### 1. Course title: PARALLEL COMPUTING

### 2. Course code: PC

### 3. Validity of course description: 2018/2019

### 4. Level of studies: 1st cycle of higher education

### 5. Mode of studies: intramural studies

### 6. Field of study: Informatics

### 7. Profile of studies: general academic

### 8. Programme: -

### 9. Semester: IV

### 10. Faculty teaching the course: Institute of Informatics

### 11. Course instructor: dr inż. Jacek Widuch

### 12. Course classification: common courses

### 13. Course status: obligatory

### 14. Language of instruction: English

### 15. Pre-requisite qualifications:
Prerequisites: Basics of computer programming, Algorithms and data structures I

### 16. Course objectives:
The aim is to introduce students into the basic issues of parallel computing

### 17. Description of learning outcomes:

<table>
<thead>
<tr>
<th>Nr</th>
<th>Learning outcomes description</th>
<th>Method of assessment</th>
<th>Teaching methods</th>
<th>Learning outcomes reference code</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Student possesses knowledge of parallel algorithms</td>
<td>Written test</td>
<td>Lectures</td>
<td>K1A_W11</td>
</tr>
<tr>
<td>2</td>
<td>Student possesses knowledge of metrics for parallel algorithms</td>
<td>Written test</td>
<td>Lectures</td>
<td>K1A_W11</td>
</tr>
<tr>
<td>3</td>
<td>Student possesses knowledge of parallel computing models</td>
<td>Written test</td>
<td>Lectures</td>
<td>K1A_W11</td>
</tr>
<tr>
<td>4</td>
<td>Student possesses knowledge of models with distributed memory</td>
<td>Written test</td>
<td>Lectures</td>
<td>K1A_W11</td>
</tr>
<tr>
<td>5</td>
<td>Student is able to design parallel algorithms</td>
<td>Written test</td>
<td>Lectures</td>
<td>K1A_U08</td>
</tr>
</tbody>
</table>

### 18. Teaching modes and hours

**Lecture:** 30 h., **Class:** -, **Laboratory:** -

### 19. Syllabus description:

As part of the lecture the following issues are presented:

1. Basic concepts
   1. Concurrency vs parallelism
   2. Definition of concurrent processes
   3. Physical and virtual processors
2. Metrics for parallel algorithms
   1. Worst-case computational complexity
   2. Speedup
3. Cost of parallel computation
4. Efficiency, or processor utilization

III. Elementary parallel algorithms
   1. Finding the minimum in O(log n) and O(1) time
   2. Sorting in O(log n) time

IV. Models of parallel computation
   1. PRAM model
   2. Versions of PRAM: EREW, CREW, CRCW
   3. MIMD computers
   4. SIMD computers

V. Distributed memory models
   1. Interconnection networks: mesh, cube, butterfly
   2. Comparison criteria of interconnection networks

VI. Designing parallel algorithms
   1. Problem decomposition (data decomposition, functional decomposition, others)
   2. Analysis of computation granularity
   3. Distribution of input, intermediate and output data
   4. Assigning tasks to processors

20. Examination: no

21. Primary sources:

22. Secondary sources:

23. Total workload required to achieve learning outcomes

<table>
<thead>
<tr>
<th>Lp.</th>
<th>Teaching mode</th>
<th>Contact hours / Student workload hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Lecture</td>
<td>30 / 30</td>
</tr>
<tr>
<td>2</td>
<td>Classes</td>
<td>- / -</td>
</tr>
<tr>
<td>3</td>
<td>Laboratory</td>
<td>- / -</td>
</tr>
<tr>
<td>4</td>
<td>Project</td>
<td>- / -</td>
</tr>
<tr>
<td>5</td>
<td>BA/ MA Seminar</td>
<td>- / -</td>
</tr>
<tr>
<td>6</td>
<td>Other (exam)</td>
<td>- / -</td>
</tr>
<tr>
<td></td>
<td>Total number of hours</td>
<td>30 / 30</td>
</tr>
</tbody>
</table>

24. Total hours: 60

25. Number of ECTS credits: 2

26. Number of ECTS credits allocated for contact hours: 1

27. Number of ECTS credits allocated for in-practice hours (laboratory classes, projects): 0

26. Comments: -

Approved:
(date, Instructor’s signature)  (date, the Director of the Faculty Unit signature)