



# Advanced Algorithmics

**Module title:**

Advanced Algorithmics

**Credits:**

9

**Responsible person:**

Niedermeier, Rolf

**Office:**

TEL 5-1

**Contact person:**

Niedermeier, Rolf

**Website:**<http://www.akt.tu-berlin.de/menue/teaching/>**Display language:**

Englisch

**E-mail address:**

lehre@akt.tu-berlin.de

## 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

Course Name	Type	Number	Cycle	SWS
Advanced Algorithms	IV	0434 L 237	WS	6

## Workload and Credit Points

Advanced Algorithms (Integrierte Veranstaltung)	Multiplier	Hours	Total
Präsenzzeit	15.0	6.0h	90.0h
Vor-/Nachbereitung	15.0	10.0h	150.0h
			240.0h

Course-independent workload	Multiplier	Hours	Total
Prüfungsvorbereitung	1.0	30.0h	30.0h
			30.0h

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

**Grading:**  
graded

**Type of exam:**  
Written exam

**Language:**  
English

**Duration/Extent:**  
90 min

## 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:

Cormen, Thomas H.; Stein, Clifford; Leiserson, Charles E.; Rivest, Robert L.: Introduction to Algorithms. 3rd Edition, 2009, The MIT Press

Kleinberg, Jon; Tardos, Éva: Algorithm Design, 2006, Pearson/Addison-Wesley

Niedermeier, Rolf: Invitation To Fixed-Parameter Algorithms. 2006, Oxford University Press

Skiena, Steven S.: The Algorithm Design Manual, 2nd Edition, 2008, Springer Verlag

Williamson, David P.; Shmoys, David B.: The Design Of Approximation Algorithms. 2011, Cambridge University Press

## Assigned Degree Programs

This module is used in the following modulelists:

### Computer Engineering (Master of Science)

StuPO 2015

Modullisten der Semester: WS 2017/18 SS 2018 WS 2018/19

### Computer Science (Informatik) (Master of Science)

StuPO 2015

Modullisten der Semester: WS 2017/18 SS 2018 WS 2018/19

### Double-Degree-Masterstudiengang ICT Innovation (Master of Science)

MSc ICT Innovation StuPO 2016

Modullisten der Semester: WS 2017/18

### Double-Degree-Masterstudiengang ICT Innovation (Master of Science)

Msc ICT Innovation StuPO 2017

Modullisten der Semester: WS 2017/18 SS 2018 WS 2018/19

### Elektrotechnik (Master of Science)

StuPO 2015

Modullisten der Semester: WS 2017/18 SS 2018 WS 2018/19

### Informatik (Master of Science)

MSc Informatik PO 2013

Modullisten der Semester: WS 2017/18 SS 2018 WS 2018/19

### Technische Informatik (Master of Science)

StuPO 2013

Modullisten der Semester: WS 2017/18 SS 2018 WS 2018/19

### Wirtschaftsinformatik / Information Systems Management (Master of Science)

StuPO 2013

Modullisten der Semester: WS 2017/18 SS 2018 WS 2018/19

### Wirtschaftsinformatik / Information Systems Management (Master of Science)

StuPO 2017

Modullisten der Semester: WS 2017/18 SS 2018 WS 2018/19

### Wirtschaftsingenieurwesen (Master of Science)

StuPO 2015

Modullisten der Semester: WS 2017/18 SS 2018 WS 2018/19

## **Miscellaneous**

*No information*