# STUDY MODULE DESCRIPTION FORM

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| Name of the module/subject<br>**Distributed programming** | Code<br>**1010335411010335196** |

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| Field of study<br>**Computer Science** | Profile of study<br>(general academic, practical)<br>**(brak)** | Year /Semester<br>**1 / 1** |
| Elective path/specialty<br>**-** | Subject offered in:<br>**polish** | Course (compulsory, elective)<br>**obligatory** |

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

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| No. of hours<br>Lecture: **16** Classes: **-** Laboratory: **8** Project/seminars: **8** | No. of credits<br>**6** |

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

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| Education areas and fields of science and art<br>**technical sciences** | ECTS distribution (number and %**)**<br>**6 100%** |

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| **Responsible for subject / lecturer:** | **Responsible for subject / lecturer:** |
| Ph.D. Eng. Adam Meissner<br>email: Adam.Meissner@put.poznan.pl<br>tel. 61 665 37 24<br>Faculty of Electrical Engineering<br>ul. Piotrowo 3A 60-965 Poznań | Ph.D. Eng. Krzysztof Zwierzyński<br>email: Krzysztof.Zwierzynski@put.poznan.pl<br>tel. 61 665 37 24<br>Faculty of Electrical Engineering<br>ul. Piotrowo 3A 60-965 Poznań |

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

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|---|---|---|
| 1 | **Knowledge** | Student has theoretical and practical knowledge on algorithm design and analysis, on abstract data structures and their implementation and on computationally hard problems; he/she has theoretical and practical knowledge on computer system architectures, on operating systems and on popular information engineering technologies. |
| 2 | **Skills** | Student is able to design algorithms using basic algorithmic techniques and analyse the algorithm complexity; he/she knows how to apply programming environments and platforms to develop, execute and test simple programs implemented in imperative, object-oriented and declarative languages. |
| 3 | **Social competencies** | Student understands the need of permanent learning and improving the professional, personal and social competencies; a student realises the responsibility for his/her work done individually or in a team; he/she is also ready to accept the rules of group work. |

## Assumptions and objectives of the course:

providing students with basic models of distributed systems and with general methods of communication and synchronization in systems of this type; presentation of selected problems in design of distributed systems.

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

### Knowledge:

1. Student has theoretical and practical knowledge on algorithm design and analysis, on abstract data structures and their implementation and on computationally hard problems - [K_W04]

2. Student has theoretical and practical knowledge on network technologies - [K_W07]

3. Student has theoretical and practical knowledge on internet technologies - [K_W11]

### Skills:

1. Student is able to work individually and in a team; he/she can estimate a time for the given task and construct a schedule for it - [K_U02]

2. Student is able to plan and perform experiments and to apply mathematical methods and models in order to test, analyse and evaluate information systems and their parts - [K_U07]

3. Student is able to analyse a functioning of a computer system and also a functioning of operating systems and computer networks or their parts - [K_U11]

### Social competencies:

1. Student understands the need of permanent learning and improving the professional, personal and social competencies - [K_K01]

2. Student understands the importance of a thorough design of a given project, respecting notation standards, using a proper language and keeping deadlines - [K_K07]

## Assessment methods of study outcomes

Lecture. Written exam consisting of theoretical questions and simple problems to solve.

Labs. Oral or written tests for preparation of a student to exercises, rating a student's activity during exercises, evaluation of reports including their punctual delivery.

Project. Keeping all milestone deadlines of the project; evaluation of the final report.

More than 50% points are necessary for passing the exam, project and labs.

## Course description

Lecture. Distributed programming vs. parallel programming, a distributed model of a parallel program, network transparency, client-server model, MPI library, Open CL environment, synchronisation of threads and processes, efficiency measures of distributed systems, design of distributed algorithms, elements of programming in the client-server model, problems of security and fault-tolerance in distributed systems, distributed programming in the multiparadigm programming methodology.

Labs. Distributed programming using the MPI standard and the GPGPU technology. Distributed programming as a variant of the multiparadigm programming in the Mozart/Oz environment. Task queuing in supercomputer systems (optional).

Project. The project illustrates capabilities of distributed programming of a given software or hardware platform.

## Basic bibliography:

1. Programowanie współbieżne i rozproszone, Weiss Z., Gruźlewski T., Wyd. Naukowo-Techniczne, Warszawa, 1993

2. Programowanie. Koncepcje, techniki i modele, Roy P. van, Haridi S., Wyd. Helion, Gliwice, 2005

3. Systemy rozproszone. Zasady i paradygmaty, Tanenbaum A.S., Steen M. van, Wyd. Naukowo-Techniczne, Warszawa, 2006

## Additional bibliography:

1. Sztuka programowania wieloprocesorowego, Herlihy M.,Shavit N., PWN, Warszawa, 2008

2. Introduction to Parallel Computing, Barney B., https://computing.llnl.gov/tutorials/parallel_comp/

3. A User's Guide to MPI, Pacheco P.S., http://www.wellesley.edu/CS/courses/CS331/notes/mpi.guide.pdf

## Result of average student's workload

| Activity | Time (working hours) |
|---|---|
| 1. Lectures | 16 |
| 2. Labs | 8 |
| 3. Project | 8 |
| 4. Consultations and the exam | 18 |
| 5. Preparation to labs, preparing the reports | 21 |
| 6. Design of the project | 38 |
| 7. Preparation to the exam | 41 |

## Student’s workload

| Source of workload | hours | ECTS |
|---|---|---|
| Total workload | 150 | 6 |
| Contact hours | 50 | 2 |
| Practical activities | 75 | 3 |