EBERHARD KARLS
UNIVERSITÄT
TÜBINGEN

Handbook

Computational Linguistics
Bachelor of Arts

Valid from summer semester 2023

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Faculty of Humanities
Institute of Linguistics

Contents

1 Program goals and content

Computational Linguistics is an interdisciplinary combination of the subjects General Linguistics and Computer Science and is concerned with the simulation of human language production in computer-supported models. It includes the implementation of language-processing systems in various application scenarios.

Graduates of our B.A. in Computational Linguistics program obtain a long-term academic qualification aimed at the systematic, critical gaining of knowledge and development of knowledge; this qualification forms a first general academically-based professional qualification in the field of Computational Linguistics. Our students learn to deal with computer linguistic issues in an appropriate, scientific manner.

The professional goals are as follows. Graduates obtain a good overview of the central topics in Computational Linguistics - symbolic/rule-based, statistical methods and corpus linguistics. They can apply mathematical methods from logic and statistics. They are familiar with the central topics in general linguistics: Morphology, syntax and semantics. They can design computer programs and implement general data structures and algorithms from informatics and computational linguistics in an object-oriented language; equally, they have sufficient grasp of theory and the ability to implement grammar and parsers operating with it and statistical methods of language processing. Graduates have specialist knowledge in two areas of Computational Linguistics and are familiar with the current literature, have the ability to compare relevant works and to assess them critically, even to the point where they are able to suggest minor improvements. They are able to compose in writing and present academic material in Computational Linguistics professionally and in line with the current standards.

Beyond the traditional confines of the discipline, graduates are qualified to program solutions generally, so that they are potentially useful to any kind of IT company. They have practical experience in the workplace both in programming and other areas. Outside of the purely computational linguistics perspective, graduates have good knowledge of the main fields of general linguistics, i.e., morphology, syntax and semantics, so that they have expertise in these areas in addition to their computational linguistics implementation. The same is true for the passive and active use of literature mentioned above - in the general academic field; in particular, graduates are able to compose short texts at the academic level. They are also capable of collecting, processing, and evaluating general statistical data.

As a formal requirement for enrollment, a knowledge of English at least of level B2 of the Common European Framework of Reference for Languages must be documented. This must be in the form of an internationally-accepted test (TOEFL, IELTS, etc.). Applicants with a German school leaving certificate (Abitur) and applicants whose native tongue is English or who have a leaving certificate from an English-language secondary school do not need additional proof, as the B2 level is thereby shown.

2 General information

2.1. Structure

The Computational Linguistics Bachelor's program is structured over three years. The first year concludes with the orientation examination, the second with the intermediate examination, and the third with the Bachelor examination. Students obtain a total of 180 credit points. The credit points allocated to each module in each year are set out in the table at 3.1.

2.2. Credit points

Credit points are intended to quantify and make internationally comparable the average workload a student has to manage to pass a module. One credit point is the equivalent of approximately 30 hours. One credit point is defined as one point under the European Credit Transfer System (ECTS). Sixty credits per year, i.e. 30 per semester, are required to complete a degree in the minimum prescribed time.

Credit points include both actual teaching time in class - contact hours - as well as private study (usually preparation and reviewing of the material taught, preparation for presentations in class, semester papers, and the Bachelor's thesis).

2.3. Assessed and non-assessed coursework

Various forms of coursework must be completed for credit points to be awarded. This includes assessment and ungraded coursework.

Assessed work is generally given a grade and counts as, or counts towards, the grade for the module. The assessed work required for each module in the Computational Linguistics study program is set out in the module handbook. Assessment may be made in the form of a grade for performance either at the end of the learning process in a module (summatively - e.g. as an exam or assignment = result = the module grade) or it may be in several stages within a module (formatively - e.g. as a programming project, exercise, or analysis task. Assessed work from each phase of assessment is incorporated into the module grade, whereby the phases may be weighted differently). A graded module has been passed if the module is graded "sufficient" (4.00) or better; it is possible to fail. Any repeat exams permitted (when and how often) are regulated in the General Provisions of the exam regulations.

Non-graded coursework is noted as "completed" / "not completed". However, non-graded coursework has only been completed when the responsible teacher attests sufficient quality, i.e. well-founded academic feedback by the teacher is possible. Non-graded coursework has no influence on the module grade. Non-graded coursework may be, e.g.: Presentation, abstract, programming project, analysis, experiment.

In the obligatory courses offered once a year, a retake exam is generally offered in the week before the next semester starts so that students who did not pass an exam have a second opportunity to pass the exam in a timely manner. Where successful, they thus can take courses building on this prerequisite without delay. Alternatively, students can also choose to repeat a course in the following year.

3 Program structure

3.1 Overview of modules

Semester	Module no.	Name of module	Type	ECTS	Program phase
1	ASW-BA-01	Linguistic Fundamentals	Compul-sory	6	Orientation exam
1	ASW-BA-02	Methods 1	Compul-sory	6	Orientation exam
2.	ASW-BA-03	Methods 2	Compul-sory	6	Orientation exam
1-2	ISCL-BA-01	Introductory module: Computa-tional Linguistics	Compul-sory	12	Orientation exam
1-6	ISCL-BA-02	Interdisciplinary professional skills 1	Compul-sory	15	Bachelor exam
1-6	ISCL-BA-03	Interdisciplinary professional skills 2	Compul-sory	6	Bachelor exam
2.	ISCL-BA-04	Introductory module: Program-ming	Compul-sory	12	Orientation exam
3	ISCL-BA-05	Introductory module: Symbolic Computational Linguistics: Text Technology	Compul-sory	6	Intermediate exam
4	ISCL-BA-06	Introductory module: Symbolic Computational linguistics: Parsing	Compul-sory	6	Intermediate exam
3-4	ISCL-BA-07	Advanced Programming	Compul-sory	12	Intermediate exam
3-4	ISCL-BA-08	Introductory module: Statistic Methods in Computational Lin-guistics	Compul-sory	9	Intermediate exam
3-4	ISCL-BA-09	Introductory module: Grammar Formalisms	Compul-sory	9	Intermediate exam
3-5	ISCL-BA-10	Internship module	Compul-sory	9	Bachelor exam
5-6	ISCL-BA-11	Specialization module	Compul-sory	15	Bachelor exam
6	ISCL-BA-12	Exam module	Compul-sory	12	Bachelor exam
Required electives General Linguistics (choose 39 ECTS from this table)					
2/4	ASW-BA-04*	Phonetics and Phonology	Required elective	9	Intermediate exam
3	ASW-BA-05*	Syntax and Semantics	Required elective	9	Intermediate exam
3	ASW-BA-06*	Psycholinguistics	Required elective	9	Intermediate exam
2/4	ASW-BA-07*	Semantics and Pragmatics	Required elective	9	Intermediate exam
4/6	ASW-BA-08	Language & Cognition	Required elective	12	Bachelor exam
3/5	ASW-BA-09	Variation, Evolution & Change	Required elective	12	Bachelor exam

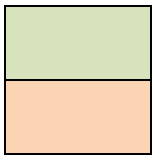
3/5	ASW-BA-10	Language Use	Required elective	9	Bachelor exam

* You must choose at least 2 modules of ASW-BA-04, ASW-BA-05 and ASW-BA-07 and overall ASW required electives worth 39 ECTS.

3.2 Program structure

Module no.	Name of module	Semester						Σ
		1	2	3	4	5	6	
ASW-BA-01	Linguistic Fundamentals	6						6
ASW-BA-02	Methods 1	6						6
ASW-BA-03	Methods 2		6					6
ISCL-BA-01	Introductory module: Computational linguistics	12						12
ASW-BA-04*	Phonetics and Phonology			(9)				(9)
ASW-BA-05*	Syntax and Semantics			9				9
ASW-BA-06*	Psycholinguistics				(9)			(9)
ASW-BA-07*	Semantics and Pragmatics				9			9
ASW-BA-08*	Language & Cognition						12	12
ASW-BA-09*	Variation, Evolution & Change						12	12
ASW-BA-10*	Language Use					9		9
ISCL-BA-02	Interdisciplinary professional skills 1		6	3	3	3		15
ISCL-BA-03	Interdisciplinary professional skills 2	6						6
ISCL-BA-04	Introductory module: Programming		12					12
ISCL-BA-05	Introductory module: Symbolic Computational Linguistics: Text Technology		6					6
ISCL-BA-06	Introductory module: Symbolic Computational Linguistics: Parsing			6				6
ISCL-BA-07	Advanced Programming			12				12
ISCL-BA-08	Introductory module: Statistic Methods in Computational Linguistics				9			9
ISCL-BA-09	Introductory module: Grammar Formalisms				9			9
ISCL-BA-10	Internship module					9		9
ISCL-BA-11	Specialization module					9	6	15
ISCL-BA-12	Exam module						12	12
Total		30	30	30	30	30	30	180

* You must choose at least 2 modules of ASW-BA-04, ASW-BA-05 and ASW-BA-07 and overall ASW required electives worth 39 ECTS. This is one possible model of how to structure the program. Other variations are permitted.



Interdisciplinary professional skills

General Linguistics required electives

Key	
Form of evaluation:	b = graded; ub = not graded (pass/fail); kP = no assessment
Assessment type:	K = exam; MP = oral exam; PA = project; H= assignment; R = presentation If several types of assessment are possible, this is shown by the use of “or” or a slash mark “/”. For instance, K/MP stands for “exam or oral exam”.
Duration:	Duration of module exam in minutes
Weighting	In courses = weighting of the exam grade as part of module grade In modules = weighting of the module grade for the final grade
Credit hours during semster	Credit hours
Status:	o = obligatory; f = facultative (not compulsory)
Class type:	VL = lecture; S = seminar; T = tutorial; Ü = exercise
LP:	Credit points under European credit transfer system (ECTS)

4 Description of modules

4.1 Compulsory modules

<table>
<tr><td>Module no.:
ASW-BA-01</td><td colspan="8">Module name:
Linguistic Fundamentals</td><td>Module type
Compulsory</td></tr>
<tr><td>ECTS credits</td><td colspan="9">6</td></tr>
<tr><td>Workload
- contact hours
- private study</td><td colspan="4">Workload:
180 hours</td><td colspan="3">Contact hours:
60 hours / 4 credit hours per week</td><td colspan="2">Private study:
120 hours</td></tr>
<tr><td>Duration of module</td><td colspan="9">1 semester</td></tr>
<tr><td>Frequency</td><td colspan="9">each winter semester</td></tr>
<tr><td>Language of instruction</td><td colspan="9">English</td></tr>
<tr><td>Module structure</td><td colspan="9">Introduction to Linguistics (4 credit hours per week, 6 ECTS)</td></tr>
<tr><td>Teaching formats</td><td colspan="9">Proseminar (lecture-style teaching, exercises, group work)</td></tr>
<tr><td>Content of module</td><td colspan="9">"Introduction to Linguistics" provides a foundation in linguistics. The goal is to give the student an overview of the research fields within linguistics: their methodology, historical development, and the ways in which they are linked as well as their significance beyond the boundaries of linguistics as a discipline.</td></tr>
<tr><td>Goals</td><td colspan="9">Students will be able to analyze linguistic data on all levels of description (phonology, syntax, semantics, pragmatics) using the conceptual means of linguistics. They will also gain insight into the specific approaches of different linguistic schools to linguistic phenomena. In addition, they will become aware of how current quantitative methods from machine learning and data science enrich and change linguistics.</td></tr>
<tr><td rowspan="2">Requirements for the awarding of credit points/ grading (and weighting, where appropriate)</td><td>Name of course</td><td>Class type</td><td>Status</td><td>Credit hours in semester</td><td>ECTS</td><td>Assessment type</td><td>Assessment duration</td><td>Grading system</td><td>Calculation of module grade</td></tr>
<tr><td>Introduction to Linguistics</td><td>S</td><td>O</td><td>4</td><td>6</td><td>K</td><td>90</td><td>b</td><td>100</td></tr>
<tr><td>Requirements for admission</td><td colspan="9">none</td></tr>
</table>

<table>
<tr><td>Module no.:
ASW-BA-02</td><td colspan="8">Module name:
Methods 1</td><td>Module type
Compulsory</td></tr>
<tr><td>ECTS credits</td><td colspan="9">6</td></tr>
<tr><td>Workload
- contact hours
- private study</td><td colspan="3">Workload:
180 hours</td><td colspan="4">Contact hours:
60 hours / 4 credit hours per week</td><td colspan="2">Private study:
120 hours</td></tr>
<tr><td>Duration of module</td><td colspan="9">1 semester</td></tr>
<tr><td>Frequency</td><td colspan="9">each winter semester</td></tr>
<tr><td>Language of instruction</td><td colspan="9">English</td></tr>
<tr><td>Module structure</td><td colspan="9">a) Mathematical Methods: Logic (2 credit hours per week, 3 ECTS)
b) Programming and Data Analysis (2 credit hours per week, 3 ECTS)</td></tr>
<tr><td>Teaching formats</td><td colspan="9">a) Introductory seminar (lecture-style teaching, exercises, group work)
b) Introductory seminar (lecture-style teaching, presentation)</td></tr>
<tr><td>Content of module</td><td colspan="9">The introductory seminar "Mathematical Methods: Logic" teaches basic methodological knowledge for the formal-structural analysis of expressions, their structure and meaning.

"Programming and Data Analysis" takes students into the programming of simple algorithms with the primary goal of familiarizing students with the processing and sifting of empirical data and several of the usual relevant analyses which build upon them and which are relevant from the linguistics point of view.</td></tr>
<tr><td>Goals</td><td colspan="9">Students learn the terminology basics of mathematical and logical concepts needed in linguistics and are able to follow linguistic argumentation and analysis.</td></tr>
<tr><td rowspan="3">Requirements for the awarding of credit points/ grading (and weighting, where appropriate)</td><td>Name of course</td><td>Class type</td><td>Status</td><td>Credit hours in semester</td><td>LP</td><td>Assessment type</td><td>Assessment duration</td><td>Grading system</td><td>Calculation of module grade</td></tr>
<tr><td>Mathematical Methods: Logic</td><td>S</td><td>O</td><td>2</td><td>3</td><td>K</td><td>90</td><td>b</td><td>100</td></tr>
<tr><td>Programming and Data Analysis</td><td>S</td><td>O</td><td>2</td><td>3</td><td>kP</td><td>-</td><td>ub</td><td>-</td></tr>
<tr><td>Requirements for admission</td><td colspan="9">none</td></tr>
</table>

Module no.: ASW-BA-03	**Module name:** Methods 2		**Module type** Compulsory
ECTS credits	6		
Workload **- contact hours** **- private study**	Workload: 180 hours	Contact hours: 60 hours / 4 credit hours per week	Private study: 120 hours
Duration of module	1 semester		
Frequency	each summer semester		
Language of instruction	English		
Module structure	Mathematical Methods: Statistics (4 credit hours per week, 6 ECTS)		
Teaching formats	Introductory seminar (lecture-style teaching, exercises, group work)		
Content of module	The “Mathematical Methods: Statistics” course introduces students to basic methods in statistical modeling, evaluation and visualization of empirical data. Students will also learn what conclusions can be drawn from statistical analyses with respect to linguistic research questions.		
Goals	Students who completed this course will be familiar with basic concepts in statistics, specifically with respect to their application to linguistic research. They will have learned to use a programming language to fit models to empirical data, and to apply visualization techniques for exploratory data analysis as well as for the graphical representation of statistical models.		

Requirements for the awarding of credit points/ grading (and weighting, where appropriate)

Name of course	*Class type*	*Status*	*Credit hours in semester*	*LP*	*Assessment type*	*Assessment duration*	*Grading system*	*Calculation of module grade*
Mathematical Methods: Statistics	S	O	4	6	K	90	b	100

Requirements for admission	none

<table>
<tr><td>Module no.:
ISCL-BA-01</td><td colspan="6">Module name:
Introductory module: Computational Linguistics</td><td>Module type
Compulsory</td></tr>
<tr><td>ECTS credits</td><td colspan="7">12</td></tr>
<tr><td>Workload
- contact hours
- private study</td><td colspan="2">Workload:
360 hours</td><td colspan="3">Contact hours:
120 hours / 8 credit hours per week</td><td colspan="2">Private study:
240 hours</td></tr>
<tr><td>Duration of module</td><td colspan="7">1 semester</td></tr>
<tr><td>Frequency</td><td colspan="7">each winter semester</td></tr>
<tr><td>Language of instruction</td><td colspan="7">English</td></tr>
<tr><td>Module structure</td><td colspan="7">a) Introduction to Computational Linguistics (2 credit hours/ week, 3 ETCS)
b) Data structures and algorithms for Computational Linguistics (4 credit hours/ week, 6 ETCS)
c) Data structures and algorithms tutorial (2 credit hours/ week, 3 ETCS)</td></tr>
<tr><td>Teaching formats</td><td colspan="7">a) Lecture: regular and active participation
b) Seminar: regular and active participation, exercises
c) Tutorial: programming exercises, homework</td></tr>
<tr><td>Content of module</td><td colspan="7">This module provides an initial overview of the material, issues, and methods in Computational Linguistics.
The Introduction to Computational Linguistics lecture provides students with the necessary knowledge for advanced use of network-based computer systems. Additionally, it gives an idea of the most important areas of Computational Linguistics.
“Data and Algorithms for Language Processing I” teaches basic knowledge in a higher programming language as well as central concepts and data structures in modern programming and the complexity of algorithms.</td></tr>
<tr><td>Goals</td><td colspan="7">Students gain an overview of the issues dealt with and methods used in Computational linguistics and learn mathematical concepts needed for successful studies. As this is a module providing an overview, an exam is considered appropriate to ensure the goals have been met.
Students gain basic knowledge in a higher programming language as well as an understanding of central concepts and data structures in modern programming and the complexity of algorithms. They obtain the basic knowledge needed for software development in modern programming languages.</td></tr>
<tr><td rowspan="4">Requirements for the awarding of credit points/ grading (and weighting, where appropriate)</td><td>Name of course</td><td>Class type</td><td>Status</td><td>Credit hours in semester</td><td>LP</td><td>Assessment type</td><td>Assessment duration</td><td>Grading system</td><td>Calculation of module grade</td></tr>
<tr><td>Introduction to Computational linguistics</td><td>VL</td><td>0</td><td>2</td><td>3</td><td rowspan="3">K</td><td rowspan="3">210</td><td rowspan="3">b</td><td rowspan="3">100</td></tr>
<tr><td>Data Structures and Algorithms</td><td>S</td><td>0</td><td>4</td><td>6</td></tr>
<tr><td>Data Structures and Algorithms</td><td>T</td><td>0</td><td>2</td><td>3</td></tr>
</table>

	At the end of the module, there is to be an exam covering all areas dealt with in the module. If a student fails this exam, he/she is strongly advised to take the repeat exam in the same semester. In the tutorial, coursework in the form of programming tasks is required for a pass in the module overall.
Requirements for admission	none

Module no.: ISCL-BA-02	**Module name:** Interdisciplinary Professional Skills 1		**Module type** Compulsory
ECTS credits	15		
Workload **- contact hours** **- private study**	Workload: 450 hours	Contact hours: 150 hours/ 10 credit hours per week	Private study: 300 hours
Duration of module	6 semesters (semesters 1-6)		
Frequency	each semester		
Language of instruction	English		
Teaching formats	regulated centrally		
Content of module	As part of the Studium Professionale, students attend additional, non-subject-specific courses worth 15 credit points.		
Goals	Students obtain supradisciplinary professional skills of their choice via courses offered by the University's Studium Professionale unit.		
Certificates / Grading	in accordance with the course selected, not graded		
Requirements for admission	none		

Module no.: ISCL-BA-03	**Module name:** Interdisciplinary Professional Skills 2		**Module type** Compulsory
ECTS credits	6		
Workload **- contact hours** **- private study**	Workload: 180 hours	Contact hours: 60 hours / 4 credit hours per week	Private study: 120 hours
Duration of module	4 semesters (semesters 1-4)		

Frequency	each semester
Language of instruction	English
Teaching formats	regulated centrally
Content of module	Students whose native tongue is not German attend German as a foreign language courses to raise their language competence; and students whose native tongue is German attend courses in another language which they did not learn at school, worth a total of 6 credit points.
Goals	Students obtain further language competence in a language they did not learn at school, or in German.
Certificates / Grading	in accordance with the course selected, not graded
Requirements for admission	none

Module no.: ISCL-BA-04	**Module name:** Introductory module: Programming		**Module type** Compulsory
ECTS credits	12		
Workload **- contact hours** **- private study**	Workload: 360 hours	Contact hours: 120 hours / 8 credit hours per week	Private study: 240 hours
Duration of module	1 semester		
Frequency	each summer semester		
Language of instruction	English		
Module structure	a) Data Structures and Algorithms for Computational Linguistics II (4 semester credit hours, 6 ECTS) b) Tutorial Data Structures and Algorithms for Computational Linguistics II (4 semester credit hours, 6 ECTS)		
Teaching formats	Programming tasks, programming projects, homework, regular and active participation		
Content of module	Data structures and algorithms are the core elements of linguistic programming. The data structures are particularly relevant for the storage and selection of data, and algorithms may be seen as recipes for the processing of that data. “Data Structures and Algorithms for Computational Linguistics II” enables students to develop their general understanding of fundamental data structures such as linked lists and trees, and how they are used in Java. The implementation of computer linguistic programs which store and select such data is also a part of this course. Among the data structures and concepts this module also goes in-depth into are fields, lists, stacks and trees, as well as specification and analysis of algorithms.		

Goals	Students' basic knowledge from the introductory course is expanded upon, such that they obtain a broad and solid foundation in the data structures and algorithms required in computational linguistics practice. Note that this module includes work in project groups.								
Requirements for the awarding of credit points/ grading (and weighting, where appropriate)	*Name of course*	*Class type*	*Status*	*Credit hours in semester*	*LP*	*Assessment type*	*Assessment duration*	*Grading system*	*Calculation of module grade*
	Data Structures and Algorithms for Computational Linguistics II	S	0	4	6	K	120	b	100
	Data Structures and Algorithms for Computational Linguistics II	T	0	4	6	kP	-	ub	-
	This class concludes with a written examination. In the tutorial, coursework in the form of programming tasks is required for a pass in the module overall.								
Requirements for admission	a pass in module ISCL-BA-01								

Module no.: ISCL-BA-05	**Module name:** Introductory module: Symbolic Computational linguistics: Text Technology		**Module type** Compulsory
ECTS credits	6		
Workload **- contact hours** **- private study**	Workload: 180 hours	Contact hours: 60 hours / 4 credit hours per week	Private study: 120 hours
Duration of module	1 semester		
Frequency	each summer semester		
Language of instruction	English		
Teaching formats	Regular and active participation		
Content of module	The use of texts in Computational Linguistics requires them to be first made available in electronic form. Text Technology supplies approaches to solving this problem as well as for the coding and making accessible of textual data for many applications. A number of markup languages play a special role in this. Text Technology includes methods of automatically classifying words and phrases into corpora as well as general methods enabling collections of texts to be annotated linguistically, and general methods enabling collections of texts to be annotated linguistically.		

Goals	Students learn the key technical requirements for processing large volumes of text. They become familiar with basic processes in automatic annotation and can demonstrate their use in example applications. They learn about the problems which arise in the electronic processing of texts as well as in further steps such as the correction of typographical errors and linguistic annotation with morphosyntactic markers. The basis of this skill is familiarity with the classifications used in English and German and the relevant, widely used methods for automatically classifying words and phrases into corpora. Students learn to apply such methods within a defined area. Furthermore, they become familiar with the usefulness of processing text corpora in the identification and extraction of information from large collections of texts. At this point in their studies, students are able to understand and apply simple statistical analysis.								
Requirements for the awarding of credit points/ grading (and weighting, where appropriate)	*Name of course*	*Class type*	*Status*	*Credit hours in semester*	*LP*	*Assessment type*	*Assessment duration*	*Grading system*	*Calculation of module grade*
	Text Technology	S	0	4	6	K	90	b	100
	This class concludes with a written examination. Coursework in the form of programming tasks during semester is required for a pass in the module overall.								
Requirements for admission	none								

Module no.: ISCL-BA-06	**Module name:** Introductory module: Symbolic Computational Linguistics: Parsing		**Module type** Compulsory
ECTS credits	6		
Workload **- contact hours** **- private study**	Workload: 180 hours	Contact hours: 60 hours / 4 credit hours per week	Private study: 120 hours
Duration of module	1 semester		
Frequency	each winter semester		
Language of instruction	English		
Teaching formats	Regular and active participation		

■ *B.A. Computational Linguistics*

Content of module	At first glance, a language is a means of communication. In the field of Computational linguistics, a language becomes a formal object which may be described using a (finite) system of rules (formal grammar). Parsing a sentence using grammar means to break it up in such a way that demonstrates how this sentence was created by the rules of grammar. This analysis is an initial step towards enabling a computer to “understand” a language data set.								
Goals	Students learn the main classes of formal language as well as formal grammar for the description of linguistic units such as words, phrases, and sentences with phrase-structure rules in the framework of such languages. Students become familiar with the base algorithms for the analysis of formal and natural language data sets, and with the allocation of analysis trees (parsing algorithms), and the necessary transformation processes. In this unit, students gain competence in mastering the advanced symbolic and quantitative approaches used in the following modules in the second and third years.								
Requirements for the awarding of credit points/ grading (and weighting, where appropriate)	*Name of course*	*Class type*	*Status*	*Credit hours in semester*	*LP*	*Assessment type*	*Assessment duration*	*Grading system*	*Calculation of module grade*
	Parsing	S	0	4	6	K	120	b	100
	This class concludes with a written examination. Coursework in the form of programming tasks during semester is required for a pass in the module overall.								
Requirements for admission	successful completion of module ASW-BA-01, ISCL-BA-01, ISCL-BA-04								

Module no.: ISCL-BA-07	**Module name:** Advanced Programming		**Module type** Compulsory
ECTS credits	12		
Workload **- contact hours** **- private study**	Workload: 360 hours	Contact hours: 120 hours / 8 credit hours per week	Private study: 240 hours
Duration of module	1 semester		
Frequency	annually: winter semester		
Language of instruction	English		
Teaching formats	Programming tasks, programming projects, homework		

Content of module	Building on the foundation of the introductory courses in data structures and algorithms, this programming course brings together the knowledge gained to date with regard to programming languages, theoretical concepts in Computational Linguistics and General Linguistics into the programming of concrete applications. In particular, this unit is about independent implementation of various common parsing strategies and algorithms in computational linguistics. Concrete examples of exemplary parsing paradigms are implemented.								
Goals	Students learn to realize abstract parsing specifications into concrete implementation step by step, to test them and optimize them in terms of particular application scenarios.								
Requirements for the awarding of credit points/ grading (and weighting, where appropriate)	*Name of course*	*Class type*	*Status*	*Credit hours in se-*	*LP*	*Assessment type*	*Assessment duration*	*Grading system*	*Calculation of module grade*
	Data Structures and Algorithms for Computational Linguistics III	S	0	4	6	K	120	b	100
	Data Structures and Algorithms for Computational Linguistics III	T	0	4	6	kP	-	ub	-
	This class concludes with a written examination. In the tutorial, coursework in the form of programming tasks is required for a pass in the module overall.								
Requirements for admission	successful completion of modules ISCL-BA-01, ISCL-BA-04								

Module no.: ISCL-BA-08	**Module name:** Introductory module: Statistic Methods in Computational linguistics	**Module type** Compulsory
ECTS credits	9	
Workload **- contact hours** **- private study**	Workload: 270 hours Contact hours: 90 hours / 6 credit hours per week Private study: 180 hours	
Duration of module	1 semester	
Frequency	annually: summer semester	
Language of instruction	English	
Module structure	a) Statistical Language Processing (CLIII) (4 semester credit hours, 6 ECTS) b) Tutorial Statistical Language Processing (CL III) (2 semester credit hours, 3 ECTS)	

Teaching formats	Seminar (regular and active participation, exercises, presentation where applicable)
Content of module	This course provides an overview of statistic methods and models used in Computational Linguistics. These methods are particularly useful to ensure wider coverage, to reduce ambiguity, to enable automatic learning, and to increase the robustness of applications. First there is an introduction to statistics focusing on concepts used in Computational Linguistics. Then we introduce Hidden Markov models and demonstrate this approach using a part-of-speech tagger. Finally, we discuss parsing approaches from probability theory; first giving a general introduction to parsing before moving on to probability-based, context-free grammars.
Goals	Dealing with statistical processes is central in many areas of modern language processing, language and information technology. Students learn to understand the functioning and application of statistical processes in Computational linguistics. They are then able to understand statistical thinking and to open up new application areas in statistical language processing as required.

Requirements for the awarding of credit points/ grading (and weighting, where appropriate)

Name of course	*Class type*	*Status*	*Credit hours in semester*	*LP*	*Assessment type*	*Assessment duration*	*Grading system*	*Calculation of module grade*
Statistical Language Processing (CL III)	S	0	4	6	K	120	b	100
Statistical Language Processing (CL III)	T	0	2	3	kP	-	ub	-

This class concludes with a written examination. In the tutorial, coursework in the form of programming tasks is required for a pass in the module overall.

Requirements for admission	successful completion of modules ISCL-BA-06, ISCL-BA-07

Module no.: ISCL-BA-09	**Module name:** Introductory module: Grammar Formalisms	**Module type** Compulsory
ECTS credits	9	
Workload **- contact hours** **- private study**	Workload: 270 hours	Contact hours: 90 hours / 6 credit hours per week Private study: 180 hours
Duration of module	1 semester	
Frequency	annually: summer semester	
Language of instruction	English	

■ *B.A. Computational Linguistics*

Module structure	a) Introductory seminar Grammar Formalisms (4 semester credit hours, 3 ETCS) b) Exercises for introductory seminar (2 credit hours per week, 6 ECTS)
Teaching formats	a) Introductory seminar: regular and active participation b) Programming exercises for introductory seminar Grammar Formalisms
Content of module	The course is an introduction to the linguistic, logical, and practical foundations of modern grammar formalisms. It follows the paradigm of constraint-based grammars, which is highly popular in computational applications. A concrete example of a grammar formalism serves as one of the outstanding constraint-based frameworks such as head-driven phrase structure grammar (HPSG) or lexical functional grammar (LFG). However, the focus is on standard phenomena of the syntax and semantics of natural languages and on describing them. Starting with more theory-neutral concepts such as subcategorizing, the constituent structure of language units and of the topological field model of German, we then move on to theory-led concepts such as the representation of constituent structure and processing congruence phenomena and the subcategorization requirements of verbs via the identity of complex structures within linguistic signs. Furthermore, the most important components of extraction theory, the theory of the interrogatives, and attachment theory will be discussed.
Goals	Familiarity with the basic concepts of modern syntax theory is essential for an understanding of linguistic approaches in Computational Linguistics. Once they have completed this course, students know the most important theory modules of the currently most influential computational linguistics frameworks (such as Head-Driven Phrase Structure Grammar (HPSG) and Lexical Functional Grammar (LFG)) and their application in formal concepts.

Requirements for the awarding of credit points/ grading (and weighting, where appropriate)

Name of course	*Class type*	*Status*	*Credit hours in semester*	*LP*	*Assessment type*	*Assessment duration*	*Grading system*	*Calculation of module grade*
Introductory seminar Grammar Formalisms	S	0	4	3	kP		ub	
Exercises for introductory seminar	U	0	2	6	K	120	b	100

Requirements for admission	Successful completion of modules ASW-BA-01, ASW-BA-02, ISCL-BA-01

Module no.: ISCL-BA-10	**Module name:** Practical module		**Module type** Compulsory
ECTS credits	9		
Workload **- contact hours** **- private study**	Workload: 270 hours	Contact hours: 0	Private study: 270 hours

■ *B.A. Computational Linguistics*

Duration of module	1 semester								
Frequency	each semester								
Language of instruction	English								
Teaching formats	Software practical training: Software project, presentation								
Content of module	The software practical module may be conducted at the Department of Linguistics or within the framework of an industrial placement - following consultation with a member of staff responsible for conducting assessment. The programming assessment must comprise at least 190 working hours. Written documentation (typically 8-10 pages) describing this practical module must be submitted and a 15-minute presentation (including presentation of your system) made to your supervisor.								
Goals	Students learn to implement a realistic application program (possibly in small groups). They document all phases of a software's life and use current software tools. They are able to document a software project correctly and concisely in writing, as well as presenting and explaining in detail its functionality to a specialist audience.								
Certificates / Grading	Written documentation (typically 8-10 pages) (50%) 20-minute presentation (including presentation of system) (50%)								
Requirements for the awarding of credit points/ grading (and weighting, where appropriate)	*Name of course*	*Class type*	*Status*	*Credit hours in semester*	*LP*	*Assessment type*	*Assessment duration*	*Grading system*	*Calculation of module grade*
	Practical module report	H	0	-	4.5	-	-	b	50
	Practical module lecture	P	0	-	4.5	-	-	b	50
Requirements for admission	successful completion of intermediate examination								

Module no.: ISCL-BA-11	**Module name:** Specialization module		**Module type** Compulsory
ECTS credits	15		
Workload **- contact hours** **- private study**	Workload: 450 hours	Contact hours: 120 credit hours/ 8 p.w.	Private study: 330 hours
Duration of module	2 semesters		
Frequency	Winter semester (16.1) & summer semester (16.2)		
Language of instruction	English		

■ *B.A. Computational Linguistics*

<table>
<tr><td>Module structure</td><td>a) Advanced seminar Computational Linguistics 1
b) Advanced seminar Computational Linguistics 2</td></tr>
<tr><td>Teaching formats</td><td>a) Advanced seminar (6 ECTS, 4 semester credit hours, regular, active participation)
b) Advanced seminar (9 ECTS, 4 semester credit hours, regular, active participation)</td></tr>
<tr><td>Content of module</td><td>The specialization modules pursue topics in the basic modules in greater depth. These topics are linked with the relative current core research in the discipline and are subject to regular review and updating. Relevant areas include Computer Lexicography, Information Retrieval, Logic, Computational Semantics, Machine Translation, Machine Learning, Text Technology, Quantitative Methods. Students are required to obtain more comprehensive mastery using examples from research and development fields of Computational Linguistics in class in the first two years of study, with the aim of now obtaining a qualification for professional work in the field of information technology. In the advanced seminar 11a) the focus is on the knowledge horizon; the seminar 11b) places special emphasis on the ability of students to formulate argumentation and results both orally and in writing.</td></tr>
<tr><td>Goals</td><td>Students learn to master in-depth an advanced and complex topic and are familiar with the current computational linguistic working methods and results. They are also able to work out and adequately present complex connections in proper academic fashion. Students are able to discuss and present in a proper structure both orally and in written form the knowledge they have gained in a methodologically correct way, and in a way which is appropriate to the material.</td></tr>
<tr><td>Certificates / Grading (weighting, where applicable)</td><td>
<table>
<tr><th>Name of course</th><th>Class type</th><th>Status</th><th>Credit hours in semester</th><th>LP</th><th>Assessment type</th><th>Assessment duration</th><th>Grading system</th><th>Calculation of module grade</th></tr>
<tr><td>Advanced seminar a)</td><td>S</td><td>o</td><td>2/4</td><td>6 (3/6)</td><td>kP</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td>Advanced seminar b)</td><td>S</td><td>o</td><td>2/4</td><td>9 (3/6/9)</td><td>R (or A / K / mP)
H</td><td>15
-</td><td>b
b</td><td>20%
80%</td></tr>
<tr><td colspan="9">In advanced seminars, grading is usually carried out on the basis of a presentation and a written assignment, whereby in this advanced module an independent project or program development often provides the basis of the written assignment. The precise form of examination is decided by the relevant member of academic staff. The total amount of credits needed can be achieved by taking several small advanced seminars.</td></tr>
</table>
</td></tr>
<tr><td>Requirements for admission</td><td>successful completion of intermediate examination</td></tr>
</table>

Module no.: ISCL-BA-12	**Module name:** Exam module		**Module type** Compulsory
ECTS credits	12		
Workload **- contact hours** **- private study**	Workload: 360 hours	Contact hours: 0	Private study: 360 hours
Duration of module	1 semester		
Frequency	annually: summer semester		
Language of instruction	English		
Teaching formats	independent reading, software project (where applicable)		
Content of module	The Bachelor's thesis is written in the sixth semester and contains typically 20-25 pages.		
Goals	Students must use their Bachelor's thesis to demonstrate their ability to process a clearly defined topic in an appropriate academic manner and to set out the results in clear arguments in an appropriate fashion.		
Certificates / Grading	BA thesis		
Requirements for admission	successful completion of intermediate examination as well as the modules ISCL-BA-02, ISCL-BA-03, ISCL-BA-10, ISCL-BA-11		

4.2 General Linguistics (ASW) required electives

Module no.: ASW-BA-04*	**Module name:** Phonetics and Phonology		**Module type** Required elective
ECTS credits	9		
Workload **- contact hours** **- private study**	Workload: 270 hours	Contact hours: 90 hours / 6 credit hours per week	Private study: 180 hours
Duration of module	1 semester		
Frequency	each summer semester		
Language of instruction	English		
Module structure	a) Introductory seminar (4 credit hours per week, 6 ECTS) b) Tutorial (2 credit hours per week, 3 ECTS)		

■ *B.A. Computational Linguistics*

Teaching formats	Proseminar “Phonetics & Phonology”, 4 SWS, 6 CP (lecture-style teaching, exercises, group work) Tutorial on “Phonetics & Phonology”, 2 SWS, 3 LP (Exercises, group work, plenary discussion)
Content of module	The Phonetics and Phonology module provides an overview of the various linguistic sounds and how they are formed, transmitted, and perceived. Furthermore, functional aspects of these sounds are introduced and the basics of phonetic analysis taught.
Goals	Students obtain knowledge of articulatory, acoustic, and perceptive phonetics. They become familiar with the basic concepts in phonology and with the methods of phonetic analysis; they are also able to fully understand such analyses and to transfer them to comparable phenomena.

Requirements for the awarding of credit points/ grading (and weighting, where appropriate)

Name of course	*Class type*	*Status*	*Credit hours in semester*	*LP*	*Assessment type*	*Assessment duration*	*Grading system*	*Calculation of module grade*
Phonetics and Phonology	S	O	4	6	K	90	b	100
Tutorial Phonetics and Phonology	T	O	2	3	kP	-	-	-

Requirements for admission	ASW-BA-01, ASW-BA-02
Note on participation	* You must choose at least 2 modules of ASW-BA-04, ASW-BA-05 and ASW-BA-07; overall ASW required electives worth 39 ECTS.

Module no.: ASW-BA-05*	**Module name:** Syntax and Semantics		**Module type** Required elective
ECTS credits	9		
Workload **- contact hours** **- private study**	Workload: 270 hours	Contact hours: 90 hours / 6 credit hours per week	Private study: 180 hours
Duration of module	1 semester		
Frequency	each winter semester		
Language of instruction	English		
Module structure	a) Introductory seminar (4 credit hours per week, 6 ECTS) b) Tutorial (2 credit hours per week, 3 ECTS)		
Teaching formats	a) Introductory seminar (lecture-style teaching, exercises, group work) b) Tutorial (exercises, group project, class discussion)		

Content of module	The Syntax & Semantics module provides basic knowledge of the analysis of language expression structures and of the compositional analysis of the meaning derived from them.								
Goals	Students obtain greater knowledge of syntax and basic knowledge of sentence semantics. They become able to fully understand syntactic analyses and corresponding semantic derivations and to transfer them to comparable phenomena.								
Requirements for the awarding of credit points/ grading (and weighting, where appropriate)	*Name of course*	*Class type*	*Status*	*Credit hours in semester*	*LP*	*Assessment type*	*Assessment duration*	*Grading system*	*Calculation of module grade*
	Syntax and Semantics	S	O	4	6	K	90	b	100
	Tutorial Syntax and Semantics	T	O	2	3	kP	-	-	-
Requirements for admission	ASW-BA-01, ASW-BA-02								
Note on participation	* You must choose at least 2 modules of ASW-BA-04, ASW-BA-05 and ASW-BA-07; overall ASW required electives worth 39 ECTS.								

Module no.: ASW-BA-06	**Module name:** Psycholinguistics		**Module type** Required elective
ECTS credits	9		
Workload **- contact hours** **- private study**	Workload: 270 hours	Contact hours: 90 hours / 6 credit hours per week	Private study: 180 hours
Duration of module	1 semester		
Frequency	each winter semester		
Language of instruction	English		
Module structure	a) Introductory seminar (4 credit hours per week, 6 ECTS) b) Tutorial (2 credit hours per week, 3 ECTS)		
Teaching formats	a) Introductory seminar (lecture-style teaching, exercises, group work) b) Tutorial (exercises, group project, class discussion)		
Content of module	The Psycholinguistics module provides an introduction to experimental methods, which are essential for systematic testing linguistic theories and approaches against empirical data. This course familiarizes students with a range of experimental techniques, and the challenges of interpreting and situating experimental research with respect to linguistic theories.		

■ *B.A. Computational Linguistics*

Goals	Students who complete this course will have acquired knowledge of the fundamental concepts of current experimental research on language processing. They will also gain practical experience in conducting experiments, especially behavioral experiments, but will also have been familiarized with the basics of eye-tracking, EEG, electromagnetic articulography and ultrasound.								
Requirements for the awarding of credit points/ grading (and weighting, where appropriate)	*Name of course*	*Class type*	*Status*	*Credit hours in semester*	*LP*	*Assessment type*	*Assessment duration*	*Grading system*	*Calculation of module grade*
	Psycholinguistics	S	O	4	6	K	90	b	100
	Tutorial Psycholinguistics	T	O	2	3	kP	-	-	-
Requirements for admission	ASW-BA-01, ASW-BA-02								
Note on participation	You must choose at least 2 modules of ASW-BA-04, ASW-BA-05 and ASW-BA-07; overall ASW required electives worth 39 ECTS.								

Module no.: ASW-BA-07*	**Module name:** Semantics and Pragmatics		**Module type** Required elective
ECTS credits	9		
Workload **- contact hours** **- private study**	Workload: 270 hours	Contact hours: 90 hours / 6 credit hours per week	Private study: 180 hours
Duration of module	1 semester		
Frequency	each summer semester		
Language of instruction	English		
Module structure	a) Introductory seminar (4 credit hours per week, 6 ECTS) b) Tutorial (2 credit hours per week, 3 ECTS)		
Teaching formats	a) Introductory seminar (lecture-style teaching, exercises, group work) b) Tutorial (exercises, group project, class discussion)		
Content of module	In the introductory seminar and supplementary tutorial “Semantics & Pragmatics" we examine basic theories and methods for the analysis of meaning in expressions and statements. The module gives an overview of relevant semantic and pragmatic core concepts, such as context dependency, intensionality, presupposition, and speech act theory.		

■ *B.A. Computational Linguistics*

Goals	Students obtain greater knowledge of sentence semantics analysis and basic knowledge of pragmatics. They are enabled to fully understand semantic derivations and the pragmatic interference based on them, and to transfer them to comparable phenomena.								
Requirements for the awarding of credit points/ grading (and weighting, where appropriate)	*Name of course*	*Class type*	*Status*	*Credit hours in semester*	*LP*	*Assessment type*	*Assessment duration*	*Grading system*	*Calculation of module grade*
	Semantics and Pragmatics	S	O	4	6	K	90	b	100
	Tutorial Semantics and Pragmatics	T	O	2	3	kP	-	-	-
Requirements for admission	ASW-BA-01, ASW-BA-02								
Note on participation	* You must choose at least 2 modules of ASW-BA-04, ASW-BA-05 and ASW-BA-07; overall ASW required electives worth 39 ECTS.								

Module no.: ASW-BA-08	**Module name:** Language & Cognition		**Module type** Required elective
ECTS credits	12		
Workload **- contact hours** **- private study**	Workload: 360 hours	Contact hours: 60 hours / 4 credit hours per week	Private study: 300 hours
Duration of module	1 semester		
Frequency	each summer semester		
Language of instruction	English		
Module structure	a) Advanced seminar Language & Cognition (2 credit hours per week, 6 ECTS) b) Project Language & Cognition (2 credit hours per week, 6 ECTS)		
Teaching formats	a) Advanced seminar (lecture-style teaching, exercises, group work) b) Advanced seminar project (researching using literature, group work, class discussion, lab work, experiment)		
Content of module	Language is a central part of human cognition. At the same time, many areas of human cognition are only accessible via the medium of language. The Language & Cognition module introduces students to basic ideas in cognitive modelling. In the project seminar students carry out their own first pilot experiments.		

Goals	Students acquire in-depth knowledge of cognitively-oriented approaches to language, including language and error-driven learning, communicative development, and human language processing. They also acquire the skills and background knowledge to read current research literature and learn methods and techniques for obtaining and analyzing relevant linguistic data using corpora, databases and experiments.								
Requirements for the awarding of credit points/ grading (and weighting, where appropriate)	*Name of course*	*Class type*	*Status*	*Credit hours in semester*	*LP*	*Assessment type*	*Assessment duration*	*Grading system*	*Calculation of module grade*
	Language & Cognition	S	O	2	6	K/MP/ PA/H	90	b	100
	Project Language & Cognition	S	O	2	6	kP	-	-	-
Requirements for admission	ASW-BA-01, ASW-BA-02, ASW-BA-03								
Note on participation	You must choose at least 2 modules of ASW-BA-04, ASW-BA-05 and ASW-BA-07; overall ASW required electives worth 39 ECTS.								

Module no.: ASW-BA-09	**Module name:** Variation, Evolution & Change		**Module type** Required elective
ECTS credits	12		
Workload **- contact hours** **- private study**	Workload: 360 hours	Contact hours: 60 hours / 4 credit hours per week	Private study: 300 hours
Duration of module	1 semester		
Frequency	each winter semester		
Language of instruction	English		
Module structure	a) Advanced seminar Variation, Evolution & Change (2 credit hours per week, 6 credits) b) Project Variation, Evolution & Change (2 credit hours per week, 6 credits)		
Teaching formats	a) Advanced seminar (lecture-style teaching, exercises, group work) b) Advanced seminar project (researching using literature, group work, class discussion, implementation)		
Content of module	Language behavior and the individual languages which result from it are dynamic, complex, and adaptive systems. The Variation, Evolution & Change module deals with language transformation processes and provides an introduction to models and theories of language evolution and transformation. In the project seminar, students implement solutions to relevant problems independently.		

■ *B.A. Computational Linguistics*

Goals	Students obtain in-depth knowledge of historical linguistics and of variation linguistics and are accordingly familiar with the relevant methods. They are able to apply these methods, particularly in the implementation of appropriate software, in the analysis of new problem complexes.								
Requirements for the awarding of credit points/ grading (and weighting, where appropriate)	*Name of course*	*Class type*	*Status*	*Credit hours in semester*	*LP*	*Assessment type*	*Assessment duration*	*Grading system*	*Calculation of module grade*
	Variation, Evolution & Change	S	O	2	6	K/MP/ PA/H	90	b	100
	Variation, Evolution & Change	S	O	2	6	kP	-	-	-
Requirements for admission	ASW-BA-01, ASW-BA-02, ASW-BA-03								
Note on participation	You must choose at least 2 modules of ASW-BA-04, ASW-BA-05 and ASW-BA-07; overall ASW required electives worth 39 ECTS.								

Module no.: ASW-BA-10	**Module name:** Language Use		**Module type** Required elective
ECTS credits	9		
Workload **- contact hours** **- private study**	Workload: 270 hours	Contact hours: 60 hours / 4 credit hours per week	Private study: 210 hours
Duration of module	1 semester		
Frequency	each winter semester		
Language of instruction	English		
Module structure	a) advanced seminar Language Use (2 credit hours per week, 6 ECTS) b) project Language Use (2 credit hours per week, 3 ECTS)		
Teaching formats	a) advanced seminar (lecture-style teaching, exercises, group work) b) advanced seminar project (researching using literature, group work, class discussion		
Content of module	Language is primarily a means for its users to achieve non-language goals. In the Language Use module, theories and approaches relating to this functional perspective are discussed and in the project seminar, further developed, independently, in group projects.		

■ *B.A. Computational Linguistics*

Goals	Students obtain in-depth knowledge of pragmatics and of the socio-linguistic aspects of language use. They are able to fully understand relevant analyses and to develop their own simple analyses.								
Requirements for the awarding of credit points/ grading (and weighting, where appropriate)	*Name of course*	*Class type*	*Status*	*Credit hours in semester*	*LP*	*Assessment type*	*Assessment duration*	*Grading system*	*Calculation of module grade*
	Language Use	S	O	2	6	K/MP/ PA/H	90	b	100
	Project Language Use	S	O	2	3	kP	-	-	-
Requirements for admission	ASW-BA-01, ASW-BA-02, ASW-BA-03								
Note on participation	You must choose at least 2 modules of ASW-BA-04, ASW-BA-05 and ASW-BA-07; overall ASW required electives worth 39 ECTS.								