COURSE DESCRIPTION CARD - SYLLABUS

Course name
Dynamics of machines [S2MiBM2>DM]

Course

Field of study
Mechanical Engineering

Year/Semester
1/1

Area of study (specialization)
–

Profile of study
general academic

Level of study
second-cycle

Course offered in
Polish

Form of study
full-time

Requirements
compulsory

Number of hours

Lecture
15

Laboratory classes
15

Other
0

Tutorials
0

Projects/seminars
0

Number of credit points

2,00

Coordinators

dr inż. Wojciech Łapka
wojciech.lapka@put.poznan.pl

Lecturers

Prerequisites

Basic engineering knowledge: mathematics, mechanics, strength of materials, theory of vibrations, basics of machine construction, ergonomics. Logical thinking skills, using knowledge gained from various sources. Understands the need to learn.

Course objective

1. Cognition and understanding of selected dynamics of significant practical importance. 2. Illustration of selected machine dynamics guesswork by means of an experiment.

Course-related learning outcomes

Knowledge:
1. Has knowledge of mathematics
2. Has knowledge of analytical mechanics
3. Has knowledge of the strength of materials
4. Has knowledge of the basics of machine construction
5. Has knowledge of the dynamics of machines

Skills:
1. Can define the basic concepts of the dynamics of machines.
2. He can dynamically model machines.
3. Can carry out a dynamic analysis of a mechanical system.
4. Is able to formulate criteria for selecting an appropriate mathematical method to solve a given technical problem. Is able to use selected mathematical methods to solve a technical problem. Is able to use basic methods of statistical analysis to evaluate measurements of technical quantities.
5. Is able to apply the laws of mechanics in solving problems in the field of mechanics and machine construction. Is able to describe the dynamics of complex mechanical systems. Is able to integrate the information obtained, interpret it, draw conclusions and formulate and justify opinions.
6. Is able to use IT systems in the design of machines and technological processes relevant to mechanics and machine construction. Is able to use CAx systems to design machines and simulate engineering issues.

Social competences:
1. Active attitude in solving the problems of machine dynamics
2. Taking care of the permissible values of dynamic loads of machines, devices and the fatigue strength related to these issues.
3. Sensitivity to harmfulness of excessive dynamic loads on machine and human elements at workplaces.
4. Is able to cooperate and work in a group, taking on various roles in it.
5. Is able to determine the importance of knowledge in solving cognitive and practical problems and seeking the opinion of experts in case of difficulties in solving the problem independently.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture:
Credit on the basis of a written exam, which will consist of five questions and tasks related to the subject. Participation in optional lectures allows you to obtain a satisfactory grade (3,0) with 100% attendance.
Laboratory - exercises:
Oral and written answers to the questions asked, grades from reports from laboratory exercises. The condition for passing the laboratory is positive grades from all exercises.
Assessment criteria for the lecture and laboratory:
Grades: very good - if the ratio of sums of achieved and total points is bigger than 90,1%; good plus - if the ratio of sums of achieved and total points is between 80,1-90%; good - if the ratio of sums of achieved and total points is between 70,1-80%; satisfactory plus - if the ratio of sums of achieved and total points is between 60,1-70%; satisfactory - if the ratio of sums of achieved and total points is between 50,1-60%; if the sum is smaller than 50% - unsatisfactory.

Programme content

Lectures:
1. Place and role of machine dynamics in engineering education.
2. Classical problems of dynamics, differential and integral problems.
3. Fundamentals of dynamics, modeling of mechanical systems, dynamic parameters of mechanical systems,
reduction of mechanical systems, arranging equations of motion of mechanical systems, dynamic characteristics.
4. The theory of vibrations of linear systems with one degree of freedom: natural vibrations - free undamped vibrations, free vibrations with damping, harmonically forced vibrations.
5. Vibrations of machines and structures reduced to the study of a linear system with one degree of freedom.
6. Selected issues:
• torsional vibrations of the shaft,
• flexural vibrations.
Lab:
1. Dynamic modeling of mechanical systems
2. Dynamic eliminator of mechanical vibrations
3. Dynamic reactions of the fixed axis of rotation of rigid bodies

4. Dynamics of a system with two degrees of freedom
5. Reduction of moments of inertia to a specific reduction point

Course topics

Lectures:
Place and role of machine dynamics in engineering education.
Classical problems of dynamics, differential and integral problems.
Fundamentals of dynamics, modeling of mechanical systems, dynamic parameters of mechanical systems, reduction of mechanical systems, arranging equations of motion of mechanical systems, dynamic characteristics.
The theory of vibrations of linear systems with one degree of freedom: natural vibrations - free undamped vibrations, free vibrations with damping, harmonically forced vibrations.
Vibrations of machines and structures reduced to the study of a linear system with one degree of freedom.
Selected issues:
• torsional vibrations of the shaft,
• flexural vibrations.
Lab: Dynamic modeling of mechanical systems. Dynamic eliminator of mechanical vibrations. Dynamic reactions of the fixed axis of rotation of rigid bodies. Dynamics of a system with two degrees of freedom. Reduction of moments of inertia to a specific reduction poin

Teaching methods

1. Lecture: multimedia presentation, presentation illustrated with examples given on the board, discussion and problem analysis.
2. Laboratory: practical exercises, team work..

Bibliography

Basic:
1. Hendzel Z., Żylski W., Mechanika ogólna. Dynamika, Oficyna Wydawnicza Politechniki Rzeszowskiej, 2006
2. Giergiel J., Drgania mechaniczne układów dyskretnych. Teoria, przykłady, zadania, Oficyna Wydawnicza Politechniki Rzeszowskiej., 2004
3. Parszewski Z., Drgania i dynamika maszyn, WNT Warszawa 1982.
4. Misiak J., Zadania z mechaniki ogólnej - część III dynamika, WNT, Warszawa, 1999.
5. Osiński Z., Teoria drgań, PWN, Warszawa, 1978.
6. Red. Osiński, Zbiór zadań z teorii drgań, PWN Warszawa 1989.
7. Kozesnik J., Dynamika maszyn, WNT, 1963.
8. R. H. Cannon jr.; Dynamika układów fizycznych, WNT, Warszawa 1973

Additional:
1. S. Wiśniewski; Dynamika maszyn, Wyd. Politechniki Poznańskiej
2. Parszewski Z., Teoria maszyn i mechanizmów, WNT, Warszawa, 1978.

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