COURSE DESCRIPTION CARD - SYLLABUS

Course name

Basics of parallel calculations

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 broaden their knowledge of selected programming languages. They gain knowledge of parallel

systems and their use in mechanical engineering. They acquire the skills of parallel programming in systems with distributed memory.

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.

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

C and Fortran programming languages; User interfaces; Discussion of the characteristics of the equipment: parallel computer with distributed and shared memory. Presentation of the possibilities of

MPI and OpenMP systems, ways of subdomain division and exchange of information using ready-made applications used in CFD and aeroelastics. Creating simple programs for parallel calculations.

Teaching methods

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

Bibliography

Basic

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

J.R. Piechna: Programowanie w języku Fortran 90 i 95. Oficyna Wydawnicza Politechniki Warszawskiej, Warszawa 2000. ISBN 83-7207-225-6

P. Pacheco: Parallel Programming With MPI. Morgan Kaufmann Publishers Inc., 1996, ISBN 15-5860-339-5; http://www.cs.usfca.edu/mpi/

B.E. Borowik: Programowanie równoległe w zastosowaniach, Wyd. MIKOM, Warszawa 2001, ISBN 83-7279-176-7

Additional

A. Trykozo: Ćwiczenia z języka Fortran, Wyd. MIKOM, Warszawa 1999, ISBN 83-87102-66-0

D. Chrobak: Fortran praktyka programowania, Wyd. MIKOM, Warszawa 2003, ISBN 83-7279-361-1

H.J.-P. Morand, R. Ohayon: Fluid-Structure Interaction: Applied Numerical Methods. John Wiley & Sons, 1995. ISBN: 0-471-94459-9

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