COURSE DESCRIPTION CARD - SYLLABUS

Course name

Engineering Mechanics II

Course

Field of study

Mechatronics

Year/Semester

1/1

Area of study (specialization)

Profile of study

general academic

Level of study

Second-cycle studies

Course offered in

Polish

Form of study

full-time

Requirements

compulsory

Number of hours

Lecture

15

Laboratory classes

15

Other (e.g. online)

0

Tutorials

0

Projects/seminars

0

Number of credit points

3

Lecturers

Responsible for the course/lecturer:

dr hab. inż. Roman Starosta

email: roman.starosta@put.poznan.pl

Faculty of mechanical Engineering

CMBiN, room 437

Responsible for the course/lecturer:

Prerequisites

Basic knowledge in mechanics and mathematics according to the first-cycle studies

Logical thinking, use of the Internet and the library, the use of computer calculation programs

Course objective

Broadening the knowledge of mechanics concerning more sophisticated problems, introducing elements of analytical mechanics. Familiarize students with the possibilities of using mathematics to solve technical issues.

Course-related learning outcomes

Knowledge

Student has knowledge in technical mechanics about analytical mechanics, constraints applications,

generalized coordinates, Dirichlet principle, vibrations of systems with many degrees of freedom, non-linear vibrations, trajectory in phase space and elements of chaos theory,

is familiar with Hamilton's principle and Lagrange equations,

has knowledge about non-linear vibrations, trajectory in phase space and elements of chaos theory.

Skills

Student has the ability to self-study using modern teaching tools, such as remote lectures, websites, databases, e-books, etc.

is able to obtain information from literature, the internet, databases and other sources, is able to integrate obtained information, interpret and draw conclusions from it

knows how to apply elements of analytical mechanics in analysis of system vibrations with multiple degrees of freedom and to determine trajectory in phase space .

Social competences

Student is able to properly set priorities for implementation of the task specified by himself or others based on available knowledge, correctly identifies the technical issues

understands the need for critical assessment of knowledge and continuous education

is aware of the importance and understands the non-technical aspects and effects of engineering activities, including its impact on the environment, and the associated responsibility for decisions made.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture: written exam verifying proper understanding of the concepts of solid mechanics

Laboratory: evaluation activities in class tasks to be solved independently

Programme content

Constrained mechanical systems;
Degrees of freedom and constraints classification;
Double-sided geometrical constraints: gradient, conditions imposed on velocities and accelerations of the system points;
Perfect constraints;
Generalized co-ordinates;
Possible general velocities and general accelerations;
Generalized forces;
Principle of Virtual work;
Balance conditions in the conservative force field;
Lagrange's equations of the second type;
Vibration of the multi degrees of freedom systems;

Nonlinear vibration;
Trajectories in phase space; elements of theory of chaos

Teaching methods

Lecture: multimedia presentation illustrated by the examples given on the blackboard, and computer simulations

Tutorial: solving of the mechanical problems using computer program "Mathematica", discussion

Bibliography

Basic

1. J.Leyko, Mechanika ogólna, tom II, PWN, Warszawa, 2008

2. Z. Gutowski Mechanika analityczna, PWN, Warszawa, 1971

2. M.Łunc, A.Szaniawski, Zarys mechaniki ogólnej, PWN, Warszawa, 1959.

3. W. Szcześniak, Mechanika klasyczna, analityczna i Mathematica w zadaniach i przykładach obliczeniowych, OWPW, Warszawa 2003

Additional

1. A.Bedford, W.Fowler, Engineering mechanics, Prentice Hall, New Jersey, 2002

2. D.J.McGill, Engineering Mechanics, PWS Publishers, Boston, 1985

3. J.Awrejcewicz, Mechanika techniczna, Warszawa WNT 2009

4. E. Ott, Chaos w układach dynamicznych, WNT, Warszawa, 1997.

2. G.K. Susłow, Mechanika teoretyczna, PWN, Warszawa 1960.

3. W. Rubinowicz, W. Królikowski, Mechanika teoretyczna, PWN

Breakdown of average student's workload

	Hours	ECTS
Total workload	75	3,0
Classes requiring direct contact with the teacher	30	2,0
Student's own work (literature studies, preparation for laboratory classes/tutorials, preparation for tests/exam, project preparation) [1]	45	1,0

[1] delete or add other activities as appropriate