Advanced Algorithmics

Module title: Advanced Algorithmics
Credits: 9
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Display language: Englisch
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Learning Outcomes
Students who have completed this module can design and analyze algorithms for computational problems arising in various application contexts. When facing a concrete computational problem, they are able to choose, from a wide range of advanced techniques, a strategy to efficiently solve the problem. This includes strategies for solving problems that are computationally hard in the worst case. In particular, the students know about current research topics in algorithmics.

Content
Introduction to advanced and modern topics of algorithm design and analysis, with a particular emphasis on coping with presumable worst-case intractability. Particular topics include:
- algorithmic game theory,
- algorithmic graph theory,
- approximation and online algorithms,
- computational geometry,
- computational social choice,
- distributed algorithms,
- online algorithms,
- parameterized and exact algorithms,
- randomized algorithms and analysis,
- universal solvers.

Module Components

<table>
<thead>
<tr>
<th>Course Name</th>
<th>Type</th>
<th>Number</th>
<th>Cycle</th>
<th>SWS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Advanced Algorithms</td>
<td>IV</td>
<td>0434 L 237</td>
<td>WS</td>
<td>6</td>
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Workload and Credit Points

<table>
<thead>
<tr>
<th>Advanced Algorithms (Integrierte Veranstaltung)</th>
<th>Multiplier</th>
<th>Hours</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Präsenzzeit</td>
<td>15.0</td>
<td>6.0h</td>
<td>90.0h</td>
</tr>
<tr>
<td>Vor-/Nachbereitung</td>
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<td>10.0h</td>
<td>150.0h</td>
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<tr>
<td></td>
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<td>240.0h</td>
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<table>
<thead>
<tr>
<th>Course-independent workload</th>
<th>Multiplier</th>
<th>Hours</th>
<th>Total</th>
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<td>Prüfungsvorbereitung</td>
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<td>30.0h</td>
<td>30.0h</td>
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</table>

The Workload of the module sums up to 270.0 Hours. Therefore the module contains 9 Credits.

Description of Teaching and Learning Methods
The course consists of roughly 2/3 lecture and 1/3 tutorial parts; in the tutorials concrete problems are solved together.

Requirements for participation and examination
Desirable prerequisites for participation in the courses:
a) obligatory: basic knowledge on algorithm design
b) desirable: basic understanding of P vs. NP classification

Mandatory requirements for the module test application:
No information

Module completion
**Duration of the Module**
This module can be completed in one semester.

**Maximum Number of Participants**
This module is not limited to a number of students.

**Registration Procedures**
Please register at QISPOS or directly at the Examination Office

**Recommended reading, Lecture notes**
- **Lecture notes:**
  - unavailable
- **Electronical lecture notes :**
  - available

**Additional information:**
Slides will be made available during the lecture period

**Recommended literature:**
*Current research literature specified during the lecture. Basic textbooks:
Kleinberg, Jon; Tardos, Éva: Algorithm Design, 2006, Pearson/Addison-Wesley
Niedermeier, Rolf: Invitation To Fixed-Parameter Algorithms. 2006, Oxford University Press

**Assigned Degree Programs**
This module is used in the following modulelists:
<table>
<thead>
<tr>
<th>Master's Program</th>
<th>Stu/PO Year</th>
<th>Module Lists of Semesters</th>
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</table>

**Miscellaneous**

No information