COURSE DESCRIPTION CARD - SYLLABUS

Course name

FEM Acoustical Modeling in COMSOL Multiphysics

Course

Field of study

Mechanical Engineering

Year/Semester

III/1

Area of study (specialization)

technical sciences

Profile of study

general academic

Level of study

First-cycle studies

Course offered in

English

Form of study

full-time

Requirements

elective

Number of hours

Lecture

7

Laboratory classes

8

Other (e.g. online)

Tutorials

Projects/seminars

Number of credit points

2

Lecturers

Responsible for the course/lecturer:

Dr. Wojciech ŁAPKA, PhD. DSc. Eng.

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tel. 61 665 2302

Faculty of Mechanical Engineering

Jan Paweł II 24, 61-139 Poznań

tel.: 61 665 2302

Responsible for the course/lecturer:

Prerequisites

Knowledge: basic knowledge of engineering and management, mathemetics (core curriculum for secondary schools, basic level)

Skills: ability to solve elementary problems of engineering based on possessed knowledge, usage of mathematical and engineering issues, the ability to acquire information from indicated sources

Social competences: understanding the need of further education; willingness to cooperate with a team

Course objective

1. Obtaining knowledge of FEM Acoustical Modeling in COMSOL Multiphysics in the scope determined by the content of the curriculum, appropriate for the field of study

2. Development of skills to model acoustical systems, perform simple acoustical system modelling in COMSOL Multiphysics based on gained knowledge

3. Developing teamwork skills.

Course-related learning outcomes

Knowledge

Student is able to define the basic engineering concepts in the range of course content, appropriate for the field of study, deepened knowledge of FEM Acoustical Modeling in COMSOL Multiphysics, broaden mathematical and computational knowlesge.

Student can expertise in modeling aided design equipment including simplifying assumptions used in the modeling, create a physical model of the mechanical system, formulation of model equations and methods of solving them.

Skills

Student is able to obtain information from the literature, databases and other carefully selected sources (also in j. English) in mechanics and mechanical engineering and other technical and engineering problems consistent with the field of study; can integrate the information obtained, to make their interpretation, as well as draw conclusions and formulate and justify opinions.

Student is able to model simple acoustical system in COMSOL Multiphysics, conduct a basic level analysis.

Social competences

Student is able to cooperate in a team, be responsible for his/her position in the team and actively participate in analysis and problem solving process, set priorities for implementation of the task

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Evaluation of performed final project that includes the analysis of solving the selected acoustical system in COMSOL Multiphysics.

Programme content

Lectures: Basics of acoustics, sound properties, acoustical wave propagation in acoustical systems, introduction to COMSOL Multiphysics - Acoustics Module, basics of Finite Elements Method, acoustical model parameters, model creation, meshing, physics, results analysis, etc.

Laboratory: exercises in COMSOL Multiphysics - Acoustics Module, creating simple system and analysis. Performing and presentation of multimetia presentation of final project.

Teaching methods

Lectures: multimedia presentations, a presentation illustrated with examples given on the board.

Laboratory: evaluation of performing and presentation of multimetia presentation of final project.

Bibliography

Basic

1. COMSOL Multiphysics, Acoustic Module, User's Guide and Model Library Documentation Set, COMSOL AB, www.comsol.com, Stockholm, Sweden, 2020.

2. Marburg S., Nolte B., Computational Acoustics of Noise Propagation in Fluids – Finite and Boundary Element Methods, 578, Springer-Verlag, Berlin, Germany, 2008.

3. Zienkiewicz O.C., Taylor R.L., Zhu J.Z., The Finite Element Method: It's Basis and Fundamentals, Butteworth-Heinemann, 2013 - 714.

4. Crocker J. Malcolm, Handbook of Acoustics, John Wiley & Sons, INC., 1998.

Additional

1. Munjal M. L., Acoustics of Ducts and Mufflers with Application to Exhaust and Ventilation System Design, John Wiley & Sons, Inc., Calgary, Canada. 1987.

2. Ver I. L., Beranek L. L. (2005), Noise and vibration control engineering, 2nd edition, Hoboken, John Wiley & Sons, Inc., New Jersey, USA.

Breakdown of average student's workload

	Hours	ECTS
Total workload	62	2,0
Classes requiring direct contact with the teacher	20	1,0
Student's own work (literature studies, preparation for laboratory classes/tutorials, preparation for tests/exam, project preparation) [1]	42	1,0

[1] delete or add other activities as appropriate