including self-education) in the field of theory of machines and mechanisms.

Social competences:
1. The student understands the need for lifelong learning; inspiring and organizing the learning process of others.
2. The student is aware of the benefits of engineering knowledge for society.
3. The student understands of the need to formulate and communicate information and opinions to society regarding engineering achievements.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture: Credit on the basis of a colloquium consisting of five practical tasks (each graded at 1 point). Depending on the number of points received, a grade is obtained: <3 pts - ndst, 3 pts - dst, 3.5 points - dst+, 4 points - db, 4.5 points - db+, 5 points - bdb. The colloquium is conducted at the end of the semester.
In the case of failure to take the colloquium, credit for the grade dst or dst+ is obtained on the basis of passing the projects issued during the semester on the indicated date.

Programme content

Lecture
1.Basic definitions. Structure of mechanisms. Classification of kinematic pairs.Classifications of mechanisms. The mobility of mechanisms.
2.Kinematics of lever mechanisms: articulated quadrilateral, crank-crank mechanism, yoke mechanism.
3.Determination of the balancing torque and power of the drive motor. Selection of the flywheel.
4.Balancing of lever mechanisms.
5.Planetary gears, wave gears.
6.Introduction to the synthesis of cam and lever mechanisms.

Course topics

none

Teaching methods

1. Lecture: presentation illustrated by examples given on the blackboard, solving tasks, presentation of solutions to problems in programs for numerical and symbolic calculations.

Bibliography

Basic:
1. Teoria Maszyn i Mechanizmów, Parszewski Z., WNT, Warszawa, 1983. [in Polish]
2. Teoria mechanizmów i manipulatorów. Podstawy i przykłady zastosowań w praktyce, Morecki A.;

Knapczyk J., Kędzior J., WNT, Warszawa, 2001. [in Polish]

Additional:
1. Mechanism Design: Analysis & Synthesis. A.G. Erdman, G.N. Sandor, & S. Kota 4th Ed. (Web Enhanced), Volume I, Prentice-Hall, 2001 [in Polish]
2. Kinematics and Mechanism Design, Suh C. H. Radcliffe C. W., Wiley, New York, 1978 [in Polish]

Breakdown of average student's workload

	Hours	ECTS
Total workload	50	2,00
Classes requiring direct contact with the teacher	16	0,50
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	34	1,50