

Technische Universität Dresden
Faculty of Computer Science

**Study Regulations
for the International MSc Program
in Computational Logic
at the Technische Universität Dresden**

From 1st October 2004

Based on § 24 of the Higher Education Act of the Free State of Saxony (Sächsisches Hochschulgesetz - SHG) of 11th June 1999 (Sächs GVBl, p. 293), the Technische Universität Dresden enacts the following Study Regulations.

In these Regulations masculine designations of persons apply to female persons as well.

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Article 1. Scope

The study regulations describe the goals, contents and administration of the International MSc Program in Computational Logic on the basis of the Higher Education Act of the Free State of Saxony (SHG).

Article 2. Program Objectives

- (1) This objective of the program is to impart to the student the profound theoretical and practical knowledge required for professional practice in the field, to give him a survey of the individual disciplines of Computational Logic and to develop his ability to work according to scientific methods. In addition, the student is given the opportunity to plan his studies to fit a particular practical application. To acquire practice-oriented knowledge he may choose appropriate combinations of modules. By mean of visits abroad and English as the language of instruction, the student is to be prepared for the increasing internationalism of science, commerce and industry.
- (2) The focus of instruction lies in the following areas: mathematical logic, logic programming, deduction systems, knowledge representation, artificial intelligence, methods of formal specification and verification, inference techniques, syntax-directed semantics, and the relationship between theoretical computer science and logic.
- (3) The further qualification for professional practice and research obtained by the International MSc Program in Computational Logic is determined by the Master's examination. The examination provides a means to determine whether the candidate has a scientific overview of his field, whether he has acquired the technical knowledge and skills required for professional practice and whether he is capable of applying knowledge and scientific methods independently. On successful completion of the examination, Technische Universität Dresden awards the academic degree of "Master of Science" (abbreviated M.Sc.). The certificates indicate that the degree was obtained in the International MSc Program in Computational Logic.

Article 3. Study Requirements

- (1) Applicants for the International MSc Program in Computational Logic must satisfy the following study requirements:
 1. Proof of a minimum knowledge of English such as an IELTS certificate or equivalent. Applicants who are native english speakers are exempt from this requirement.
 2. Bachelor's degree in Computer Science with a regular study period (Regelstudienzeit) of six semesters, or an equivalent degree or comparable university study records approved by the Examination Board.
 3. Proof of extensive knowledge in the areas of
 - The foundations of mathematical logic;
 - The foundations of artificial intelligence; and
 - The programming language Prolog.

is required with a grade equivalent of “good” or “very good”.

4. The requirements stated in point 3 can be demonstrated by certificates, examination records or other written academic performance records.
- (2) The fulfillment of the requirements mentioned in Paragraph 1 is decided by the Examination Board.
- (3) Students are registered in accordance with the regulations of the Technische Universität Dresden.

Article 4. Commencement and Duration of Study

- (1) The program normally commences in the winter semester.
- (2) The regular period of study including preparation and defense of the Master’s thesis comprises four semesters.
- (3) Students who acquired the study requirements of Article 3, Paragraph 1, Number 2 at a German university should spend one semester of the regular study period at a university-level institution in a country other than Germany. The semester abroad can also be used to prepare the Master’s thesis under supervision of a university lecturer or professor at the foreign university. The Examination Board for the International MSc Program in Computational Logic decides on the semester abroad and its commencement upon application. Upon application the Examination Board also decides on whether an individual exception to this rule can be made. The students must ask a university professor’s advice on which courses to select or on the topic of his Master’s thesis at the foreign institution early enough before going abroad.

Article 5. Forms of Instruction

- (1) The curriculum is structured into modules. In each module the subject will be introduced, consolidated and deepened by means of lectures, tutorials, seminars and practical sessions.
- (2) The subject is introduced in lectures. Tutorials are associated with lectures, and serve to consolidate the subject matter. In tutorials, students discuss their solutions to exercises in supervised groups. Seminars serve to develop the student’s ability to research a particular field using literature, documentation and other material, and then to present and defend his results. Practical sessions serve for the practical application and deepening of the taught material as well as the acquisition of practical skills in the use of hardware and software.
- (3) The language of instruction, work and examination is English. Students can take oral examinations in German.

Article 6. Course Structure and Syllabus

- (1) Courses are distributed over three semesters. They amount in value to a total of 90 ECTS points (credits, abbreviated crs).

- (2) Teaching is divided into compulsory foundation modules and optional advanced modules (from which students may choose) and is divided up as follows:
 - 42 crs of foundation modules;
 - 36 crs of advanced modules;
 - 12 crs of project; and
 - 30 crs for the Master's thesis and defence.
- (3) The distribution of the modules over individual semesters are listed in the attached credit hours schedule in appendix 1.
- (4) The goals of the individual modules, their prerequisites and the dependencies between modules are given in the module descriptions in appendix 2.
- (5) In the final Master's thesis the candidate should demonstrate that he is capable of independently solving a problem in Computational Logic or its applications using scientific methods.
- (6) The study program is completed with the Master's examination.
- (7) The student is advised to consolidate knowledge, abilities and skills acquired during his studies by means of practical professional work.

Article 7. Examinations and ECTS Point System

- (1) The course of study is completed by the Master's examination. The Master's examination consists of two parts, the module examinations and the Master's thesis together with its defence. Module examinations are taken in the form of examinations that take place throughout the period of study. The grading of module examinations is performed according to the ECTS scale, along with the german grade designations as given in article 11, paragraph 1 of the examination regulations.
- (2) ECTS points are issued if a module examination has been passed. The ECTS point system offers a unified framework for the assessment of studies carried out abroad.

Article 8. Student Advisory Service

The Student Advisory Service of the Faculty of Computer Science of Technische Universität Dresden gives advice relating to course requirements, examinations, university transfer, study abroad or any other study-related matter. In accordance with the international character of the programme counseling is also available over the Internet.

Article 9. Authority and Publication

- (1) These Study Regulations shall apply to students registered from winter semester 2004/2005 onwards. For students registered before that date, the study regulations of 26th November 1997, modified on the 9th May 2000 and 9th April 2003.

- (2) These Study Regulations shall be in force with effect from 1st October 2004 and shall be announced in the "Amtliche Bekanntmachungen" (official announcements) of Technische Universität Dresden.

Appendix 1. Credit Hours Curriculum

Modules	Semester			
	1	2	3	4
Foundations	12			
Logic and Constraint Programming	12			
Advanced Logics		9		
Integrated Logic Systems		9		
Selected advanced modules	36			
Project			12	
Master's thesis				30
Total	120			

Appendix 2: Module Descriptions

Module: Foundations

Contact person: Steffen Hölldobler

Keywords: propositional logic; first order logic; deduction; proof theory; abduction and induction; knowledge representation and reasoning; complexity theory; computer algebra.

The module offers a comprehensive introduction to Computational Logic covering the main subareas as well as main methods and techniques. After recalling basic notions from propositional and first order logic, complexity theory and computer algebra, the areas of equational reasoning, deduction, proof theory, abduction and induction, non-monotonic reasoning, logic-based program development, natural language processing and machine learning as well as logic and connectionism are covered.

This module consists of lectures and tutorials. The total of 12 credit points can be scored by passing the final written examination of the module.

The module takes one semester and is offered every winter semester.

Prerequisites: none

Module: Logic and Constraint Programming

Contact person: Michael Thielscher

Keywords: unification; declarative, procedural, and operational semantics; logic programming; constraint logic programming; combinatorics and analysis of algorithm.

This module is concerned with the foundations of logic programming and constraint logic programming. The basic computation mechanisms of unification and SLD-resolution are introduced. The declarative and the operational semantics of logic programs are given and related to the procedural semantics. A logic programming language is introduced as an example of a declarative programming language. Logic programs with constraints are introduced and basic computation mechanisms is given. The module concludes with examples of constraint logic programming languages. In addition basic knowledge of combinatorics and analysis of algorithms is taught.

After the successful completion of this module, students will have acquired a profound understanding of the mathematical principles of logic programming. Students will also have experience in using logic programming languages and constraint logic programming languages for problem solving.

This module consists of lectures and tutorials. The total of 12 credit points can be scored by passing the final written examination of the module.

The module takes one semester will be offered every winter semester.

Prerequisites: none

Module: Advanced Logics

Contact person: Horst Reichel

Keywords: higher order logics; lambda calculus; lambda prolog; modal logics, epistemic logic; temporal logic; mu-calculus; CTL*; schematic tableaux; model theory.

The aim of this module is to introduce basic concepts behind first-order predicate logics. In Computer Science many different logics and deductive systems exist. First we introduce higher order logic (HOL) as a framework for specifying syntactic and deductive notions of different logics. HOL is used in several interactive proof tools, like PVS and Isabelle. In addition, specific families of logics aimed at different application areas are introduced: logics of time and computation (modal logics, temporal Logics), logics for reasoning about knowledge (epistemic logic). Finally we introduce the mu-calculus which allows to define recursive temporal properties and we present a tableau based deduction calculus for the mu-calculus. The mu-calculus and its deduction system can be used to define problem oriented systems of modal operators and corresponding deduction systems.

This module consists of lectures and tutorials. The total of 9 credit points can be scored by passing the final written examination of the module.

The module takes one semester will be offered every summer semester.

Prerequisites: none

Module: Integrated Logic Systems

Contact person: Michael Schröder

Keywords: Logic & computers, logic & other systems; logic & interfaces; logic & applications.

The module meets the demand for practice-oriented subjects in the curriculum. By means of selected examples it shall give an insight to various issues of how logic can be used in real world applications. The students shall be introduced to how logic can be linked to computers (e.g. data structures, WAM, distributed computation), to other systems (e.g. between rules and data bases). The underlying techniques will be supplemented by examples from bioinformatics, which provides a rich set of online data sources and problems amenable to logic programming.

This module consists of lectures and tutorials. The total of 9 credit points can be scored by passing the final written examination of the module.

The module takes one semester will be offered every summer semester.

Prerequisites: none