# STUDY MODULE DESCRIPTION FORM

| Name of the module/subject | Code |
|---|---|
| **Programming languages and elements of parallel computations** | **1010622211010657867** |

| Field of study | Profile of study (general academic, practical) | Year /Semester |
|---|---|---|
| **Mechanical Engineering** | **(brak)** | **1 / 1** |
| **Elective path/specialty** | **Subject offered in:** | **Course (compulsory, elective)** |
| **Virtual Design Engineering** | **Polish** | **obligatory** |

| Cycle of study: | Form of study (full-time,part-time) |
|---|---|
| **Second-cycle studies** | **full-time** |

| No. of hours | No. of credits |
|---|---|
| Lecture: **1** Classes: **-** Laboratory: **1** Project/seminars: **-** | **2** |

| Status of the course in the study program (Basic, major, other) | (university-wide, from another field) |
|---|---|
| **(brak)** | **(brak)** |

| Education areas and fields of science and art | ECTS distribution (number and %) |
|---|---|
| **technical sciences** | **2 100%** |
| **Technical sciences** | **2 100%** |

## Responsible for subject / lecturer:

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## Prerequisites in terms of knowledge, skills and social competencies:

| | | |
|---|---|---|
| 1 | **Knowledge** | As for all the graduates of first degree of Mechanics, FWMT |
| 2 | **Skills** | As for all the graduates of first degree of Mechanics, FWMT |
| 3 | **Social competencies** | As for all the graduates of first degree of Mechanics, FWMT |

## Assumptions and objectives of the course:

Improve knowledge of computer operating systems. Programming in selected languages. Creating user interfaces (GUI). Gaining knowledge about parallel systems. The acquisition of parallel programming skills.

## Study outcomes and reference to the educational results for a field of study

### Knowledge:

1. knows the basic methods, techniques and programming tools used in solving complex engineering tasks in the field of mechanics - [T2A_W07]
2. has a theoretically founded detailed knowledge of issues related to the use of parallel programming and parallel applications in engineering calculations of mechanics - [T2A_W04]
3. has a knowledge on developments and the most important new achievements in parallel computations in mechanics - [T2A_W05]

### Skills:

1. is able to obtain information from literature, databases and other properly selected sources (also in English); is able to integrate the information obtained, to make interpretations and draw conclusions - [T2A_U01]
2. is able to assess the suitability and ability to use new information technology in applications in the field of mechanical engineering - [T2A_U03]
3. can set the directions of further learning and has a the ability to self-learning - [T2A_U05]
4. is able to use to formulate and solve engineering tasks and simple research problems selected programming languages??, methods and tools for parallel computing - [T1A_U09]
5. is able to assess the suitability and ability to use new information technology in applications in the field of mechanical engineering - [T2A_U12]
6. is able to assess the usefulness of methods and tools to solve engineering tasks specific to computational engineering; is able to solve complex engineering task in the IT environment - [T2A_U18]

| **Social competencies:** |
|---|
| 1. understands the need for lifelong learning; is able to inspire and organize the learning process of others - [T2A_K01] |
| 2. is able to interact and work in a group, taking different roles - [T2A_K03] |
| 3. is able to properly identify priorities from the implementation of tasks specified by himself or others - [T2A_K04] |

| **Assessment methods of study outcomes** |
|---|
| Oral and written tests. Evaluation of the results of individual tasks. |
| **Course description** |
| Programming languages ??C and Fortran; the basics of manipulating data sets, memory management, libraries; Creating user interfaces (GUI); Overview of hardware characteristics: parallel computer with distributed and shared memory. Presentation of the capabilities of MPI, methods of domain decomposition and exchange of information using existing applications used in aeroelasticity and FSI issues. Creating simple programs for parallel computing. |

**Basic bibliography:**

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

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

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

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

**Additional bibliography:**

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

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

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

**Result of average student's workload**

| Activity | Time (working hours) |
|---|---|
| 1. Participation in the lecture | 15 |
| 2. Fixation of the lecture | 4 |
| 3. Preparing to pass (lecture) | 2 |
| 4. Participation in completing (lecture) | 1 |
| 5. Preparation for laboratory exercises | 12 |
| 6. Participation in laboratory exercises | 15 |
| 7. Strengthening exercises and report content | 4 |
| 8. Consultation | 2 |
| 9. Preparing to pass (lab.) | 5 |

**Student's workload**

| Source of workload | hours | ECTS |
|---|---|---|
| Total workload | 60 | 2 |
| Contact hours | 33 | 1 |
| Practical activities | 38 | 1 |