

# Theoretical Computer Science as a major or minor<sup>1</sup>

Theoretical computer science develops and applies mathematical methods for systematic modelling, analysis and solution of computational problems. Such methods play a central role in the design of software systems and parallel computer architectures, routing protocols of communication networks, cryptography, VLSI design, and the development of programming languages and compilers for them.

The major in theoretical computer science provides the student with working knowledge on modelling and analysing information processing systems, computational complexity theory, and cryptology; and a deep understanding of one or two focus areas of the Laboratory: computational logic, computational complexity theory, verification, and cryptology. The goal is to become eligible for post-graduate studies as well as demanding R&D tasks; including abilities to analyse large and complex systems and their critical parts using mathematical tools and to apply latest research results in practical engineering applications.

**Module structure of Theoretical Computer Science** The Laboratory for Theoretical Computer Science offers the intermediate module A2 and the advanced module A3 in theoretical computer science.

T-79.4001	Seminar on Theoretical Computer Science	3 cr
T-79.4201	Search Problems and Algorithms	4 cr
T-79.4301	Parallel and Distributed Systems	4 cr
T-79.4501	Cryptography and Data Security	4 cr
T-106.4100	Design and Analysis of Algorithms*	5 cr
* or T-79.5103 Computational Complexity Theory, if T-106.4100 has to be placed in some other module		

Table 1: The intermediate module A2 in Theoretical Computer Science

The advanced A3 module allows comparatively free selection of courses on the focus areas of the Laboratory for Theoretical Computer Science (see the Study Guide or Study Programme).

**Theoretical Computer Science for CS students** The major in theoretical computer science consists of the intermediate A2 module and the advanced A3 module in theoretical computer science; they are based on the computer science T module offered by the Department of Computer Science and Engineering.

**Theoretical Computer Science for students of other degree programmes** The Computer Science module B1 is a minor module for students of other degree programmes. It can be taken as a minor in candidate studies, and it allows continuing minor studies at A2 level or even major studies at A3 level. Different A2 modules require including different courses in the B1 module. Before taking the module B1 the student must take T-106.1203 Basics of Programming L (Java), T-106.1206 Basics of Programming Y (Java) or T-106.1207 Basics of programming (Swedish) (Java).

T-106.1223	Data Structures and Algorithms Y	5 cr
T-106.1243	Intermediate Course in Programming L1 (Java)	6 cr
T-79.1001	Introduction to Theoretical Computer Science T	4 cr
T-79.3001	Logic in Computer Science: Foundations	4 cr

Table 2: The courses in minor module B1 required for studying theoretical computer science

To study the intermediate A2 module in theoretical computer science the minor student must take module B1 so that the courses in Table 2 are included, unless they are included in an earlier module. Additional courses of the B1 module (see Study Guide) must be chosen so that the courses total at least 20 cr.

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<sup>1</sup>This handout is based on the Study Programme 2006–07. See also <http://www.tcs.hut.fi/Studies/> and <http://tieto.tkk.fi/Opinnot/opetusohjelma.html> Harri Haanpää 8 Mar 2007