COURSE DESCRIPTION CARD - SYLLABUS

Course name
Pneumatic transport systems [S1MiBM2>PST]

Course

Field of study
Mechanical Engineering

Year/Semester
3/6

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
15

Other
0

Tutorials
0

Projects/seminars
0

Number of credit points

2,00

Coordinators

Lecturers

Prerequisites

Is able to obtain information from the Internet, library, reading room and other resources. In particular, he is able to properly indicate the sources of necessary information. Is able to determine the quality and usefulness of the retrieved information and data. He is also able to integrate information obtained from various resources, interpret it, draw conclusions and formulate and justify opinions. Social competences: can cooperate and work in a group, taking on various roles in it.

Course objective

Learning the basic safety requirements necessary during the machine design process. Learning about publicly available databases in order to obtain technical and legal information for the machine design process. Based on the information obtained, the student will be able to draw appropriate practical conclusions for the needs of machine design but also for business activities.

Course-related learning outcomes

Knowledge:
1. The student has structured, theoretically based knowledge of analytical mechanics methods and computer computational methods, including the rigid finite element method (MSES)
2. The student has knowledge of computer-aided design, including modeling and structure analysis

Skills:
1. Is able to obtain information from literature, databases and other properly selected sources in the field of study; is able to integrate the information obtained, interpret and critically evaluate it, as well as draw conclusions and formulate and fully justify opinions.
Is able to work individually and in a team, use information and communication techniques appropriate to perform tasks, communicate using various techniques in a team and environment, also in English or another foreign language recognized as the language of international communication in the field of mechanics and machine construction.

Social competences:
1. Understands the need for lifelong learning;
2. Is able to cooperate and work in a group, taking on various roles in it.
3. Is able to appropriately determine priorities for the implementation of a task specified by himself or others.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture: Exam/pass in case of correct answer to at least 2 questions out of 4 questions: <2 ndst, 3 dst, 3.5 dst+, 4 db, 4.5 db+, 5 db), conducted at the end of the semester. The condition for obtaining a pass in the course is also obtaining a positive grade in the project classes.
Laboratories: Completion of the laboratory based on entrance exams and passing grades.

Programme content

Lectures:
Lecture 1 - Basics of pneumatic transport - basic concepts such as: pressure transport, vacuum transport, phases of pneumatic transport, the most frequently transported loose and granulated materials;
Lecture 2- What materials can be transported pneumatically;
Lecture 3 - Basic properties of materials transported pneumatically;
Lecture 5 - Examples of pneumatic conveyors (blowers and suction cups, suction-pressing conveyors, cyclones, dust removal systems);
Lecture 6 - Examples of the geometry of pneumatic conveyors and methods supporting their design;
Lecture 7 - Examples of the use of the CFD-DEM method during simulation of the pneumatic transport process and optimization of pneumatic transport machine elements;
Lecture 8 - Summary of pneumatic conveyor design methods.
Laboratory:
Laboratory 1 - Measurement of basic dimensional parameters; granular materials: wood pellets, seeds, plastic granules;
Laboratory 2 -Measurement and analysis of friction coefficients;
Laboratory 3 - Measurement and analysis of aerodynamic resistance Cx of granular materials;
Laboratory 4 - Measurement and analysis of the granulometric composition of selected granular materials;
Laboratory 5 - Simulation of pneumatic transport on selected geometry using the CFD-DEM method;
Laboratory 6 - Simulation of pneumatic transport on selected geometry using the CFD-DEM method, continued;
Laboratory 7 - Analysis of the obtained test results and their impact on the pneumatic transport process;
Laboratory 8 - Summary of issues and passing the laboratories.

Course topics

none

Teaching methods

Lecture: multimedia presentation illustrated with examples given on the board, solving tasks.
Laboratories: solving practical problems, searching for sources, team work, discussion.

Bibliography

Basic:
1. Jerzy Strumiński: Transport pneumatyczny. Biuro Studiów i Projektów Typowych Budownictwa Przemysłowego.
2. Urządzenia transportu ciągłego - Przenośniki pneumatyczne do transportu materiałów luzem - Przewody rurowe PN-M-46693 / Polski Komitet Normalizacji, Miar i Jakości.
3. Dariusz Stawiarski: Urządzenia pneumatyczne w obrabiarkach i przyrządach
4. Gierz, Ł.; Kruszelnicka, W.; Robakowska, M.; Przybył, K.; Koszela, K.; Marciniak, A.; Zwiachel, T. Optimization of the Sowing Unit of a Piezoelectrical Sensor Chamber with the Use of Grain Motion Modeling by Means of the Discrete Element Method. Case Study: Rape Seed. Appl. Sci. 2022, 12, 1594. https://doi.org/10.3390/app12031594

Additional:
1. Aleksander Dmowski: Transpoert pneumatyczny w młynarstwie. Wydawnictwo Przemysłu Lekkiego i Spożywczego, 1967.
2. Gierz, Ł.; Kolankowska, E.; Markowski, P.; Koszela, K. Measurements and Analysis of the Physical Properties of Cereal Seeds Depending on Their Moisture Content to Improve the Accuracy of DEM Simulation. Appl. Sci. 2022, 12, 549. https://doi.org/10.3390/app12020549
3. Kruszelnicka W., Diviš J., Hlosta J., Gierz Ł., Žurovec D. Calibration of selected bulk biomaterials parameters for DEM simulation of comminution process. Case study: corn and rice grains. Adv. Sci. Technol. Res. J. 2022; 16(5):64-77 https://doi.org/10.12913/22998624/152990

Breakdown of average student's workload

	Hours	ECTS
Total workload	50	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)	20	1,00