COURSE DESCRIPTION CARD - SYLLABUS

Course name
Mechanisms theory [S1ETI2>TM]

Course

Field of study
Education in Technology and Informatics

Year/Semester
2/4

Area of study (specialization)
–

Profile of study
general academic

Level of study
first-cycle

Course offered in
Polish

Form of study
full-time

Requirements
elective

Number of hours

Lecture
15

Laboratory classes
0

Other
0

Tutorials
15

Projects/seminars
0

Number of credit points

2,00

Coordinators

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Lecturers

Prerequisites

Basic knowledge of physics on the level of studies of the first degree and knowledge of mechanics comprising statics, kinematics of material point, rotational motion, planar notion, dynamics of rotational and planar motions. Deep knowledge of the advanced mathematics comprising algebra, trigonometry, vectors, differential and integral calculus necessary to describe phenomena accompanying work of machines. Knowledge of basic computer tools and numerical methods enabling performing numerical experiment.

Course objective

Acquisition of knowledge on mechanism theory to solve problems related to design, action and exploitation of machines.

Course-related learning outcomes

Knowledge:
Student has a knowledge
1. To explain the meaning of structural analysis of mechanisms, apply physical laws to describe and analyze motion of mechanisms, formulate principles of motion and forces transmission, carry out analysis of machine motion under action of forces.

2. To explain limitations of simplified mathematical models describing actions of machines and point out their effects, carry out critical analysis of theoretical calculations.
3. To use computer software which aids kinematic and dynamic analysis of mechanical systems.
4. To point out current studies on development of mechanism theory and development of computer software for kinematic and dynamic analysis of complex mechanical systems.

Skills:
1. To extract information from the literature, databases and other properly selected sources, ability to reconstruct reasoning described in literature regarding taken assumptions and simplifications.
2. To present the results of studies in the required form.
3. To communicate effectively with specialists as well as with non-specialists in the field of engineering.
4. To specify ways of further acquisition of knowledge and skills in the field of mechanism theory.
5. To exploit relevant analytical methods, formulate and solve engineering problems.

Social competences:
1. Is aware of the importance of each course in acknowledging all aspects of engineering knowledge.
2. The student understands the need of life-long learning, of inspiring and organising other person's teaching process.
3. Is aware of importance of engineering knowledge and its importance for society and environment.
4. Understands the need for popularisation of knowledge of mechanical engineering.
5. Is aware of the risk when getting knowledge from the unverified sources.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Tutorials: Colloqium and project prepared at home. Criteria of assessment 3.0 (50%-70%), 4.0 (71%-90%), 5.0 (>90%). Up to 3.5 grade can be obtained on the basis of presence at the lectures and home project.
Lecture: Presence and theoeretical test.

Programme content

Basic methods of testing the structure of mechanisms. Kinematic analysis of lever mechanisms - determination of positions, velocities and accelerations of links and points of mechanisms. Selected issues of machine dynamics: total compensating torque, flywheel and balancing. Selected methods of synthesis of planar and cam mechanisms.

Course topics

1. Basic definitions.
2. Structure of mechanisms. Structural and functional classification of mechanisms.
3. Classification of kinematic pairs. Mobility of mechanisms. Mechanism class as a method of assessing kinematic complexity.
4. Kinematics of mechanisms. Analytical methods of kinematic analysis of lever mechanisms: four-bar linkage, crank-slider mechanism and ypoke mechanism. Determination of positions, velocities and linear and angular accelerations of links and points of the mechanism.
5. Total compensating torque, engine power. Determination of the balancing torque and power of a electrci engine (asynchronous) using the example of machines based on four-bar mechanisms and crank-slider mechanisms. Selection of the flywheel in order to maintain the preset speed fluctuation coefficient of the machine.
6. Balancing of planar mechanisms.
7. Special mechanisms - universal joint, planetary and strain wave gears.
8. Introduction to synthesis of lever and cam mechanisms. Determination of the dimensions of a four bar linkage for the realisation of motion through three positions and/or points. Synthesis of a cam-pusher and cam-disc type cam mechanism.

Teaching methods

1. Lecture: multimedia presentation, solving sample problems on the blackboard,
2. Exercises: solving problems, discussion.

Bibliography

Basic:
1. Podstawy Teorii Maszyn i Mechanizmów, Olędzki A, WNT, Warszawa, 1987
2. Teoria Maszyn i Mechanizmów, Parszewski Z, WNT, Warszawa, 1983
3. Teoria mechanizmów i manipulatorów. Podstawy i przykłady zastosowań w praktyce, Morecki A.; Knapczyk J., Kędzior J., WNT, Warszawa, 2001

Additional:
1. Mechanism Design: Analysis & Synthesis. A.G. Erdman, G.N. Sandor, &S. Kota 4th Ed. (Web Enhanced), Volume I, Prentice-Hall, 2001

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