COURSE DESCRIPTION CARD - SYLLABUS

Course name

Engineering calculations in Python

Course

Field of study

Mechanical Engineering

Year/Semester

1/2

Area of study (specialization)

Virtual Design Engineering

Profile of study

general academic

Level of study

Second-cycle studies

Course offered in

Polish

Form of study

full-time

Requirements

elective

Number of hours

Lecture

15

Laboratory classes

15

Other (e.g. online)

Tutorials

Projects/seminars

Number of credit points

2

Lecturers

Responsible for the course/lecturer:

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Wydział Inżynierii Mechanicznej

ul. Piotrowo 3 60-965 Poznań

Responsible for the course/lecturer:

Prerequisites

KNOWLEDGE: the student has knowledge of information technology, including programming languages, as well as knowledge of mechanical engineering and numerical methods

SKILLS: the student knows how to program in a basic range in any programming language and use the CAx software, including simple FEM computer simulations

SOCIAL COMPETENCES: the student is aware of the responsibility for the tasks performed, understands the need to acquire new knowledge.

Course objective

Students gain knowledge about the engineering applications of script programming languages, using the example of the Python language, and broaden their knowledge of numerical methods.

Course-related learning outcomes

Knowledge

K2_W01: Has extended and in-depth knowledge of mathematics including numerical solution of equations, determination of matrix values and vectors, solving ordinary and partial differential equations to describe complex mechanical problems.

K2_W07: Has knowledge of modeling, including simplifying assumptions used in modeling, creating a numerical model of a mechanical system, formulating model equations and methods of solving them, identifying system parameters, formulating and solving dynamics problems, nonlinear issues, optimization methods used for modeling and calculation complex mechanical systems using numerical methods.

K2_W04: Has extended and in-depth knowledge of mechanics, understands the basic computational models and methods used in construction. Has ordered, theoretically founded general knowledge that allows linking technical mechanics and strength of materials with computer techniques.

K2_W10: Has knowledge of the basics of CAD / CAM (Computer Aided Design / Computer Aided Manufacturing) integration and aggregation, 3D geometric modeling methods, model visualization methods and procedures for using models for virtual product testing. Has knowledge in the field of integration of information flows, the use of IT tools supporting design.

Skills

K2_U10: Can choose modeling methods in design, carry out basic modeling calculations, knows how to choose effective numerical procedures for their practical, engineering applications.

K2_U11: Can interpret natural and technical phenomena; can perform a simple calculation related to elastic stress, fluid flow or data processing, write a simple computer program to perform more complex parallel calculations.

K2_U14: Is able to describe and basically use engineering software systems to support design, describe 3D geometric modeling methods, model and data visualization methods, and procedures for using models for virtual product testing.

Social competences

K2_K01: Understands the need for lifelong learning; can inspire and organize the learning process of others.

K2_K04: Can adequately set priorities for implementation of the tasks specified by him or others.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Oral and written tests. Assessment of individually made projects.

Programme content

Python programming language; Discussion of selected libraries (numpy, matplotlib, scikit-learn, OpenCV); Overview of methods for creating window applications using Tkinter. Selected problems of engineering simulations. Discussion of selected numerical methods (e.g. solving differential equations). Creating simple tools for engineering applications.

Teaching methods

Information / problem lecture, Case study, laboratory with elements of project.

Bibliography

Basic

Mark Lutz. Python. Wprowadzenie. Wydanie V. Helion, 2020.

A. Malthe-Sorenssen. Elementary Mechanics Using Python. Springer, 2015.

Additional

R. Stones, N. Matthew: Linux. Programowanie. Wyd. RM, 1999. ISBN 83-7243-020-9

Breakdown of average student's workload

	Hours	ECTS
Total workload	60	2,0
Classes requiring direct contact with the teacher	35	1,0
Student's own work (literature studies, preparation for laboratory classes/tutorials, preparation for tests/exam, project preparation) [1]	25	1,0

[1] delete or add other activities as appropriate