1. Course title: ALGORITHMS AND DATA STRUCTURES

2. Course code: AaDS

3. Validity of course description: 2017/2018

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

5. Mode of studies: intramural studies

6. Field of study: Macrofaculty

7. Profile of studies:

8. Programme:

9. Semester: 6

10. Faculty teaching the course: Faculty of Automatic Control, Electronics and Computer Science


12. Course classification: common courses

13. Course status: obligatory

14. Language of instruction: English

15. Pre-requisite qualifications: It is assumed, that the student has an elementary knowledge of mathematics at the secondary level and logical thinking skills, including abstract thinking. An additional requirement is knowledge of English and the ability to write and understand simple programs.

16. Course objectives: The aim of the course is to introduce students into advanced topics of algorithms and data structures. We present algorithms for sorting, searching, operating on graphs, trees. We discuss selected data structures: binary trees, heaps, priority queues. Students after this course should be able to analyze the complexity of algorithms, adapt known algorithms for new problems etc. Topics are illustrated with many examples.

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>Analyzes computational complexity of algorithms, solves the equations expressing the complexity of recursive algorithms; analyzes the amortized cost</td>
<td>Lab programs, Written tests/exam</td>
<td>Lecture, lab classes</td>
<td>K1A_U11</td>
</tr>
<tr>
<td>2</td>
<td>Designs efficient algorithms, understands the influence of computer architecture on algorithms, is able to tune algorithms</td>
<td>Lab programs, Written tests/exam</td>
<td>Lecture, lab classes</td>
<td>K1A_U11</td>
</tr>
<tr>
<td>3</td>
<td>Uses following methods in algorithms: divide and conquer, dynamic programming, greedy methods</td>
<td>Lab programs, Written tests/exam</td>
<td>Lecture, lab classes</td>
<td>K1A_U11</td>
</tr>
<tr>
<td>4</td>
<td>Can apply known algorithms (sorting, searching, selection, graph, text, geometric number theory, algebra and linear algebra,)</td>
<td>Lab programs, Written tests/exam</td>
<td>Lecture, lab classes</td>
<td>K1A_U11</td>
</tr>
</tbody>
</table>
18. **Teaching modes and hours**

**Lecture / BA / MA Seminar / Class / Project / Laboratory**

30h lecture / 30h laboratory

19. **Syllabus description:**

**Lectures:**


**Laboratory:**

Programs implementing selected algorithms presented during lectures.

20. **Examination:** yes

21. **Primary sources:**

T.H. Cormen, C.E. Leiserson, R.L. Rivest, Wprowadzenie do Algorytmów, WNT, Warszawa, 1997 (Original version in English)

22. **Secondary sources:**


2. N. Wirth, Algorytmy + Struktury danych = Programy, WNT, Warszawa, 2000 (Original version in English)


9. R.L. Graham, D.E. Knuth, O. Patashnik, Matematyka Konkretna, PWN, Warszawa, 1996 (Original version in English)

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 / 15</td>
</tr>
<tr>
<td>2</td>
<td>Classes</td>
<td>- / -</td>
</tr>
<tr>
<td>3</td>
<td>Laboratory</td>
<td>30 / 15</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</td>
<td>- / -</td>
</tr>
<tr>
<td></td>
<td>Total number of hours</td>
<td>60 / 30</td>
</tr>
</tbody>
</table>

24. **Total hours:** 90

25. **Number of ECTS credits:** 3

26. **Number of ECTS credits allocated for contact hours:** 1
<table>
<thead>
<tr>
<th>27. Number of ECTS credits allocated for in-practice hours (laboratory classes, projects):</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td>26. Comments:</td>
<td>–</td>
</tr>
</tbody>
</table>

Approved:

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