

Module: Theory of Computing

Level	Bachelor	Short Name	TI
Responsible Lecturers	Schäfer, Andreas Prof. Dr.		
Department, Facility	Electrical Engineering and Computer Science		
Course of Studies	International Track		
Compulsory/elective	Compulsory	ECTS Credit Points	3
Semester of Studies	2	Semester Hours per Week	4
Length (semesters)	1	Workload (hours)	150
Frequency	SuSe	Presence Hours	60
Teaching Language	German/English	Self-Study Hours	90

The following section is filled only if there is **exactly one** module-concluding exam.

Exam Type	Portfolio Exam	Exam Language	German/English
Exam Length (minutes)		Exam Grading System	One-third Grades
Learning Outcomes	<p>Students can define regular languages using regular expression, deterministic and non-deterministic finite automata and can use standard constructions e.g. the subset construction.</p> <p>Students can define context free languages using context free grammars and push down automata.</p> <p>Students can determine the correct class in the Chomsky hierarchy for standard languages and prove that a language is not regular / context free using the Pumping lemma.</p> <p>Students know undecidable problems and can construct simple undecidability proofs using reduction or Rice's theorem.</p> <p>Students know the basic time and space complexity classes.</p>		
Participation Prerequisites			

The previous section is filled only if there is **exactly one** module-concluding exam.

Consideration of Gender and Diversity Issues	<ul style="list-style-type: none"> ✓ Use of gender-neutral language (THL standard) ✓ Target group specific adjustment of didactic methods ✓ Making subject diversity visible (female researchers, cultures etc.)
Applicability	
Remarks	

Module Course: Theory of Computing (Lecture)

(of Module: Theory of Computing)

Course Type	Lecture	Form of Learning	Presence
Mandatory Attendance	no	ECTS Credit Points	3
Participation Limit		Semester Hours per Week	2
Group Size		Workload (hours)	90
Teaching Language	German	Presence Hours	30
Study Achievements ("Studienleistung", SL)		Self-Study Hours	60
SL Length (minutes)		SL Grading System	

The following section is filled only if there is a course-specific exam.

Exam Type		Exam Language	
Exam Length (minutes)		Exam Grading System	
Learning Outcomes			
Participation Prerequisites			

The previous section is filled only if there is a course-specific exam.

Contents	<p>Regular Languages</p> <ul style="list-style-type: none"> • Finite automata (deterministic and non deterministic) • Regular Expressions • Pumping Lemma • Minimizing deterministic finite automata <p>Context free languages</p> <ul style="list-style-type: none"> • Context free grammars • Push down automata • Pumping Lemma <p>Computability and Complexity</p> <ul style="list-style-type: none"> • Turing Machines • Undecidability of the halting problem, reduction, Rice's Theorem • Time Complexity (P, NP, NP completeness, polynomial time reduction) • Space Complexity (PSPACE, NPSPACE, Savitch's Theorem, L, NL)
Literature	<ul style="list-style-type: none"> • Rajeev Motwani, Jeffrey D. Ullman, John E. Hopcroft, Introduction to automata theory, languages, and computation, 2007 • Elaine Rich, Automata, Computability and Complexity: Theory and Applications • Michael Sipser, Introduction to the Theory of Computation, Cengage Learning, 2012

Remarks	
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Module Course: Theory of Computing (Tutorial)

(of Module: Theory of Computing)

Course Type	Exercise	Form of Learning	Presence
Mandatory Attendance	no	ECTS Credit Points	
Participation Limit		Semester Hours per Week	1
Group Size		Workload (hours)	30
Teaching Language	German/English	Presence Hours	15
Study Achievements ("Studienleistung", SL)		Self-Study Hours	15
SL Length (minutes)		SL Grading System	

The following section is filled only if there is a course-specific exam.

Exam Type		Exam Language	
Exam Length (minutes)		Exam Grading System	
Learning Outcomes			
Participation Prerequisites			

The previous section is filled only if there is a course-specific exam.

Contents	See lecture
Literature	
Remarks	

Module Course: Theory of Computing (Practical Training)

(of Module: Theory of Computing)

Course Type	Practical Training	Form of Learning	Presence
Mandatory Attendance	no	ECTS Credit Points	
Participation Limit		Semester Hours per Week	1
Group Size	12	Workload (hours)	30
Teaching Language	German/English	Presence Hours	15
Study Achievements ("Studienleistung", SL)		Self-Study Hours	15
SL Length (minutes)		SL Grading System	

The following section is filled only if there is a course-specific exam.

Exam Type		Exam Language	
Exam Length (minutes)		Exam Grading System	
Learning Outcomes			
Participation Prerequisites			

The previous section is filled only if there is a course-specific exam.

Contents	See lecture
Literature	
Remarks	