
THE MSc LOGIC AT THE UNIVERSITY OF AMSTERDAM:
A CRITICAL REFLECTION

April 2013

Purpose

The purpose of this report is to provide a description of the MSc Logic programme offered by the Institute for Logic, Language and Computation at the University of Amsterdam. On the basis of this report, the programme can be assessed by the *Nederlands-Vlaamse Accreditatieorganisatie* (NVAO, Accreditation Organisation of the Netherlands and Flanders) in view of its suitability for retaining its status as an accredited Master's programme in the Netherlands. The report follows the relevant guidelines of the NVAO.

Administrative Data Regarding the Programme

- Name of the programme: Master of Science in Logic
- Level and orientation: Master's programme (academic orientation)
- Number of credit points: 120 EC
- Specialisations: Logic and Computation (L&C), Logic and Language (L&L), Logic and Mathematics (L&M), Logic and Philosophy (L&P)
- Location: [Science Park 107, 1098 XG Amsterdam](#)
- Mode of study: Full-time
- CROHO registration number: 60226
- Programme website: <http://www.illc.uva.nl/MScLogic/>

Administrative Data Regarding the Institution

- Name of the institution: University of Amsterdam
- Executive Board of the University of Amsterdam: Dr. L.J. Gunning-Schepers (President), Prof. Dr. D.C. van der Boom (Rector Magnificus), P.W. Doop, MSc (Vice President)
- Address of the organisation: Spui 21, 1012 WX Amsterdam
- Contact person at the University of Amsterdam: Dr. Ir H.B. (Hotze) Lont (020 5253078)
- Contact person for the MSc Logic: Dr. U. (Ulle) Endriss (020 5256511)
- Status of the institution: Publicly funded body providing higher education
- Outcome of the institutional quality assurance assessment: Requested (expected in 2013)

Personalia

- Programme director: Dr. U. Endriss
- Programme manager: Drs. T. Kassenaar
- Chair of the Board of Examiners: Prof. Dr. B. Löwe
- Chair of the Educational Committee (OC): Prof. Dr. F.J.M.M. Veltman
- Director of the Graduate School of Informatics: Dr. A.D. Pimentel

Throughout this document, you will find short extracts of quotes collected from recent graduates of the MSc Logic. The full quotes are available at the MSc Logic website:

<http://www.illc.uva.nl/MScLogic/people/comments.html>

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PREFACE

The MSc Logic at the University of Amsterdam

The MSc Logic (often referred to as the *Master of Logic*, or simply the MoL) is a two-year Master's programme providing intensive interdisciplinary research training for students with a first degree in Mathematics, Computer Science, Philosophy, Linguistics, or a related discipline. It has been offered by the Institute for Logic, Language and Computation (ILLC) at the University of Amsterdam (UvA) since 1995, initially as a one-year programme exclusively attracting students from abroad and since 2003 (with the introduction of the Bachelor-Master system in the Netherlands) as a regular two-year programme. The MSc Logic is part of the *Graduate School of Informatics* at the UvA's Faculty of Science, although many of its courses are taught by staff affiliated with the Faculty of Humanities. It is furthermore embedded into the ILLC's *Graduate Programme in Logic*, which also includes the institute's PhD programme and a non-degree programme known as the *Logic Year*.

As the science of truth and reasoning, logic has played a central role in philosophy and the study of natural language for centuries. In the late 19th century it furthermore got closely intertwined with mathematics, with logic becoming the methodology of choice to explore the foundations of mathematics. In the middle of the 20th century, finally, logic stood at the cradle of computer science. It is this blend of a humanistic tradition and modern applications that makes logic a uniquely interdisciplinary field, combining the humanities and the exact sciences in both methodology and motivation. Standing in the Amsterdam tradition of combining philosophical enquiry with formal methods (going back to Brouwer, Heyting and Beth), the MSc Logic covers an area of research known as *Logic, Language and Information*. Besides mathematical and philosophical logic, formal semantics and pragmatics, philosophy of language and formal epistemology, as well as theoretical computer science and logic in artificial intelligence, the programme also embraces neighbouring disciplines such as cognitive science, computational linguistics, and mathematical economics.

The MSc Logic is probably the oldest, largest, and most comprehensive Master's programme in Logic, Language and Information in the world. We are very proud that so many talented and enthusiastic students choose to come to Amsterdam each year to study here and to share with us their fascination for this interdisciplinary field of enquiry. We hope that this *Critical Reflection* will convince the reader that they do so with some justification.

Previous Accreditation

The first (and most recent) accreditation of the MSc Logic took place in 2006/07. The programme was visited by a committee of experts and evaluated under the rules of the NVAO. The framework of accreditation in operation at the time consisted of 21 *facets*. The MSc Logic was assessed to be *excellent* on four facets, *good* on thirteen facets, and *satisfactory* on the re-

maining four facets. This result is amongst the very best achieved by any programme anywhere in the Netherlands. The [committee's report](#) was particularly positive about the programme's breadth and its integration with current trends in research; the research credentials of its academic staff; the student support provided by the ILLC, particularly through the programme's mentoring system; and the final level achieved, stressing the good opportunities for graduates to obtain PhD positions and the global significance of the programme.

The main advice given by the assessment committee in 2006 was to continue to implement the strategy followed thus far; to not grow the programme too fast; to help students with obtaining grants to support their studies; and to resist the dangers of over-regulation. We summarise the developments since the previous accreditation in Appendix K.

Structure of this Document

This report is a presentation of the MSc Logic programme, following the guidelines set out in the NVAO's Framework for Limited Programme Assessments. Under this framework, a programme is judged in terms of three so-called *standards*:

- Standard 1: Intended Learning Outcomes.
- Standard 2: Teaching-Learning Environment.
- Standard 3: Assessment and Achieved Learning Outcomes.

Part I of this document is a self-assessment of the MSc Logic in terms of these three standards. Part II consists of several appendices with additional information, such as descriptions of all courses currently offered by the programme, a list of student publications, and the results of a recent survey amongst MSc Logic graduates.

Genesis of this Document

This report has been written by Ulle Endriss (programme director, teacher, mentor, and expert for L&C), with support from Maria Aloni (teacher, mentor, and expert for L&L), Benedikt Löwe (chair of the Board of Examiners, teacher, mentor, and expert for L&M), Frank Veltman (chair of the OC, teacher, mentor, and expert for L&P), Inés Crespo (PhD student and MSc Logic alumna), and Tanja Kassenaar (programme manager). Assistance has also been received from several members of the support staff of the UvA's Faculty of Science, particularly Kristien van Lunen, Thea van Schoot, and Kees van Wensen. Some of the text in this report is based on the [self-assessment report](#) produced for the previous accreditation. A preliminary version of this report has been read and commented on by representative groups of students and alumni, as well as all core members of the academic staff.

Quantitative Data

Below we summarise the quantitative data required by the NVAO and provide pointers to the main text where this data is presented in detail.

CONTACT HOURS	13h / 2h per week	see Section 2.1.3 (page 14)
STUDENT-TEACHER RATIO	10.1 students per FTE	see Section 2.4.4 (page 24)
DROPOUT RATE	22% / 13%	see Section 2.3 (page 20)
SUCCESS RATE	61% / 69%	see Section 2.3 (page 20)
TEACHING STAFF	100% PhD / 22% BKO	see Section 2.4.3 (page 23)

STANDARD 1

INTENDED LEARNING OUTCOMES

In this chapter we assess the MSc Logic programme in view of its *intended learning outcomes*. This corresponds to *Standard 1* in the NVAO’s Framework for Limited Programme Assessments. The NVAO defines *Standard 1* as follows:

The intended learning outcomes of the programme have been concretised with regard to content, level and orientation; they meet international requirements.

1.1 Aims and Objectives of the Programme

The aims and objectives of the MSc Logic programme are formally determined in Part B of the Teaching and Examination Regulations (known as the OER, reprinted in Appendix D). The OER states that the *aim* of the programme is “to create an international, interdisciplinary and research-oriented learning environment in which students are educated as researchers in the area of Logic, Language and Information.” At the programme level, this general aim is served by a list of *objectives* that clearly specify the *intended learning outcomes* (referred to as “exit qualifications” in the OER) of the MSc Logic programme:

On the basis of the acquired knowledge, understanding and skills, students that have successfully completed the programme are able to

[IR] carry out *interdisciplinary research* in the area of Logic, Language and Information, either as a PhD student or in an application-directed environment.

The *insight* (i.e., the *knowledge*) of a graduate of the MSc Logic is based on

[K1] a *solid foundation* in the most important aspects of logic, and its applications in computer science, linguistics, philosophy and mathematics; and

[K2] *specialised knowledge* at an advanced level in one or more of the following research areas: Logic & Computation, Logic & Language, Logic & Mathematics, and Logic & Philosophy.

The acquired *skills* lie in the area of research and communication. More specifically, a graduate of the MSc Logic is able to

[S1] formulate *research questions*, and address these in a research plan;

[S2] *make a contribution* to the theories and research methods in the area of their expertise;

- [S3] *critically evaluate* contributions to their field of expertise, based on an awareness of its research traditions and conventions;
- [S4] collaborate with others in a *multidisciplinary team*; and
- [S5] deliver and defend *presentations* of their own work, both orally and in writing.

Finally, a graduate possesses

- [IM] the *intellectual mobility* to transcend traditional boundaries between the academic disciplines that border their specialisation area.

That is, items K1–2 and S1–5 refer to the generic dimensions of *knowledge* and *skills*, while items IR (“interdisciplinary research”) and IM (“intellectual mobility”) refer to characteristics that are very specific to the MSc Logic. IR stresses the the ability to carry out research (particular, but not only, in an interdisciplinary context), while IM highlights the ability to interact fruitfully with peers from neighbouring disciplines.

The research area of Logic, Language and Information is sketched in Appendix A.1. This is a significant area of research and an appropriate domain for a research-oriented Master’s programme. Logic has been an integral part of philosophy and the study of language for centuries; it is inseparably linked to the foundations of mathematics; and it has played a central role in the creation of the discipline of computer science. As such, logic occupies a unique position at the interface of the humanities and the sciences. The concept of information, which is central to the domain and to this Master’s programme, is tightly connected to what some have called the *digital revolution*. A graduate trained in the interdisciplinary field of Logic, Language and Information therefore will not only be able to relate to a long and proud tradition of significant scientific innovations that have formed today’s society, but they will also be excellently equipped to succeed professionally.

The intended learning outcomes specified above are appropriate in view of the requirements of the domain of Logic, Language and Information: Any researcher in the field first and foremost requires solid foundations in logic and its applications (cf. K1). They also require advanced specialised knowledge in at least one specific branch of the field (cf. K2). The research-related skills listed (cf. S1–3) are of crucial significance for anyone engaged in scientific research, while the communication skills (cf. S4–5) are also important to a wide range of high-level professions beyond research. Items IR and IM, the ability to carry out interdisciplinary research and the intellectual mobility required to move beyond a narrowly defined area of specialisation, most directly address the requirements of the domain and are necessary prerequisites for a successful career as a researcher in Logic, Language and Information.

1.2 Level and Orientation of the Programme

The level of the MSc Logic meets the international requirements for a *Master’s programme*. These requirements have been codified in the so-called *Dublin Descriptors*.¹ Below we explain how the MSc Logic conforms to each of the Dublin Descriptors and refer to the relevant learning outcomes where appropriate (IR, K1–2, S1–5, and IM):

- **Knowledge and understanding:** Graduates of the MSc Logic will have demonstrated knowledge and understanding going significantly beyond the Bachelor’s level and have reached a level at which they can make original research contributions (cf. IR, K1, K2).

¹See *Shared ‘Dublin’ Descriptors for Short Cycle, First Cycle, Second Cycle and Third Cycle Awards*, a report produced by the Joint Quality Initiative Meeting in Dublin, 23 March 2004.

THOMAS ICARD (MoL 2008)

“[...] *what sets the ILLC apart, to my mind, is the diversity of approaches to logic and the rich variety of interactions between logic and other disciplines represented here.*”

Before the MoL, Thomas studied Philosophy at Middlebury College. After the MoL, he started a PhD in Philosophy at Stanford. From 2014 onwards, he will be Assistant Professor of Philosophy and Symbolic Systems at Stanford.



- **Applying knowledge and understanding:** Graduates will be able to apply the knowledge and understanding acquired to solve problems in new and unfamiliar environments in a broad interdisciplinary and/or multidisciplinary context (cf. S1, S2, S4, IM).
- **Making judgements:** Graduates will be in a position to make informed judgments regarding complex questions, also in the face of incomplete information (cf. S3).
- **Communication:** Graduates will be able to clearly communicate results, as well as the background knowledge and insights that have led to these results, to both specialist and non-specialist audiences (cf. S4, S5, IM).
- **Learning skills:** Graduates will have acquired learning skills that allow them to further develop themselves in an autonomous and self-directed fashion (cf. IR, S1, IM).

The fact that MSc Logic graduates do *actually* meet the *intended* learning outcomes under discussion here is most convincingly demonstrated by their excellent performance on the job market and by the research contributions they make already during their time in the programme, as documented in Section 3.2.

The MSc Logic has an *academic* (rather than a *professional*) orientation (in Dutch: *Wetenschappelijk Onderwijs* rather than *Hoger Beroeps Onderwijs*). This can be demonstrated by reviewing the accepted assessment criteria for academic Master’s programmes:²

- **Objectives:** The learning outcomes of the MSc Logic are derived from the requirements of relevant scientific disciplines, namely Logic, Mathematics, Computer Science, Philosophy, and Linguistics. MSc Logic graduates are qualified to carry out independent scientific research in an interdisciplinary context.
- **Programme requirements:** Students learn by directly interacting with scientific research. The content of the programme reflects current developments in the relevant scientific disciplines and the MSc Logic ensures the development of research skills.
- **Intake:** In terms of its form and content, the MSc Logic programme is in line with the qualifications of incoming students, who are required to have a Bachelor’s degree in a relevant discipline and who have all undergone a content-based selection procedure.
- **Duration:** The curriculum load is 120 EC.
- **Staffing:** The programme content is delivered by researchers who actively contribute to the development of the field.

²See *The Higher Education Qualifications Framework in the Netherlands*, 15 December 2008 (pages 15–16). Report authorised by the Ministry of Education, Culture and Science.



ANNEMIEKE REIJNGOUD (MoL 2011)

“In the master thesis I presented my first piece of ‘real’ science; a valuable, frustrating and rewarding experience at the same time. [...] If you love logic too and if you are not afraid of intellectual challenges, please apply! I have not regretted it.”

Before the MoL, Annemieke studied Cognitive Artificial Intelligence at Utrecht. After the MoL, she started working as a consultant for McKinsey & Company.

1.3 International Positioning of the Programme

The MSc Logic is the only Master’s programme of its kind in the Netherlands. Internationally, on the other hand, there are several other programmes that also cover significant parts of the field of Logic, Language and Information. A representative, albeit not exhaustive, list of such programmes is given in Appendix A.2. The MSc Logic is probably the oldest programme in the field, and it probably is also the largest (in terms of student numbers). It certainly is the most comprehensive Master’s programme in Logic, Language and Information anywhere in the world, and the only programme that allows a student to specialise in all of Logic & Computation, Logic & Language, Logic & Mathematics, and Logic & Philosophy.

The MSc Logic enjoys an outstanding reputation internationally. One clear indicator for this fact is that each year it attracts excellent students from all over the world (see Section 2.2.3). Another indicator is the fact that our graduates easily find PhD positions at leading universities and employment at highly respected companies (see Section 3.2.2). A third indicator is the fact that the MSc Logic has inspired the creation of similar programmes elsewhere.

1.4 Requirements of the Professional Field

The chief aim of the MSc Logic is to educate future researchers. Therefore, the most relevant professional field is academia itself. Indeed, most graduates of the MSc Logic move on to become PhD students at universities worldwide. It therefore is of the utmost importance that the learning outcomes defined by the MSc Logic are appropriate in view of the requirements of the departments that take on our students after graduation.

The ILLC, as the research institute offering the MSc Logic, is able to ensure that these requirements are met by staying in close contact with many of the leading departments in Philosophy, Linguistics, Mathematics, and Computer Science, as well as a number of interdisciplinary research centres. All of the teachers on the MSc Logic are active researchers, who keep abreast of the latest developments in the field and, more often than not, influence these developments with their own research work. These insights, won through research activity and research contacts to other institutions, directly influence teaching in the MSc Logic and thereby help prepare our graduates for the competitive job market in academia.

Of course, not all MSc Logic graduates stay in academia or opt for a career in research. The programme is also an excellent preparation for a number of other professions, the two most important of which have turned out be in (a) management and technology consulting and (b) software engineering and the ICT industry at large. First, while consulting is not the same as research, some of the basic skills required are rather similar: A consultant will also often be faced with new and previously unseen problems; a thorough training in how to

approach an open research question can help with this task (cf. IR). More generally, the kind of analytical skills that the MSc Logic can provide are highly sought after by consultancy firms. Second, particularly students in the Logic & Computation track who have obtained relevant basic skills (such as programming) during their time as undergraduate students can acquire the kind of high-level analytical skills required for a senior position in the ICT industry during the MSc Logic. The skills related to communication, namely giving presentations (cf. S5) and collaboration within an interdisciplinary and/or multidisciplinary team (cf. S4), are also immensely important for careers in both consulting and ICT.

1.5 Strengths and Weaknesses

Strengths:

- The MSc Logic, with its comprehensive approach to Logic, Language and Information, is uniquely positioned in the international educational landscape. This helps in developing a recognisable brand and attracting the best students from around the world.
- The focus on interdisciplinarity and research is highly attractive for both students and employers representing the professional field.

Weaknesses:

- Despite being an established research area, Logic, Language and Information does not have the status of a widely recognised academic discipline such as Mathematics, Computer Science, Philosophy or Linguistics. This means that representatives of the MSc Logic regularly have to explain the aims and objectives of the programme to outside stakeholders, ranging from potential students to university administrators.
- The MSc Logic is not associated with a single clear-cut career path. This can make it more difficult for individual students to find their way and it puts high demands on their ability to plan their own progress. The programme tries to address this challenge by providing close individual guidance in the form of an academic mentoring system.

STANDARD 2

TEACHING-LEARNING ENVIRONMENT

In this chapter we assess the MSc Logic programme in view of the *teaching-learning environment* it provides. This corresponds to *Standard 2* in the NVAO's Framework for Limited Programme Assessments. The NVAO defines *Standard 2* as follows:

The curriculum, staff and programme-specific services and facilities enable the incoming students to achieve the intended learning outcomes.

2.1 The Programme

The programme of the MSc Logic has been designed so as to allow students to achieve the intended learning outcomes described in Section 1.1. A focus on research and interdisciplinarity, paired with a strong emphasis of formal methods, is at the core of the programme. The general methodology employed to create the best possible teaching-learning environment is the MSc Logic's **I³ System**, stressing **I**nterdisciplinarity, **I**nternationality, and **I**ndividuality:

- **Interdisciplinarity:** The knowledge imparted by the programme spans several disciplines and students are specifically trained to transcend disciplinary boundaries in their own work. This is facilitated by the embedding of the programme into the interdisciplinary research environment provided by the ILLC. Furthermore, the student population is composed of individuals with a wide variety in prior education, including Mathematics, Computer Science, Philosophy, and Linguistics.
- **Internationality:** The majority of the student population is drawn from outside the Netherlands and each cohort includes students from around 15 different countries. This creates a unique atmosphere in which highly motivated students form a strong social network that goes far beyond attending classes together.
- **Individuality:** Each student receives a lot of individual attention from staff. The central goal of the programme is the formation of a research personality on the basis of the strengths and interests on the individual student. Therefore, there are very few obligatory courses and each student can design their own individual programme. They do so with the help of a personal academic mentor.

2.1.1 Curriculum

The MSc Logic is a two-year programme requiring a total of 120 EC for graduation. There are three types of curriculum components: taught obligatory courses, taught elective courses, and

non-taught components. For a diagrammatic overview of the curriculum, refer to Appendix B; for a full description of each individual component, refer to Appendix C.

There is only a single course that must be taken by all students, namely **Logic, Language and Computation**. This is a series of guest lectures covering all (or at least most) areas of research represented at the ILLC. The objective of this course is to quickly give new students an idea of the breadth of the field of Logic, Language and Information in general, and of research opportunities at the ILLC in particular. The course is also an opportunity to practice writing skills (as students have to write summaries of the guest lectures) and it facilitates direct contacts between MSc Logic students and both staff and PhD students (as students are required to arrange individual meetings with representatives of both groups).

One of the formal entry requirements for the MSc Logic is for a student to have had a mathematically rigorous introduction to logic up to the completeness theorem for first-order predicate logic. However, for many otherwise excellent students it unfortunately is impossible to fulfill this requirement in its entirety. Most undergraduate programmes in Philosophy, for instance, simply do not offer any courses of the mathematical rigour we ideally would like to see. Similarly, many undergraduate programmes in Mathematics will not offer a full course solely devoted to logic. Many applicants manage to get around this problem by taking the initiative to look for additional courses in other departments or even other institutions before they apply to our programme. Still, some of the students selected by us for their past academic performance and their promise do not fully meet this particular entry requirement. The course **Basic Logic**, covering basic proof- and model-theoretic techniques in mathematical logic, is a deficiency course offered to these students. At the time of admission, the Board of Examiners decides for which students the course is obligatory (and which students are barred from taking the course, because they already have the required knowledge).

Each student has to choose one of the four available **tracks** to graduate in: Logic & Computation (L&C), Logic & Language (L&L), Logic & Mathematics (L&M), and Logic & Philosophy (L&P). The programme is designed so that the choice of a given track ensures that a student has solid foundations in the corresponding discipline. At the same time, this should not interfere with the programme's interdisciplinary and individual character. Concretely, this means that each track comes with a small number of track-specific obligatory courses:

- **L&C:** Computational Complexity; Recursion Theory.
- **L&L:** Meaning, Reference & Modality; Structures for Semantics.
- **L&M:** Proof Theory; Model Theory.
- **L&P:** Meaning, Reference & Modality; Philosophical Logic; Kant, Logic & Cognition.

The courses *Introduction to Modal Logic* and *Axiomatic Set Theory* have a special status, as they are shared with the local Bachelor's programme in Mathematics. Technically, like *Basic Logic*, they are **deficiency courses**. Students in the L&M track have to take both of them if they have not covered this material in their undergraduate education; students in the L&C track have to take *Modal Logic* if they do not yet possess this knowledge. Other students are encouraged to take these courses as well (as electives), provided of course they do not yet possess the relevant knowledge. In practice, *Axiomatic Set Theory* really is a deficiency course in the normal sense of the word, as a strong Bachelor's programme in Mathematics with a good coverage of logic will usually offer a similar course. The situation is somewhat different for *Modal Logic*, as the UvA is one of at best a handful of institutions in the world that teaches this kind of material at undergraduate level.

FABIO ZANASI (MoL 2012)

“Projects represented a key step in my education: I had the chance to explore areas of logic which are usually not covered at the master level, presenting them in talks and seminars; I also learned to organize independently my work in a way which has also been fruitful at the PhD level.”

Before the MoL, Fabio studied Philosophy at Siena. After the MoL, he started a PhD in Computer Science at ENS Lyon.



The remaining courses are **electives**. Each year, we offer some 30 electives. Some of them are formally “owned” by other programmes but available to our students without restrictions.¹ Students can also choose track-specific obligatory courses from other tracks as electives. Each student has to compose their own individual curriculum of electives in consultation with their mentor. They may select up to 20 EC in courses from outside the MSc Logic programme. Students regularly make use of this opportunity and choose specialised courses at other Dutch universities. If a student wishes to use more than 20 EC in outside courses, then this is possible in exceptional and well-argued cases; decisions on this matter are taken by the Board of Examiners who ensure that each student graduates with a coherent programme that is a good reflection of the intended learning outcomes of the MSc Logic. The Teaching and Examination Regulations (OER) furthermore outline clear rules for students who want to transfer credits from institutions abroad, obtained either before entering the MSc Logic or during an exchange programme. Finally, a student may take up to 12 EC in (local) courses at undergraduate level to cover relevant deficiencies (including *Axiomatic Set Theory* and *Modal Logic*).

There are three types of curriculum components that are not regular taught courses. The first of these is the **research project**. Each student must complete projects for at least 6 EC. Projects prepare students for the more intensive research work of the final thesis. Each January and June, which are periods that are free of regular teaching, we offer several *coordinated projects* for students to choose from. In addition to that, students can also do *individual projects* at any time of the year. This is a great opportunity for bringing students into direct contact with active researchers. We particularly encourage PhD students to offer such projects.

The final semester of the programme is dedicated to the **thesis**, which is worth 30 EC. An MSc Logic thesis is a report on a substantial piece of scientific work, usually including a significant amount of original research, that clearly demonstrates the student’s capacity to independently conduct research. The thesis project exemplifies the individual nature of the MSc Logic: while the student does obtain supervision, they are expected to carry out their research on their own.

Students are strongly encouraged to take part in **research seminars**. During term time there are several such seminars taking place almost every week. Each student is required to have attended at least 10 seminar sessions before embarking on their thesis project.

Appendix C describes each component of the curriculum in detail and specifies the intended learning outcomes to which each such component is contributing.

¹These other programmes currently are the *MSc Artificial Intelligence*, the *MSc Brain and Cognitive Sciences*, and the *MSc Computational Science*. Similarly, the MSc Logic “lends” several of its courses to other programmes, such as the *MA Philosophy*.

2.1.2 Study Methods and Forms of Assessment

The programme makes use of a wide range of study methods. Regular courses are delivered in the form of classical *lectures*. Some of these courses are paired with *tutorials*, in which students work on exercises under the supervision and guidance of either the main teacher of the course or a teaching assistant. This is the case, in particular, for those courses that teach basic mathematical skills. Other courses are paired with *seminar* sessions, in which students engage in discussions. This is the case for some of the courses in Philosophy or Cognitive Science. For some courses there occasionally are *computer lab sessions* (although programming only plays a role in a small number of courses and students are typically expected to master the lower technical details of programming assignments on their own).

During *research projects*, study methods can take an even wider range of forms. Some of these projects function like reading groups; in some students give a series of presentations; in some students jointly design and execute an experiment; in some they collaborate in the implementation of a larger piece of software. Some of these projects are specifically designed to support the researchers offering these projects, e.g., a PhD student in covering a body of literature they have not yet fully mastered; a senior researcher in getting in-depth feedback on a book manuscript; or a computational linguist in getting help with annotating and analysing data. This is a win-win situation: the student has the opportunity to get fully involved in real research and the researcher is able to push their own research agenda. Other projects again are organised similarly to regular courses, albeit in a much more intensive form.

The MSc Logic programme also makes use of a wide range of forms of assessment (see Section 3.1.1 for full details). Many of these are integrated into the process of study. For instance, *homework exercises*, besides being forms of assessment, double as a means of practising new skills and also incentivise interaction between the students. For some courses and projects students need to give *presentations* of their work in class and for some they are asked to write a *final paper*. Some teachers have also experimented with *peer review* methods, asking students to read and comment on each others' work. For *Logic, Language and Computation* students have to write short summaries of guest lectures and they receive feedback on the clarity of their exposition.

This heterogeneous choice of study methods and forms of assessment encourages the development of a wide range of *research and professional skills*. This includes communication skills (e.g., during presentations), organisational skills (e.g., to secure an individual project), planning (e.g., during their thesis work), and team-working skills (e.g., during project work). Regarding team work, students will experience working closely with peers from different scientific as well as cultural backgrounds. They will also experience working together with seniors (e.g., PhD students or professors).

2.1.3 Contact Hours

The average amount of face-to-face instruction in the MSc Logic is **13 hours per week** during the first three semesters and **2 hours per week** during the final semester when students work on their thesis. We have calculated the former figure as follows: A standard 6 EC course running over a period of 8 weeks is scheduled with 4 hours of lectures per week. Depending on the type of course, this is supplemented with 4, 2 or no hours of tutorials per week (with the average being close to 2 hours per week). The amount of face-to-face instruction for projects is similar as for regular courses. A student is expected to take two such courses in parallel (or the equivalent in other types of courses), adding up to $2 \times (4 + 2) = 12$ hours on average. We

LOES OLDE LOOHUIS (MoL 2008)

“As a student you are free to develop, explore or create whatever it is that makes your heart beat faster [...] under supervision you can develop a program that fits your personal interests.”

Before the MoL, Loes completed the *Beta Gamma Bachelor* at the UvA. After the MoL, she started a PhD in Computer Science at the City University of New York.



add to this 1 extra hour per week, which is a conservative estimate of the amount of time spent on individual guidance and mentoring per student.

2.1.4 Student Support and Guidance

Students receive support and guidance from a variety of sources. The Faculty of Science provides support for foreign students (e.g., housing, residence permits) through its International Office. As the MSc Logic attracts more foreign students than any other programme at the faculty, there are close relations between the programme and the International Office. Niels Molenaar at the International Office is an important point of contact for many of our students, as he very competently helps them with many of the smaller and larger problems one encounters when living abroad for the first time.

General support regarding matters such as course registration is provided by the helpdesk of the Education Service Centre (ESC). The UvA also has a range of general student services available, including for instance a counselling service and access to student doctors. On top of these general provisions, the MSc Logic has three important special features:

- **Academic mentors:** Upon arrival each new student is paired with an academic mentor from amongst the core staff of the programme. The mentor assists the student in the design of their personal study programme and they can mediate between the student and other teachers in case of problems. They also provide help with finding a thesis supervisor and can give career advice. In terms of research interests, the match between students and mentors is not always perfect, nor is it intended to be. The idea is that each mentor, through close contacts with different representatives of the student body, should develop a deep understanding of the programme and its needs.
- **Student mentors:** Each new student is furthermore assigned to a student mentor, i.e., a second-year student who has volunteered to provide guidance for incoming students during their first semester. Student mentors can help with many of the practical problems students face when starting at a new institution; they also provide a crucial social link between students from different cohorts.
- **Programme manager:** The administrative management of the MSc Logic is in the hands of Tanja Kassenaar, whose position is partly financed by the ESC and partly by the ILLC. Together with the programme director she oversees the trajectory of each individual student from the first time they make contact with the programme until the day they graduate (and in fact, more often than not, until long after that). She coordinates the admission process, keeps contact with the ESC, and supports the OC and the Board of Examiners in their work. She also is the first point of contact for students with every

possible question, ranging from the interpretation of regulations to personal problems. Having all these tasks being performed by a single, competent and dedicated person who knows every teacher and every student on the programme personally, is of immense value to the programme and contributes much to its coherence and success.

The assessment of general study **facilities** (such as lecture rooms or library access) is subject to the Institutional Quality Assurance Assessment (see Appendix L). Suffice it to say that these facilities are of very good quality. On top of these general facilities, a special feature of the MSc Logic is the *MoL Room*, a room equipped with desktop computers and blackboards located in the midst of the ILLC, where students can meet to work alone and in groups.

2.1.5 Study Load and Feasibility

The programme follows Dutch standards for implementing the recommendations of the European Credit Transfer System. Under this system, 1 EC corresponds to a workload on 28 hours for the student. In other words, when taking two 6 EC courses in parallel over a period of 8 weeks (the recommended workload during a typical semester), a student has to work in the order of 40 hours per week.

The MSc Logic is a demanding programme, but it is nevertheless feasible to complete it within the set time of two years. Having said this, the MSc Logic, like other Master's programmes, does face certain challenges in this respect. Let us review two of them here. First, in many programmes, problems with completion times are often due to outside interests of students who do not aim at completing the recommended number of credit points each semester. This is a rare problem for the MSc Logic with its highly motivated students. In fact, rather the opposite is a problem: students sometime take on *too many courses*. In some cases this can lead to delays, as such students will have difficulties in finishing what they started. This pitfall is mostly an issue in the first semester, when new students (many of which will have gotten used to always being the best student in their peer group) overestimate their own capacity to deal with the challenging programme of the MSc Logic. We address this problem by issuing very explicit warnings at the start of the programme. We have intensified this strategy in recent years and this has paid off; the problem is now noticeably less common than still a few years ago. Second, in many programmes, students (also motivated and academically strong students) often get stuck at points in the programme *where they have to make a decision*. In the MSc Logic, due to its flexible nature, there are many such points. The most critical point in this respect is the time when students have to switch from taking courses and doing small projects to committing to a large thesis project. We address this potential pitfall through the mentor system.

In line with a general policy change at the UvA, in September 2012 the MSc Logic switched to the so-called *block system* (also known as 8-8-4). Under this system, most courses are taught during blocks of 8 weeks. Each semester consists of two such 8-week blocks, followed by a 4-week block for project work. Previously, most regular courses were taught over a period of 16 weeks (with half the intensity), again followed by a 4-week project period. One of the declared aims of this new policy is to increase the feasibility of programmes and to reduce completion times, the idea being that when students take fewer courses in parallel, they should be able to focus better. At the time of writing it is too early to make predictions on how this new policy will affect the MSc Logic.

2.2 Admission and Incoming Students

In this section we review the admission procedure used by the MSc Logic and characterise the student population admitted to the programme.

2.2.1 Admission Procedure

The MSc Logic is a selective programme. Applicants must have at least a Bachelor's (or equivalent) degree in a relevant discipline, such as Mathematics, Computer Science, Philosophy, or Linguistics. They furthermore must have a reasonable background in logic, affinity with mathematical and formal thinking, and some familiarity with mathematical proofs. Specifically, we expect that incoming students have had a formal introduction to logic up to the completeness theorem for first-order predicate logic and have taken courses requiring mathematical or formal reasoning. Finally, applicants are required to have a strong academic record. To apply, a student has to submit the following information:

- **Application form:** Besides information on the applicant's prior education and track record (e.g., prizes or distinctions obtained), the form includes a list of questions concerning their technical background regarding basic logic and elementary mathematics, as well as existing knowledge in philosophy of language, linguistics, and theoretical computer science. Amongst other things, we use this information to determine whether an admitted student has to take one of the deficiency courses, such as *Basic Logic*.
- **Transcripts and diplomas:** We ask for a certified copy of the student's Bachelor's diploma and for transcripts showing the grades of all university courses taken in the past.
- **Letter of motivation:** Each applicant has to write a letter in which they explain their interest in the field and motivate their application. We place great importance on this letter and find that it sometimes is a better indicator for future performance than the grades in specific subjects.
- **Letters of recommendation:** For each applicant we ask for two letters of recommendation, preferably confidential letters sent in separately from the application by academics familiar with the applicant's work. Like the letter of motivation, these letters play a crucial role in the admission process. We are particularly interested in hearing about a student's potential for research.
- **English proficiency:** Finally, we require proof that the student meets the standard English language requirements set by the university.

2.2.2 Selectiveness

The MSc Logic management does not systematically maintain statistics regarding admission, but the following figures are representative of recent years. Between 1 April 2010 and 1 April 2011, the programme management was contacted by a little over 100 undergraduate students with an interest in the MSc Logic. Only in a few cases, this first contact already consisted of an application—because of the nonstandard nature of the programme, in most cases, students first want to ask a few questions. When students seem ill-prepared for the programme, we advise them not to apply formally. Around 50% of the initial contacts eventually resulted in an application. Of those that applied, just under 25% were rejected. Of those that were accepted, just under 25% eventually declined the offer, mostly for financial reasons and in a few cases because they were offered a PhD position elsewhere. In summary, a little under 30% of students who make initial contact end up enrolling in the programme.

The MSc Logic is a **highly selective** programme, even if this may not be immediately apparent from above admission statistics. As we shall see, selectiveness can be *explained* in terms of both the uniqueness of the programme and our approach to selection. It can be *demonstrated* in terms of the attributes of the students that eventually enrol.

First, the uniqueness of the programme results in a certain degree of *self-selectiveness*: For a student to hear about the MSc Logic—indeed, for a student to even be aware of the fact that it is possible to do postgraduate study in this field at all—they usually must have shown some aptitude in a relevant discipline already, and a dedicated teacher must have recognised their talent and pointed them towards us.

Second, we provide a lot of *information and guidance* before and during the application process: one aspect of this is that we run a well-maintained website for the programme that gives full information about the curriculum and the spirit of the MSc Logic. This means that only students who are both truly interested in the material and sincerely motivated to participate in a challenging programme are likely to apply. A second aspect is that we respond to queries promptly and in depth, which we believe binds the most ambitious candidates to the programme early on. We also are frank in case a student is not qualified and discourage them from applying. Some students contact us early on (sometimes more than a full year before applying) and we are able to advise them on what courses to take in their final year as an undergraduate student so as to be optimally prepared for the MSc Logic. Finally, each year there are several students who visit us in person before deciding to apply (sometimes travelling from as far as North America).

Indeed, the *quality* of the students selected is generally excellent. This is not only apparent from the results they achieve within the programme (see Section 3.2), but also from their profiles at the time of enrolment. To demonstrate this, we have conducted a small case study. The *grades of applicants* in their undergraduate studies can provide some indication of quality. As each cohort of the MSc Logic includes students from around 15 different countries, all using different grading schemes, a systematic study of the grades of the entire student population is not possible. Instead, we focus on students with a Dutch Bachelor's degree (who wrote a Bachelor's thesis). During 2006–2009 the MSc Logic accepted 22 such students. The average grade of their Bachelor's thesis was 8.5, which compares favourably with the national average of 8.3 for so-called *Research Master* programmes and 7.8 for other Master's programmes.² How does this sample relate to the rest of our students? Of those 22 students, 18 have eventually graduated. The average grade of *their* Bachelor's thesis was 8.6 and the average grade of their MSc Logic thesis was 8.3. For comparison, the average grade for MSc Logic theses in general during the same period was also 8.3, i.e., in this respect our small sample is representative for the MSc Logic student population as a whole.

Another indicator of quality is the fact that our students are successful in obtaining *competitive grants* to support their studies. For instance, between 2006 and 2011, the students of the MSc Logic obtained an average of 5 grants per year under the prestigious *Huygens Scholarship Programme* (HSP). That is, roughly 25% of foreign students in the MSc Logic were supported by the HSP programme, which specifically targeted excellent student from abroad and which provided an award to around 15% of all applicants (unfortunately, the Dutch government terminated the HSP in 2012). Other high-profile student grant programmes of significance for the

²See the recent NVAO study [Research Master Review 2011: Peaks in Sight](#) (page 47). A typical *Research Master* in the humanities is small (with an annual student intake of around 30% of the MSc Logic) and is often paired with a one-year sister programme in the same discipline for students less interested in research. For political reasons (the discussion of which would go beyond the scope of this footnote), there exist no *Research Masters* in the exact or natural sciences (but all two-year programmes are considered research-relevant).

2.3 Dropout and Success Rates

The NVAO defines the *dropout rate* of a two-year full-time Master’s programme as the proportion of the number of students dropping out of the programme within the official duration of the programme. Table 2.1 summarises the dropout rates for cohorts 2006–2011. We also provide information on how many students dropped out at an earlier stage.³

Cohort	<i>N</i>	within 1 semester	within 1 year	within 2 years
2006	19	1 (5%)	2 (11%)	4 (21%)
2007	22	2 (9%)	2 (9%)	3 (18%)
2008	29	6 (21%)	7 (24%)	7 (24%)
2009	29	2 (7%)	4 (14%)	5 (17%)
2010	30	3 (10%)	6 (20%)	10 (33%)
2011	33	1 (3%)	2 (6%)	?
Average	27	3 (9%)	4 (16%)	6 (22%)

Table 2.1: Dropout rates

The averages shown in Table 2.1 are weighted by *N* (the number of students starting in a given year). For the dropout rate within at most two years, the average has been calculated over cohorts 2006–2010 only. If students drop out within the first semester of the programme, particularly if they manage to switch successfully to another programme at the UvA (which has been the case for many of our early dropouts), then we do not consider this a negative point. Rather, we consider it a success when we manage to advise them at an early stage on how to best invest their talents. The proportion of students still active after the first semester who then drop out within the official duration of the programme is **13%** (15 out of 115 students in cohorts 2006–2010).

The NVAO defines the *success rate* of a two-year Master’s programme as the proportion of students who graduate within at most three years. Table 2.2 summarises the success rates for cohorts 2006–2010, and also provides data on the number of students who finish within two years and the total number of graduates.

Cohort	<i>N</i>	within 2 years	within 3 years	total
2006	19	7 (37%)	10 (53%)	14 (74%)
2007	22	8 (35%)	13 (57%)	15 (65%)
2008	29	13 (45%)	16 (55%)	17 (59%)
2009	29	13 (45%)	21 (72%)	21 (72%)
2010	30	9 (30%)	?	?
Average	26	10 (39%)	15 (61%)	17 (68%)

Table 2.2: Success rates

Averages are again weighted by *N* and have been calculated for cohorts 2006–2009 only in case of total graduations and graduations within three years. It is worth pointing out that the definition of success rate used by the NVAO is not uncontroversial. For a (three-year)

³Students may start in September or February of a given year, with around 90% of students starting in September. Cohort 2006 includes all students who started either in February 2006 or in September 2006 (and accordingly for later years). Both dropout and success rates are calculated with respect to a student’s actual starting date—also for students starting in February (e.g., if a student who started in February 2006 dropped out in January 2007, then this counts as dropping out after one year).

Bachelor’s programme the success rate is defined as the proportion of students *still enrolled after one year* who graduate within at most four years, while for a Master’s programme a student who switches to another programme within, say, one month of enrollment will count as a failure. If we correct for this mismatch by calculating success rates with respect to students *still active after one semester*, we obtain a success rate of **69%**, with 42% graduating after two years and 77% graduating in total.

Finally, observe that 10% of students are covered neither by Table 2.1 nor by Table 2.2 (the 22% of dropouts after two years and the 68% of graduates in total add up to 90%). This group includes individuals who had to interrupt their studies for financial or other personal reasons and hope to still graduate eventually. It also includes students who left the programme before graduation for a PhD offer abroad and still hope to complete the MSc at a later point. While leaving room for improvement, in the context of postgraduate education in the Netherlands the above figures regarding dropout and success rates would be widely considered good results.⁴

2.4 Academic Staff

The *core staff* of the MSc Logic consists of 32 individuals, who together are responsible for over 90% of the programme content delivered (see Appendix F.1 for full details). Next we review the research and teaching credentials of this group (and we briefly comment on the occasional staff delivering the remaining content). We also report on basic teaching qualifications as required by the NVAO, as well as the student-teacher ratio and the job satisfaction of MSc Logic teachers.

2.4.1 Research Credentials

The MSc Logic is a research-oriented Master’s programme. Therefore, the research credentials of the academic staff teaching on the programme are of central importance to the quality of the teaching-learning environment it can provide. Many of the teachers associated with the programme are leading researchers in their field. For lack of space, we do not review their research results here, list their publications, or comment on their substantial contributions to service to the international research community. Instead, we restrict ourselves to highlighting a small number of clear indicators for research excellence.

One such indicator is success in the NWO’s Innovational Research Incentives Scheme (*Vernieuwingsimpuls*), the most prestigious personal grant programme for researchers in the Netherlands at different stages in their career. With this programme, the NWO aims to support excellent researchers in the top 10–20% of their peer group. The *Veni* award is for researchers within three, the *Vidi* for researchers within eight, and the *Vici* for researchers within 15 years of their PhD. Of the 32 core staff listed in Appendix F.1, twelve have won an award in this programme (some have won two):

- **Vici:** Bod, Buhrman, Sima’an, Venema
- **Vidi:** Aloni, Bod, Endriss, Van Rooij, Sima’an, Smets, De Wolf
- **Veni:** Aloni, Fernández, Palmigiano (an MSc Logic alumna), de Wolf, Zuidema

In addition, Van Lambalgen is a recipient of an NWO Pionier award (the predecessor of the Vici) and Dekker is a recipient of an NWO first-generation *Vernieuwingsimpuls* award (the predecessor of the Vidi). Van Benthem won an NWO Spinoza award, Smets an ERC Starting Grant, and Fernández an NWO Meervoud award. Van Benthem and Stokhof are members of

⁴See for instance the recent NVAO study *Research Master Review 2011: Peaks in Sight* (pages 23–25).



CHRISTIAN GEIST (MoL 2010)

“Both students and professors are extremely approachable and create an unrivaled, collaborative atmosphere [...] [This] led to truly interdisciplinary results that would have been impossible in a different setting.”

Before the MoL, Christian studied Mathematics at TU Darmstadt. After the MoL, he started working as a consultant for McKinsey & Company and is currently doing a PhD in Computer Science at TU Munich.

the Royal Netherlands Academy of Arts and Sciences (KNAW); Apt and Van Benthem are members of the *Academia Europaea*.

Several of the postdoctoral research fellows at the ILLC who in recent years had temporary teaching duties in the MSc Logic have also been successful in the NWO Innovational Research Incentives Scheme: Eric Pacuit received a Vidi award, Catarina Dutilh Novaes (an MSc Logic alumna) won both a Veni and a Vidi award, and Michael Franke (an MSc Logic alumnus), Davide Grossi, Aline Honingh, Christian Schaffner, Bryan Renne, and Floris Roelofsen (an MSc Logic alumnus) all obtained Veni awards.

The MSc Logic is tightly embedded into the research environment of the ILLC, a leading research institute that has consistently been rated as *excellent* during all past research assessment exercises. The most recent results for the three groups that make up the institute and for the ILLC as a whole (covering the period of 2000–2005) are given in Table 2.3 (the best possible grade is 5). The outcome of the most recent research assessment of the ILLC (covering the period of 2006–2011) is expected to become available in the course of 2013.

Criterion	LoLa	LoCo	LaCo	ILLC
Quality	5	5	5	5
Productivity	5	5	5	5
Relevance	4	5	5	5
Prospects	4	5	4	4

Table 2.3: Results of the ILLC research assessment 2000–2005

Note that the ILLC is home to further excellent researchers, who are not part of the *core group*, but whose expertise is still available to MSc Logic students. This includes Veni awardee Katrin Schulz (an MSc Logic alumna) and Vidi awardee Jaap Kamps.

2.4.2 Teaching Credentials

The MSc Logic programme is delivered by an experienced group of individuals with substantial teaching credentials. To support this claim, we offer five kinds of evidence.

First, the staff of the MSc Logic can bring to bear a wealth of **international experience**. Many of the teachers in the programme have held appointments abroad involving regular teaching duties. This includes institutions in Europe (e.g., Oxford, Cambridge, London, Edinburgh, Paris, Berlin, Bonn, Potsdam, Tübingen, Brussels, Helsinki), North America (e.g., Stanford, Texas-Austin, New York University, SUNY-Buffalo), and Asia (e.g., Tsinghua, Singapore). On top of this there are a vast number of shorter courses and invited lectures that MSc Logic teachers have given as visitors at universities all over the world.

Second, members of the academic staff of the MSc Logic are regularly asked to teach at international **summer schools** and to deliver **invited tutorials** at international conferences. One summer school that stands out is ESSLLI, the European Summer School in Logic, Language and Information, which each year attracts hundreds of participants from around the world. MSc Logic staff contribute to this important event with one or several courses almost every year. The other summer schools and tutorials are too numerous to list here; they include the North American and Asian counterparts of ESSLLI as well as summer schools in fields ranging from Formal Epistemology, to Theoretical Linguistics, to Quantum Computing, to Multiagent Systems and Algorithmic Game Theory.

Third, MSc Logic teachers have written a number of widely used **textbooks**. Examples include the two-volume “Gamut” on *Logic, Language and Meaning* authored by Van Benthem, Groenendijk, De Jongh, and Stokhof (with Verkuyl); Apt’s *Principles of Constraint Programming*; Van Eijck’s *Computational Semantics with Functional Programming* (with Unger); De Wolf’s *Foundations of Inductive Logic Programming* (with Nienhuys-Cheng); and the *Modal Logic* book of Venema (with Blackburn and De Rijke).

Fourth, MSc Logic teachers score highly in **student evaluations**. For instance, we have extracted the scores given specifically *to the teacher* (rather than other aspects of a course) from the student evaluation forms for the academic year 2011/12 and found that, on a scale from 1 to 5, MSc Logic teachers received an average score of 4.2.

Finally, several members of our staff have won **awards** for teaching. The UvA’s Faculty of Humanities (currently offering 28 BA and 66 MA programmes) each year awards a prize for the best MA and the best BA course, respectively. In 2007 this prize went to the course *Logica en de Linguistic Turn* in the BA Philosophy, which over the years had been jointly developed by many ILLC members. In 2011 the prize went to Katrin Schulz (MSc Logic alumna and occasional teacher on the programme) for her course *Logische Analyse* in the BA Philosophy. In 2012 the prize went to Van Lambalgen for his MSc Logic course *Rationality, Cognition and Reasoning*, while in 2010 his MSc Logic course *Kant, Logic and Cognition* became runner-up. Furthermore, in 2007 Endriss was nominated by the Student Union for Information Sciences (VIA) for the *UvA Teacher of the Year* award, and in 2008 Groenendijk was nominated by the Student Union for Philosophy (AmFiBi) for the same award and became one of five finalists.

2.4.3 Basic Qualifications

As per NVAO guidelines, in Table 2.4 we summarise the basic qualifications of the 32 members of the core group of academic staff (as of December 2012) and list the number of individuals holding a Master’s degree (or equivalent), a PhD, and a Basic Teaching Qualification certificate (BKO, see Appendix F.2).⁵ In terms of FTE contributed to the programme, 22% of the (core) staff hold a BKO and 100% hold both a Master’s degree (or equivalent) and a PhD.

The additional staff (together responsible for less than 10% of the programme) include postdoctoral research fellows and PhD students at the ILLC, as well as senior scientists from other institutions. All of them hold a Master’s degree, over 75% hold a PhD, and most of them do not hold a BKO certificate.

⁵The poor representation of women amongst the teaching staff (currently 16%) is something that both the ILLC and the MSc Logic management are aware of and are actively addressing. Note that at the time of the previous accreditation, there was *no* woman with a permanent appointment teaching regularly on the programme.

Position	Master's	PhD	BKO	Total (m/f)
Full Professor (HGL)	14	14	1	14/0
Associate Professor (UHD)	8	8	2	7/1
Assistant Professor (UD)	8	8	2	5/3
Instructor (<i>docent</i>)	2	2	1	1/1
Total	32	32	6	27/5

Table 2.4: Basic qualifications of core staff

2.4.4 Student-Teacher Ratio

The NVAO defines the student-teacher ratio as “the ratio between the total number of full-time students enrolled and the total number of FTE’s logged by the teaching staff of the programme in the most recent academic year”. The student-teacher ratio of the MSc Logic in the academic year of 2011/12 has been **10.1 students per FTE** of teaching effort logged. The way we have calculated this figure is documented in Appendix F.3. To put this in context, a ratio of around 20 would typically be considered normal in the Netherlands.

2.4.5 Job Satisfaction

Finally, NVAO guidelines suggest to also comment on the job satisfaction of academic staff. This is not something that we monitor systematically at the level of the MSc Logic (although there is an annual survey regarding job satisfaction of UvA personnel in general). However, anecdotal evidence suggests that most members of staff, most of the time, are very satisfied with their teaching job in the MSc Logic programme. This is not surprising: teaching material that is close to your own research to relatively small groups of highly motivated students is widely regarded as the ideal situation in university-level teaching.

2.5 Quality Assurance

The UvA ensures that basic measures of quality assurance are implemented for all programmes offered. This aspect is evaluated in the Institutional Quality Assurance Assessment (see Appendix L). Here we focus on specific instruments used by the MSc Logic. These instruments are applied in accordance with the applicable rules and regulations, as laid down, for instance, in the Handbook for Quality Assurance in Education (*Handboek Kwaliteitszorg Onderwijs*) of the Faculty of Science.

When it comes to quality assurance, the most important organ in the MSc Logic is the **OC** (*Opleidingscommissie* or Educational Committee). This committee, which by law any programme is required to feature, consists of both teachers and students. It is installed by the Dean of the Faculty of Science. Its main tasks are to guard and evaluate the quality of the programme. The OC meets at least four times a year to discuss the individual courses, the programme as a whole, and the Teaching and Examination Regulations (OER), and it has the right to advise the MSc Logic director on all aspects of the programme.

The most direct way by which MSc Logic courses are evaluated is via **evaluation forms**. At the end of each course, the students (anonymously) fill in an evaluation form, which is then processed by the ESC and sent to both the programme director and the OC. These forms cover the organisation of the course, the study load, assessment methods, the quality of the teacher, and the quality of the teaching materials used. In case the forms indicate problems,

FAN YANG (MoL 2008)

“Then, suddenly, I understood why people at the ILLC never get tired: they really enjoy it!”

Before the MoL, Fan studied Philosophy at Sun Yat-sen University. After the MoL, she began a PhD in Mathematics at Helsinki.



the programme director can take action, either on his own initiative or if asked to do so by the OC. The deliberations of the OC are recorded in its minutes and can be consulted in subsequent years to assess whether the suggested improvements have been implemented.

Typical examples for a problems that can be (and have been) caught as well as resolved using this approach are when a teacher does not provide sufficient or timely feedback on homework, or when the chosen textbook is lacking in didactic quality. Evaluation forms are also very helpful in identifying courses with a workload that is either too high or too low in view of the amount of credit it is worth, which allows the programme director to address such issues.

On top of the evaluation of individual courses, the student members of the OC each year also organise a **general evaluation** of the programme as a whole. This evaluation covers issues such as the mentor system, course offerings, and study facilities.

Besides these official means of quality assurance there are also several informal channels, that in practice prove to be very important. For instance, the academic mentors will often be the first to hear about problems in a course and can alert the programme director long before the OC can. The programme manager (Tanja Kassenaar) is also in close contact with the students and can sometimes identify problems that may not be easily visible to the academic staff. Since 2011, she furthermore systematically meets each second-year student at the beginning of the academic year to enquire about their progress and plans.

2.6 Special Features of the Programme

The MSc Logic has a number of special features that deserve being highlighted here:

- **Academic mentors:** Each student is assigned a personal mentor from amongst the academic staff who assists them in designing their individual programme of study, and who can help with issues such the choice of a thesis supervisor and career advice.
- **MoL Room:** The ILLC offers (and finances) a room specifically for MSc Logic students located in the midst of the institute. Students use this so-called *MoL Room* to do their homework, to check their email, and to work together. More importantly, the MoL Room is a place where students of different academic and socio-cultural backgrounds meet, get to know each other, and form a unique community.
- **Embedding into ILLC:** The MSc Logic is closely embedded into the ILLC in several ways—physically, scientifically, and socially: the MoL Room is located within the institute; teachers incorporate their research into their courses and students contribute to research at the ILLC; students are regular participants and sometimes speakers at ILLC seminars; and students are part of the social community that makes up the ILLC.

- **Projects:** Projects are a flexible instrument for in-depth education and provide opportunities for the transfer of research skills that regular courses cannot hope to offer.

2.7 Strengths and Weaknesses

Strengths:

- The close integration with the ILLC and the research credentials of the staff allow us to realise our high ambitions regarding the research-oriented character of the programme.
- The presence of an international, interdisciplinary and highly motivated student population facilitates a unique learning environment in which excellence can thrive.
- Through working together, MSc Logic students develop strong team-working skills, including in particular working in an interdisciplinary and/or multidisciplinary team. Importantly, “team work” is not an explicitly taught soft skill, but a natural consequence of the organisation of the curriculum and the choice of study methods.
- Every single student receives close individual attention, both through the programme’s mentoring system and through its general support structure. The latter is facilitated by a dedicated programme manager who is in direct personal contact with all relevant parties (students, teachers, research institute, teaching administration, facility providers).

Weaknesses:

- Making admission decisions is challenging for a postgraduate programme with no corresponding undergraduate programme. The recent focus on quantitative data in assessing the quality of university education provides unwanted incentives for simply rejecting applicants where one cannot be absolutely certain that they will graduate in a timely manner. This endangers the profile of the MSc Logic as a programme that has traditionally been open to students interested in switching discipline and to students with an unusual academic history. The management of the MSc Logic tries to balance these concerns by entering an in-depth dialogue with such applicants before making an admission decision.
- Due to the financial crisis and changing priorities in the Dutch government, scholarships for international students have become much harder to come by in recent years. As a result of this, there has been a noticeable dip in enrolments of students from non-European (i.e., high-tuition-fee) countries. This is a serious concern, which the MSc Logic only has limited means to address (e.g., by liaising with the *Beth Foundation* providing grants for our students). At the same time, overall enrolment is stable and even increasing, partly due to an improved public relations strategy within the Netherlands.

STANDARD 3

ASSESSMENT AND ACHIEVED LEARNING OUTCOMES

Next we assess the MSc Logic in view of how it handles the *assessment* of students and in view of its *achieved learning outcomes*. This corresponds to *Standard 3* in the NVAO's Framework for Limited Programme Assessments. The NVAO defines *Standard 3* as follows:

The programme has an adequate assessment system in place and demonstrates that the intended learning outcomes are achieved.

3.1 Assessment

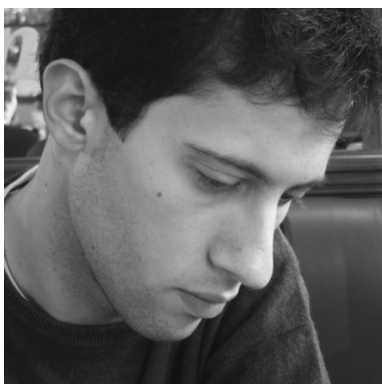
In this section we review the wide variety of forms of assessment used in the MSc Logic and we explain how the programme's Board of Examiners guarantees the quality of examinations.

3.1.1 Forms of Assessment

The variety of courses, and more generally of curriculum components, in the MSc Logic require a range of different forms of assessment. While a written exam is sometimes regarded as the standard way of assessing a student's performance, it certainly is not the only one and it certainly is not the best—or even an adequate—form of assessment in all cases. As the MSc Logic involves many different areas in science and the humanities, and as it aims at achieving several different types of learning outcomes, there is a correspondingly rich variety of assessment methods used to account for this heterogeneity.

Besides written exams, other forms of assessment used include regular homework (and take-home exams), oral exams, term papers, in-class presentations, programming assignments, the design and execution of experiments, and combinations of several of these. Appendix C lists for each curriculum component the (main) form(s) of assessment used. Two aspects of this approach to assessment are particularly noteworthy:

- For many courses, students get evaluated already *during* the course, e.g., via homework assignments or presentations in class. This forces students to actively engage with the course early on, and thereby helps them to also perform well during a written examination or when preparing a term paper at the end of a course.
- Several of the assessment methods used are directly tailored at furthering, and ultimately assessing, research skills. The clearest example for this is the requirement to write papers,



SALVADOR MASCARENHAS (MoL 2009)

“[T]he MSc Logic not only gave me the opportunity to learn about my desired field of specialization [...], it also made me a capable and critical judge of work in areas unrelated to mine, with questions at the end of talks.”

Before the MoL, Salvador studied Linguistics at Lisbon. After the MoL, he started a PhD in Linguistics at New York University.

for both projects and certain regular courses. Other examples include student presentations, sometimes of results from the literature and sometimes of their own work; and the design and execution of experiments, e.g., for curriculum components in computational linguistics or cognitive science.

Of special significance is the assessment of the final *thesis*. Each thesis is supervised by an experienced scientist who can guarantee the chosen subject and the level of difficulty are appropriate. An additional level of assurance is provided by the fact that at the start of their thesis work a student has to outline their research plan in an *approval form*, which needs to get countersigned by both the programme director and a member of the Board of Examiners. Each thesis is assessed by a *thesis committee*. This committee must consist of at least three people, including the supervisor(s). All members of the committee must hold at least a Master’s or equivalent degree; at least three of them must have a PhD. At least two members must be experts who were not involved in the thesis supervision. Every thesis committee is chaired by a member of the Board of Examiners; this is an important factor in ensuring the coherence of grading standards across thesis projects. Until early 2012, the convention was that the chair of the thesis committee would briefly summarise the deliberations of the committee, and thus the reasons for the grade given, at the end of the defense in a short address to the student. To improve transparency and accountability, in 2012 we formalised this approach and the committee now produces a short text that justifies the grade given to the student, by relating their performance to five criteria: technical correctness, quality of writing, level of difficulty, level of originality, and level of independence of the student. The guidelines given to the committee members before a thesis defense are reproduced in Appendix E. This includes descriptions of the five criteria applied.

3.1.2 Quality of Examinations and the Board of Examiners

The MSc Logic aims at conducting examinations in a manner that not only ensures that graduates achieve an appropriate level of competence, but that also is *fair*, *coherent*, *transparent*, and *accountable*. Fairness means that individual students are evaluated based on their academic performance alone (with the common exceptions to this rule, e.g., a student with a disability might be given more time during a written exam). Coherence means that the assessment standards across curriculum components are comparable and that a similar performance results in a similar grade. Transparency means that students understand how they are being assessed and what the evaluations they receive are based on. This includes the requirement that the assessment method to be used for a curriculum component has to be announced by the start of that component. Accountability, finally, means that teachers can justify the evaluations they give towards the students and the programme.

The *Board of Examiners* is ultimately responsible for the quality of examinations in the MSc Logic. In day-to-day practice, this responsibility is largely delegated to the individual teachers. However, the Board has the right to carry out spot checks and it can, if required, intervene. Should a student feel that a particular examination has been inappropriate or that they have been treated unfairly, they can lodge a complaint with the Board. This hardly ever happens, but when it does, the Board has the means to resolve such problems.

In practice, a very useful tool for ensuring the quality of examinations are the *course evaluation forms* that students fill in at the end of every regular course and at the end of every coordinated group project with at least a handful of participants. Amongst other things, this form asks whether students feel that the chosen form of assessment is appropriate for the curriculum component in question and whether students understand how their grades are being determined. In case student responses to this question raise concerns, the programme director can ask the Board of Examiners to investigate the matter.

In line with UvA policy, the Board of Examiners has been taking a more active role in the recent past. One example is the revision of the rules for assessing MSc theses (see Appendix E). The accountability of the Board of Examiners itself has also been improved, for instance, by instituting an annual report of the Board. In its work, the Board can rely on the structure provided by the UvA, and more specifically the Faculty of Science. For instance, the faculty has recently produced a document outlining rules and regulations for every Board of Examiners (*Regels en Richtlijnen van de Examencommissies*) and the *Graduate School of Informatics* is currently working on an assessment policy document (*Toetsbeleid*).

3.2 Achieved Learning Outcomes

In this section we document the fact that our graduates achieve the intended learning outcomes specified in Section 1.1. The main indicators for success that we cite are their performance on the job market (see Section 3.2.2) and the fact that they are able to produce a host of high-quality publishable research (see Appendix I). But maybe most importantly, our graduates themselves are satisfied with the education received; we substantiate this claim in Appendix J, where we report on a recent survey amongst graduates.

3.2.1 Level Achieved

MSc Logic graduates achieve the learning outcomes of the programme as specified in Section 1.1 and the OER (see Appendix D):

- **Knowledge:** Each graduate will have successfully completed several basic and several advanced courses, ensuring that they possess both solid foundations (K1) and specialised knowledge (K2). Details on which courses cater for which type of knowledge are given in Appendix C.
- **Skills:** Each graduate will have practiced and have been assessed on their skills regarding research (S1, S2), making judgements (S3), team work and collaboration in an interdisciplinary context (S4), and giving presentations (S5). Again, which curriculum components cover which of these skills is specified in Appendix C.
- **Interdisciplinary research:** Each graduate will have completed one major work of research, in the form of the thesis. Each graduate will furthermore have completed at least one smaller research project on a topic different from that of their thesis research.

- **Intellectual mobility:** Each graduate will have acquired the intellectual mobility aimed for by the programme through having studied and worked for two years at an interdisciplinary research institute and together with a group of international students with a background in a variety of disciplines, including Mathematics, Computer Science, Philosophy and Linguistics. Each graduate will also have attended at least 10 (but typically far more) research seminars on a wide variety of topics.

Importantly, not only do our graduates achieve the learning outcomes specified by the programme, but they more often than not excel in their studies and reach a level that is well beyond what would usually be expected from a graduate of a Master's programme.

The clearest indicator for this fact is the exceptionally strong performance of MSc Logic graduates when it comes to achieving original research results. This may be witnessed by studying the research theses written by MSc Logic graduates, but is probably most immediately evident from the fact that around 30–40% of all MSc Logic theses result in an original research publication. On top of this, several individual and group projects, as well as a few term papers written for advanced courses, have also resulted in publications. Appendix I lists **50 student papers published in 5 years**, from 2008 to 2012 (note that this list is *not* exhaustive). This includes journal papers, archival conference papers, and workshop papers (all of them peer-reviewed). Some of these publication venues belong to the foremost such venues in their respective discipline.

The publication record of the MSc Logic also bears witness to the *interdisciplinarity* of the programme. For instance, in 2011 MSc Logic students published in journals such as *Morphology*, the *Journal of Philosophical Logic*, the *Journal of Logic and Computation*, the *Journal of Artificial Intelligence Research*, and *Theoretical Computer Science*, while the publication record of 2012 includes conferences such as *Sinn und Bedeutung*, the *Conference of the European Chapter of the Association for Computational Linguistics (EACL)*, *Language Resources and Evaluation (LREC)*, the *Conference of the European Association for Machine Translation (EAMT)*, and *Autonomous Agents and Multiagent Systems (AAMAS)*.

Another indicator of excellence is the fact that several MSc Logic students have won **prizes and awards** for their work. For instance, Boaz Leskes won the UvA Thesis Prize 2005; Ivano Ciardelli won the AILA Thesis Award 2010 for the best Master's thesis in Logic by an Italian student; and Margaux Smets won the STIL Prize 2010 for the best Master's thesis in Computational Linguistics in the Netherlands and Flanders. MSc Logic students and graduates have won the Best Paper Award at the ESSLLI Student Session on several occasions. Willem Conradie won in 2003 and Thomas Icard in 2007. MSc Logic alumni Reut Tsarfaty and Michael Franke won while already PhD students in 2006 and 2008, respectively. *Logic Year* student Casper Storm Hansen won in 2010. Loredana Afanasiev, Reut Tsarfaty and Yurii Khomskii all won prestigious Mozaïek Grants to fund their PhD positions from the NWO for research proposals developed during their time as MSc Logic students (in 2005 and 2007, respectively). Other noteworthy achievements include Mark Beumer in 2009 getting selected to participate in the *Nationale Denktank* programme and Floor Sietsma in 2012 becoming the youngest person in modern history to complete a PhD at a Dutch university.

3.2.2 Job Market Performance

MSc Logic graduates enjoy excellent opportunities on the job market. Over 90% find a job at graduate level within six months of graduation. The majority of them choose a career in

LORENZ DEMEY (MoL 2010)

“Without any doubt, I can say that being a student in the Master of Logic programme at the ILLC has been the most intellectually stimulating experience of my life so far.”

Before the MoL, Lorenz studied Philosophy at KU Leuven. After the MoL, he returned to Leuven for a PhD in Philosophy.



academia and/or research. Table 3.1 gives an overview of graduate destinations for students who graduated in the (calendar) years 2006–2011.¹

Year	<i>N</i>	PhD	Software	Consulting	Other	Unknown
2006	10	7	–	–	1	2
2007	22	18	2	2	0	0
2008	13	9	1	2	1	0
2009	17	11	–	–	5	1
2010	20	9	4	1	5	1
2011	21	15	1	3	2	0

Table 3.1: Graduate destinations

In Table 3.1, *Software* includes software engineering and a variety of related jobs in the ICT industry. *Consulting* refers to management and technology consulting jobs at companies such as McKinsey, Deloitte, PricewaterhouseCoopers, and CapGemini. Other jobs include teaching, online retailing, and design; this column also covers graduates who entered a second Master’s programme, one graduate who entered Law School, and one who became a faculty librarian.

Around **67%** of the graduates covered by Table 3.1 (69 out of 103 graduates) have entered a PhD programme. In a handful of cases they did so after completing either a second Master’s programme in a related field or after a short stint in another profession. Of the 69 graduates who entered a PhD programme, 18 did so at the ILLC, 3 elsewhere at the UvA, and 6 at the CWI. Several graduates joined other universities in the Netherlands as PhD students, namely Groningen (3), Nijmegen (2), Utrecht, Leiden, and the VU University in Amsterdam. Our placement record for graduates of 2006–2011 furthermore includes Stanford (2), CUNY (2), NYU, UMASS-Amherst, Michigan, McGill, Oxford (2), Cambridge, LSE, Bristol, Leicester (3), St. Andrews (3), Wellington, Paris VII, EPFL, Bonn, Göttingen, TU Munich, Padova (2), Bari, Brussels, KU Leuven (2), Ghent, Helsinki, and Aarhus. Of the graduates who did not stay at the ILLC, roughly one third entered Philosophy departments and one third entered Computer Science departments, with the rest being distributed between Mathematics, Linguistics, and various interdisciplinary centres. Of those who remained at the ILLC, roughly half chose a PhD topic that fits under the heading of Logic in the narrow sense of the word, with other popular choices including Philosophy and Cognitive Science.

¹The trend for 2012 graduates is similar, but at the time of writing it was too early to give a reliable picture, as most students graduated less than six months ago and some were still looking for a PhD position.

3.3 Strengths and Weaknesses

Strengths:

- The MSc Logic operates a flexible system of assessment that allows for an adequate evaluation of all aspects of the programme's intended learning outcomes, including research skills. In particular, by using instruments such as individual and group projects, the writing of papers, and the presentation of research results, the research skills of students get assessed already well before they begin working on their research thesis.
- MSc Logic students are able to produce high-quality research, as clearly evidenced by the stream of publications coming out of the programme (see Appendix I).
- MSc Logic graduates are highly employable. The proportion of graduates who obtain PhD positions, often at very prestigious institutions, will hardly be matched by other programmes of a comparable size. But also outside of academia, graduates easily find rewarding positions in business, ICT, and elsewhere.
- We are in close contact with many of our alumni. They care about the programme and several of our recent students have applied on direct recommendation of alumni.

Weaknesses:

- The flexible and student-oriented approach to assessment of the MSc Logic, with its focus on individual coaching and the transfer of research skills, runs against the current trend in higher education in the Netherlands, which favours the use of highly regulated and standardised written exams, as they are more easily accounted for.
- While graduates enjoy excellent employment opportunities also outside academia, this is not always obvious to students at the time of their studies and some students feel that the programme does not put enough emphasis on professional skills. We try to address this issue through the "Life after ILLC" event series (organised by PhD students) in which alumni are invited back to the institute to present alternative career paths to current students. We are also in the process of adding a page on *Careers* to the MSc Logic website to better inform current students about their options.
- The MSc Logic currently does not have an alumni network that would allow graduates to communicate with each other or that would be visible to the outside world. To address this issue, we are currently building up an ILLC Alumni Network on LINKEDIN and are also working on an improved representation of MSc Logic graduates on the ILLC website.

PART II: APPENDICES

APPENDIX A

REFERENCE FRAMEWORK

For many monodisciplinary Master's programmes there are widely accepted reference frameworks defining the field and specifying requirements for such a programme (e.g., the curriculum recommendations for Computer Science of the *Association for Computing Machinery*). The MSc Logic is an interdisciplinary programme educating students in the research area of Logic, Language and Information. For this area, no such framework exists. To nevertheless provide a point of reference, in this appendix we first briefly outline the research area of Logic, Language and Information and then present a number of Master's programmes from around the world that each cover a significant part of this area.

A.1 Logic, Language and Information

John Stuart Mill called logic the art and science of reasoning. To fully appreciate the scope of this definition, we have to consider the immense variety of contexts in which reasoning can play a role.

The origins of the study of logic can be found in philosophy. To convince an opponent of the validity of one's arguments during a philosophical debate, one needs to develop a clear understanding of the structure of arguments and also of the notion of validity itself. That is, one is naturally driven towards formalising the process of argumentation, so as to be able to make unambiguous statements about what is true and what conclusions can be inferred from certain premises. One is also naturally driven towards examining the language in which people express their arguments more closely, and eventually towards studying the structure of well-formed discourse and the meaning of its constituents. That is, logic plays a central role in many parts of philosophy, and particularly in the study of natural language and thought.

In the late 19th century, logic started getting new applications, outside of philosophy. As mathematicians were digging deeper into the foundations of mathematics, they found logic to be the appropriate tool to represent and reason about the body of mathematical knowledge they were examining. In a similar manner as philosophers had wanted to understand how a certain conclusion logically follows from a set of premises in the context of a philosophical debate, mathematicians now were seeking to clarify what theorems logically follow from which basic axioms. In the process, the tools and techniques of logic were further sharpened and diversified. Around the middle of the 20th century logic then played a central role in the creation of the new discipline of computer science (and a little later of artificial intelligence), and logic has maintained its position at the foundational core of computer science to this day.

Logic thus occupies a unique position at the interface of the humanities and the sciences. Besides its intense contacts with philosophy, theoretical and computational linguistics, math-

ematics, computer science, and artificial intelligence, in recent years logic has also interacted heavily with other fields. Prime examples include cognitive science and mathematical economics. Cognitive science, for instance, has been concerned with the description of everyday human reasoning (as opposed to the idealised forms of reasoning common in argumentation theory), while in mathematical economics logic has been applied to the study of the epistemic foundations of game theory.

Today, logic is studied in many different parts of the university. A professor of logic in a philosophy department might specialise in argumentation theory or in formal epistemology; a professor of logic in a mathematics department might be a set theorist or a proof theorist; a professor of logic in a computer science department might do research on the semantics of programming languages or in the area of knowledge representation for artificial intelligence; and a professor of logic may also be found in a linguistics department, working on the formal semantics and pragmatics of natural language. Some of these professors will see their field of research as being strictly included in the larger discipline represented by the department they work in. Others will emphasise the common interests that cut across the institutionalised disciplines.

It is this latter view that epitomises the field of Logic, Language and Information: the interdisciplinary study of all aspects of information, particularly languages (both natural and artificial) as carriers of information, in a manner that emphasises the use of logic and formal methods more generally, but without being restricted to their use.

While few universities can muster the capacity to offer a broad taught programme in this field, the significance of the research tradition in Logic, Language and Information is nevertheless widely accepted, both in academia and—to the extent to which such a thing is possible—also in society at large. Indeed, an often-told anecdote amongst those working in the field is the story of how the list of “the 20 most influential scientists, thinkers and inventors” of the 20th century published by *Time Magazine* in March 1999 included no fewer than three logicians: the logician and mathematician Kurt Gödel, the logician and computer scientist Alan Turing, and the logician and philosopher Ludwig Wittgenstein. All three of these intellectual giants are perfect examples for the open-minded approach to research that characterises the field of Logic, Language and Information, bridging the humanities and the sciences, and emphasising the use of formal methods.

Another indicator for the significance of the field is the fact that it is well represented in university education above the Master’s level. For instance, each year the European Summer School in Logic, Language and Information (ESSLLI) attracts hundreds of participants (most of them PhD students) from all over the world, and there are smaller but equally successful initiatives of a similar kind in both North America and Asia. ESSLLI is organised by a professional society, the Association for Logic, Language and Information (FoLLI), devoted to the advancement of the field. Finally, there is also a journal, the *Journal of Logic, Language and Information*, specifically dedicated to the publication of work in the field, although research in Logic, Language and Information is in fact published in a wide range of journals (and other publication outlets) across the humanities and the sciences, appropriately reflecting the nature and ambition of the field.

A.2 Related Master’s Programmes

The MSc Logic is the only Master’s programme in Logic, Language and Information in the Netherlands. However, internationally there is a small number of other programmes that also cover significant parts of the field. Below we list some of the best known representatives of this

group. This list is not intended to be exhaustive; rather we want to demonstrate the variety of (often very good) programmes that serve the area.

A.2.1 Athens: Logic, Algorithms and Computation

The University of Athens has been offering its Graduate Programme in Logic, Algorithms and Computation since 1997. This is a joint effort of the Departments of Mathematics, of Informatics, and of Methodology, History and Theory of Science. The programme website (<http://mpla.math.uoa.gr/>) characterises the field as follows:

“[The programme serves] a dynamic area of research and teaching, grounded in mathematics, logic and computer science and (conversely) providing mathematical foundations and applications to all three. The methodology of the field is mathematical (rigorous formulation, construction, proof, application), but many of its problems stem from computer science and solutions are often based on ideas and concepts from logic.”

That is, this long-standing programme focuses on the interplay of logic and theoretical computer science, and specifically on the notion of algorithm.

A.2.2 Barcelona: Pure & Applied Logic / Cognitive Science & Language

The universities in and around Barcelona together boast a rich research community in Logic, Language and Information. They offer two Master’s programmes that each cater for an important aspect of the field. The first is the Master’s programme in Pure and Applied Logic (<http://www.ub.edu/masterlogic/>) offered jointly by the University of Barcelona and the Technical University of Catalonia. It focuses specifically on the mathematical and computational aspects of the field:

“This Master aims to provide a thorough grounding in all aspects of advanced logic, both pure and applied. [...] [This includes] Algebraic Logic, Computational Complexity, History of Logic, Logical Foundations of Artificial Intelligence, Model Theory, Non-Classical Logics, Philosophy of Logic and of Mathematics, Proof Theory and Set Theory.”

The language aspect, particularly its connection to cognition, is served by the inter-university postgraduate programme in Cognitive Science and Language (<http://www.ub.edu/ccil/>), coordinated by the University of Barcelona:

“This Master’s degree is designed to introduce students to interdisciplinary research on language and cognition. As an inter-university programme, it consists of a wide academic platform formed by lecturers and researchers in cognitive science from five Catalan universities. The work carried out by the researchers focuses on a variety of aspects related to natural language, such as its computational processing, its psychological and neurological bases, and its grammar and philosophy.”

A.2.3 Budapest: Logic and Theory of Science

Launched in 2010, the Master’s programme in Logic and Theory of Science offered by the Department of Logic at Eötvös Loránd University in Budapest covers a broad array of topics ranging from mathematical logic to philosophy of science. Its website (<http://phil.elte.hu/logic/ma.html>) describes the programme as follows:

“The programme focuses on logic and its applications in the philosophy of science, particularly in the foundations of mathematics, physics, linguistics, and the social sciences. Beyond a few core courses and a joint four-semester seminar series, providing a kind of common background to all students, we offer the following four optional modules: Logic and the Philosophy of Mathematics, Foundations of Physics, Logic in Linguistics and Models in the Social Sciences.”

A.2.4 Carnegie Mellon: Logic, Computation and Methodology

The Department of Philosophy at Carnegie Mellon University in Pittsburgh offers a Master’s programme in Logic, Computation and Methodology (<http://www.hss.cmu.edu/philosophy/graduate-ms.php>):

“[This programme is intended] for students who are looking to enhance their training in selected areas of Formal Philosophy, in order either to pursue a vocation outside academe, e.g. designing expert systems for consulting firms that specialize in AI methods, or to prepare for further graduate study in Analytic Philosophy, Cognitive Psychology, Computer Science, Mathematics, or Statistics.”

This is a strong as well as broad programme covering many aspects of Logic, Language and Information. Of particular interest are its offerings around the topics of rational decision making and epistemology.

A.2.5 Dresden: Computational Logic

The International Center for Computational Logic (ICCL) at the Technical University of Dresden has been offering its International Master’s programme in Computational Logic since 1997. The goals of the programme are described on its website (<http://www.computational-logic.org>) as follows:

“Based on a solid background in mathematical logic and its subareas [...], a student [...] will learn the engineering aspects of Computational Logic: how does a deductive system operate, what kind of logic-based grammar can be used to process natural language, how can techniques for the verification of software and hardware be applied in industry, what kind of implementation techniques are needed for logic-based systems, what formal methods are required for computer integrated manufacturing, how to apply formal methods for the layout of blueprints for machines and processes, and what problems occur in such applications.”

The programme has been very successful and has been instrumental in creating a European Master’s programme in Computational Logic (<http://www.emcl-study.eu>) in which the ICCL cooperates with similar groups at the Free University of Bozen-Bolzano, the Technical University of Vienna, and the Universidade Nova de Lisboa.

A.2.6 King’s College London: Language and Cognition

The Department of Philosophy at King’s College London is offering a one-year MA programme in Language and Cognition (<http://www.kcl.ac.uk/prospectus/graduate/index/name/language-and-cognition/>), which is described as follows:

“The degree focuses on issues at the interface of Philosophy of Language, Cognitive Science, Philosophy of Mind, Philosophy of Psychology, Formal and Computational Linguistics, and Logic. It offers a choice of modules in these areas, in conjunction with two core modules in the Theory of Grammar, and the Theory of Meaning.”

This is a new programme, but the same group previously offered a small but highly respected Master’s programme in Computational Linguistics and Formal Grammar.

A.2.7 Manchester: Pure Mathematics and Mathematical Logic

The Department of Mathematics at the University of Manchester is offering a one-year programme leading to the degree of MSc in Pure Mathematics and Mathematical Logic (<http://www.maths.manchester.ac.uk/postgraduate/pgadmission/msc-pure-logic.html>). Its stated aims are the following:

“The aims of the programme are to provide training in a range of topics related to pure mathematics and mathematical logic, to encourage a sophisticated and critical approach to mathematics, and to prepare students who have the ability and desire to follow careers as professional mathematicians and logicians in industry or research. This programme is also suitable as a preparation for [the] PhD programmes in pure mathematics and in mathematical logic [at Manchester].”

This programme is the result of a merger between the department’s MSc in Pure Mathematics and its well-known MSc in Mathematical Logic and the Theory of Computation.

A.2.8 Munich: Logic and Philosophy of Science

In 2012 the Munich Center for Mathematical Philosophy (MCMP) at Ludwig Maximilian University launched a new Master’s programme in Logic and Philosophy of Science (<http://www.mcmp.philosophie.uni-muenchen.de/students/ma/>):

“The MCMP [...] offers a lively environment to study logic and philosophy of science [...] it covers all areas of philosophy, and it has a strong interdisciplinary orientation towards areas such as physics, neuroscience, mathematics, statistics, linguistics, computer science, and more.”

While this Master’s programme has not yet produced any graduates, it is widely expected to soon become an important player in the field. It is coordinated by a PhD graduate of the ILLC (Dr. Olivier Roy).

A.2.9 Paris: Logic, Philosophy of Science and Epistemology

Paris offers several opportunities to study logic, at different levels and with different specialisations. A programme of particular relevance is the *LoPhiSC* Master’s programme in Logic, Philosophy of Science and Epistemology (<http://www.lophisc.org>), which is offered jointly by Paris 1 and Paris 4:

“Its objective is to provide a fundamental education of high standards that is both balanced and open, in the areas of philosophy of science, of logic, and of epistemology.” [*our translation*]

A.2.10 Wellington: Logic and Computation

The Centre for Logic, Language and Computation (<http://www.cllic.vuw.ac.nz/>) at Victoria University of Wellington, established in 2001, offers a number of options for studying logic at both the undergraduate and the postgraduate level. The most comprehensive of these is its Master's programme in Logic and Computation:

“The aim of this programme is to provide students with a solid grasp of the major concepts and methods of Logic and their use in aspects of Computer Science, Mathematics and Philosophy.”

APPENDIX B

CURRICULUM OVERVIEW

On the following page you will find a high-level diagrammatic overview of the curriculum of the MSc Logic. The curriculum is described in Section 2.1.1.

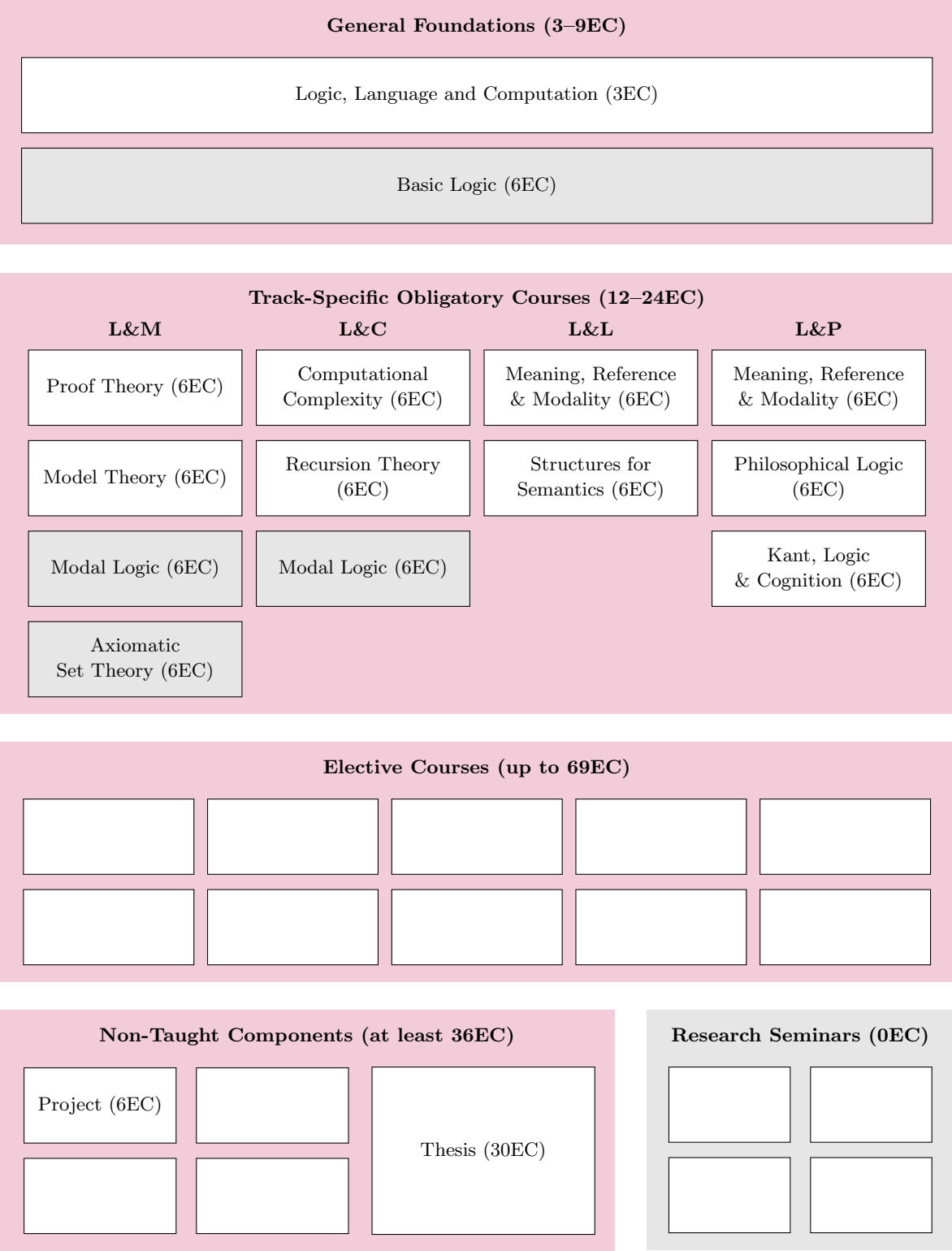


Figure B.1: Diagrammatic overview of the curriculum

APPENDIX C

CURRICULUM COMPONENTS

In this appendix we describe the individual components of the curriculum of the MSc Logic. These are the obligatory and elective courses, the research projects and seminars, and the thesis. For each component we list the general learning outcomes the component is contributing to (see Section 1.1 for the meaning of the abbreviations used), the specific objectives of the component, a brief outline of the technical content of the component, the teaching methods used, the form of assessment employed, the mandatory and recommended literature (where applicable), the name of the teacher(s), and the number of credit points awarded.

This information is based on the UvA's online *Study Guide* (available at <http://studiegids.uva.nl/>). We use the academic year of 2012/13 as our point of reference.

C.1 Obligatory Courses

In this section we list all taught courses that are obligatory for at least *some* of the students. Only *Logic, Language and Computation* is obligatory for all students (see Section 2.1.1).

C.1.1 Logic, Language and Computation

Learning outcomes:	S3, IM
Teaching methods:	Lectures; one-to-one research meetings
Assessment:	Summaries of guest lectures; reports on research meetings
Teacher:	Ulle Endriss (coordinator)
Credit points:	3 EC

Objectives: This course is the central obligatory course of the programme, running throughout the first semester. It is the time and place to meet for all MSc Logic students. The course provides an overview of the areas of research that the ILLC is involved in.

Content: The course consists of a series of guest lectures introducing some of the areas of research that members of the ILLC are involved in. Additionally, as part of this course, each student will have an individual research meeting with a senior member of staff of the ILLC and with a PhD student working at the ILLC.

C.1.2 Basic Logic

Learning outcomes:	K1
Teaching methods:	Lectures; tutorials
Assessment:	Homework; take-home exams
Teacher:	Frank Veltman
Credit points:	6 EC

Objectives: The purpose of this course is to introduce and train students in the basic proof-theoretic and model-theoretic techniques used in mathematical logic.

Content: The focus is on classical propositional and predicate logic, but every now and then some excursion is made to intuitionistic and many-valued logics.

Literature: Lecture notes.

C.1.3 Axiomatic Set Theory

Learning outcomes:	K1
Teaching methods:	Lectures; tutorials
Assessment:	Homework; take-home exam
Teacher:	Benedikt Löwe
Credit points:	6 EC

Objectives: Understanding of the connections between logic and set theory, in particular the axiomatic approach. Skillful handling of ordinals and cardinals, in particular the methods of transfinite induction and recursion.

Content: Axioms of set theory, set theory as a foundation of mathematics, ordinal numbers, cardinal numbers, the axiom of choice. Time permitting, additional topics are covered, such as set theory of the reals, descriptive set theory, and large cardinals.

Literature: K. Devlin. *The Joy of Sets: Fundamentals of Contemporary Set Theory* (2nd edition). Springer-Verlag, 1993.

C.1.4 Computational Complexity

Learning outcomes:	K1, K2
Teaching methods:	Lectures; tutorials
Assessment:	Homework; written exam
Teacher:	Harry Buhrman
Credit points:	6 EC

Objectives: To familiarise students with basic and advanced concepts in the theory of computational complexity.

Content: Complexity theory deals with the fundamental question of how many resources, such as time, memory, communication, randomness etc., are needed to perform a computational task. A fundamental open problem in the area is the well-known P versus NP problem, one of the Clay Millennium problems. In this course we will treat the basics of complexity theory, NP-completeness, diagonalisation, Boolean circuits, randomised computation, interactive proofs, cryptography, quantum computing, and circuit lower bounds.

Literature: S. Arora and B. Barak. *Computational Complexity: A Modern Approach*. Cambridge University Press, 2009.

C.1.5 Introduction to Modal Logic

Learning outcomes:	K1
Teaching methods:	Lectures; tutorials
Assessment:	Homework; take-home exams
Teacher:	Alexandru Baltag
Credit points:	6 EC

Objectives: To understand the basic techniques of modal logic and its most important applications.

Content: The course covers the basic notions of modal logic: syntax, relational semantics, models and frames, bisimulations, model-theoretic and frame-theoretic constructions, completeness. More advanced topics include expressive power and intelligent agency.

Literature: P. Blackburn, M de Rijke and Y. Venema. *Modal Logic*. Cambridge University Press, 2002. Also parts of: J. van Benthem. *Modal Logic for Open Minds*. CSLI Publications, Stanford, 2010.

C.1.6 Kant, Logic and Cognition

Learning outcomes:	K1, K2, S5, IM
Teaching methods:	Lectures; seminars
Assessment:	Participation in online discussion forum; final paper
Teacher:	Michiel van Lambalgen
Credit points:	6 EC

Objectives: It is a common belief among logicians that Kant's discussion of logic in his *Critique of Pure Reason* has little to offer to modern practitioners, since it appears to assume that all judgements are given in subject-predicate form. Indeed, Kant explicitly writes that Aristotelian logic comprises all there is to say about formal logic. By contrast, modern predicate logic is concerned with relations and quantifier combinations, of which Aristotelian logic is only a minute part. The aim of this course is to challenge the received view.

Content: The groundwork for a revisionist view of Kant's logic has been laid by Béatrice Longuenesse's book *Kant and the Capacity to Judge* (1998). Here it is argued that Kant's 'transcendental logic' is a vast attempt to explain the validity of formal logic for all reasoning. To use Longuenesse's slogan: Kant was concerned with the question 'what must synthesis be like for analysis to be possible?' This observation provides the starting point for an investigation into the formal aspects of transcendental logic, which will be seen to be highly relevant to modern concerns with the justification of logic. In so doing we will see how Kant's concept of 'necessary knowledge' is still relevant to the study of cognition. We specifically will focus on Kant's logic and its semantics and show that Kant's logic is really what is nowadays called 'geometric logic'.

Literature: Kant's *Critique of Pure Reason* (Cambridge edition) as well as B. Longuenesse. *Kant and the Capacity to Judge*. Princeton University Press, 1998.

C.1.7 Meaning, Reference and Modality

Learning outcomes:	K1
Teaching methods:	Lectures; seminars
Assessment:	Take-home exams
Teacher:	Paul Dekker
Credit points:	6 EC

Objectives: To acquire a working knowledge of the history, background, and current issues in semantic and pragmatic debates concerning Meaning, Reference and Modality.

Content: In this course classical intensional semantics and dynamic semantics are approached from a philosophical-logical perspective. The philosophical backgrounds of the two paradigms are studied as well as their logical formulation. We will study classical texts on intensionality from Frege, Lewis, Stalnaker and Kripke, and zoom in on long-standing issues such as sense and reference; naming, identity and necessity; beliefs *de dicto*, *de re*, and *de se*; speaker's reference and semantic reference; context and context change; modality and discourse.

Literature: L.T.F Gamut. *Logic, Language and Meaning II: Intensional Logic and Logical Grammar*. The University of Chicago Press, 1991; as well as original research papers.

C.1.8 Model Theory

Learning outcomes:	K1
Teaching methods:	Lectures; tutorials
Assessment:	Homework; written exam
Teacher:	Yde Venema
Credit points:	6 EC

Objectives: To understand some of the key tools, techniques and results of model theory.

Content: In this course we will give a general introduction to the methods and results of classical model theory including games, compactness, the Löwenheim-Skolem theorems, and various preservation theorems, illustrated by examples and applications in algebra and discrete mathematics. Various model-theoretic techniques for constructing models will be introduced and applied, such as unions of elementary chains, omitting-types constructions, ultraproducts and saturated models.

Literature: W. Hodges. *A Shorter Model Theory*. Cambridge University Press, 1997.

C.1.9 Philosophical Logic

Learning outcomes:	K1, S3, S4, S5
Teaching methods:	Lectures; tutorials
Assessment:	Homework; group project; student presentations; final paper
Teacher:	Frank Veltman
Credit points:	6 EC

Objectives: To learn how to build and evaluate logical theories.

Content: The course covers three modelling techniques, headed under the titles 'Partiality', 'Intensionality', and 'Dynamics'. Each of these techniques is illustrated with a number of

examples. The topics dealt with include modalities, (counterfactual) conditionals, the liar paradox, vagueness, imperatives, default reasoning, and intensional verbs. The course ends with some methodological reflections, touching on issues such as the justification of logical theories and logical pluralism.

Literature: Handouts and original research papers.

C.1.10 Proof Theory

Learning outcomes:	K1, S5
Teaching methods:	Lectures; tutorials
Assessment:	Homework; written exam; project
Teacher:	Alessandra Palmigiano
Credit points:	6 EC

Objectives: To develop a working knowledge of the basic notions in proof theory.

Content: The course will cover the Lambda calculus, natural deduction systems, Gentzen systems, and cut elimination.

Literature: A.S. Troelstra and H. Schwichtenberg. *Basic Proof Theory* (2nd edition). Cambridge University Press, 2000.

C.1.11 Recursion Theory

Learning outcomes:	K1
Teaching methods:	Lectures; tutorials
Assessment:	Homework; written exam
Teacher:	Piet Rodenburg
Credit points:	6 EC

Objectives: To understand the key concepts and some basic methods of modern recursion theory.

Content: This course will cover the basics of recursion theory: the notion of algorithm and its formalisation, as well as limitative theorems. It will discuss the connections between recursion theory and the foundations of mathematics (Gödel's Incompleteness Theorem). After that, Turing degrees and the arithmetical hierarchy will be introduced.

Literature: Lecture notes and a draft version of R.I. Soare's *Computability Theory and Applications*.

C.1.12 Structures for Semantics

Learning outcomes:	K1
Teaching methods:	Lectures; tutorials
Assessment:	Take-home exams; written exam; final paper
Teacher:	Maria Aloni
Credit points:	6 EC

Objectives: To gain a working knowledge of the logical and mathematical techniques employed in formal semantics.

Content: We will study mathematical techniques that are used in formal semantics to model natural language meanings. We will discuss, among others, type theory, the lambda calculus, generalised quantifiers, intensional logic, partial orders, and lattices. In all cases we will motivate the techniques from a semantic point of view and discuss linguistic applications of the tools.

Literature: L.T.F Gamut. *Logic, Language and Meaning II: Intensional Logic and Logical Grammar*. The University of Chicago Press, 1991; as well as original research papers.

C.2 Elective Courses

In this section we list the taught courses offered as electives. Some of these courses are offered jointly with other programmes (such as the *MSc Brain and Cognitive Sciences* or the *MSc Artificial Intelligence*). All courses listed above as obligatory courses are also available as electives to those students for whom they do not form part of their fixed obligatory programme. Importantly, the list of elective courses is subject to regular changes (with around 10–15% of the courses being replaced by new courses each year).

C.2.1 Advanced Strategic Game Theory

Learning outcomes:	K1, K2
Teaching methods:	Lectures
Assessment:	Homework; written exams
Teacher:	Krzysztof Apt
Credit points:	6 EC

Objectives: To introduce the main concepts concerned with strategic games (sometimes called non-cooperative games) and illustrate them by an analysis of various example games.

Content: Strategic games deal with the analysis of interaction between rational players, where rationality is understood as utility maximisation. In strategic games the players take their actions simultaneously and the utility (payoff) for each player depends on the resulting joint action. The course will introduce the basic concepts, such as pure and mixed strategies, best response, Nash equilibrium, strictly and weakly dominated strategies, Pareto efficient outcome, rationalisability, pre-Bayesian games, and Bayesian games. Other forms of equilibria will also be studied. We shall discuss well-known examples such as the prisoner's dilemma, beauty contest games, and the tragedy of the commons. Also, we shall use the introduced concepts to analyse some well-known examples of strategic games studied in economics: Cournot competition, Bertrand competition and location games. Other classes of games will include congestion games and social network games. Finally, we shall consider mechanism design, the aim of which is to arrange the economic interactions in such a way that when everyone behaves in a self-interested manner, the result is satisfactory for everybody.

Literature: Lecture notes, book chapters, and original research papers.

C.2.2 Capita Selecta: Modal Logic, Algebra, Coalgebra

Learning outcomes:	K2
Teaching methods:	Lectures; tutorials
Assessment:	Homework; written exam
Teacher:	Yde Venema
Credit points:	6 EC

Objectives: To provide an overview of some important advanced methods and techniques in modal logic.

Content: Modal languages are simple yet expressive and flexible tools for describing all kinds of relational structures. Thus modal logic finds applications in many disciplines such as computer science, mathematics, linguistics or economics. Notwithstanding this enormous diversity in appearance and application area, modal logics have a great number of properties in common. Aspects of this common mathematical backbone form the topic of this course. This year, the course will be devoted entirely to connections between modal fixpoint logic and automata theory. This is a classic field in theoretical computer science, which has led to both seminal theoretical results such as Rabin's decidability theorem, and practical applications in the field of specification and verification of software. More specifically, a large part of the course will focus on the modal mu-calculus, an extension of modal logic with fixpoint operators, which was introduced in the early 1980s. The modal mu-calculus shares many attractive properties with ordinary modal logic, but has a much bigger expressive power. A main theme of the course will be the use of automata-theoretic tools to understand and prove results about the modal mu-calculus.

Literature: Lecture notes.

C.2.3 Cognitive Models of Language and Music

Learning outcomes:	K2, S5, IM
Teaching methods:	Lectures; seminars
Assessment:	Homework; student presentations; final paper
Teacher:	Rens Bod and Aline Honingh
Credit points:	6 EC

Objectives: At the end of this course you should be able to have an overview of state-of-the-art cognitive models of language and music processing and acquisition; to understand the differences and commonalities between language and music processing; to critically discuss and analyse cognitive models of language and music from the literature; and to understand the interrelations between cognitive models of language and music.

Content: This course will give an up-to-date overview of cognitive models of language and music processing and acquisition, their commonalities and differences. Topics will include construction grammars, connectionist linguistics, item-based language acquisition, usage-based linguistics, and data-oriented/exemplar-based linguistics. We will also deal with some applications of these frameworks for modelling other cognitive modalities, in particular music. We will point out the most striking commonalities between language and music, especially with respect to phrase perception, and discuss what cognitive models can tell us about underlying processing mechanisms for different modalities. Topics on music will include cognitive models

of musical structure, cognitive models of tonality and their applications, cognitive models of rhythm, and cognitive models of music similarity.

Literature: Original research papers.

C.2.4 Cooperative Games

Learning outcomes:	K1, K2, S5
Teaching methods:	Lectures
Assessment:	Homework; student presentations; final paper
Teacher:	Olivier Cailloux
Credit points:	3 EC

Objectives: To introduce the basic concepts of cooperative game theory.

Content: The goal of this course is to introduce cooperative games, a branch of game theory. We will start the course by focusing on games with transferable utility (TU games) and we will introduce some of the most important solution concepts: the core, the bargaining set, the nucleolus, the kernel, and the Shapley value. We will introduce each concept and study its properties. We will also study voting games, a special type of TU games, and. games that do not allow transfer of utility (NTU games).

Literature: Lecture notes.

C.2.5 Computational Semantics and Pragmatics

Learning outcomes:	K2, S3, S5, IM
Teaching methods:	Lectures
Assessment:	Homework; student presentations
Teacher:	Raquel Fernández
Credit points:	6 EC

Objectives: The overall objective of the course is to introduce some of the major topics and methodologies in the study of natural language semantics and pragmatics, from an empirical and computational point of view.

Content: Semantics and pragmatics are concerned with the study of natural language meaning and its context of use in written texts and in conversation. The computational counterparts of these disciplines address these issues from an explicitly computational point of view, combining insights from linguistic theory, computational linguistics, and artificial intelligence. The course will introduce some of the fundamental concepts in contemporary computational semantics and pragmatics, exposing students to current research in topics such as distributional lexical semantics, generation and resolution of referring expressions, speech acts, and dialogue modelling. Students will also get acquainted with current methodologies and techniques, such as working with annotated and unannotated corpora, and with rule-based and statistical methods.

Literature: Original research papers.

C.2.6 Computational Social Choice

Learning outcomes:	K2, S3, IM
Teaching methods:	Lectures
Assessment:	Homework
Teacher:	Ulle Endriss
Credit points:	6 EC

Objectives: To introduce some of the fundamental concepts in social choice theory and related disciplines, and to expose students to current research at the interface of social choice theory with logic and computation.

Content: Social choice theory is the study of mechanisms for collective decision making, such as election systems or protocols for fairly dividing a set of goods, and computational social choice addresses problems at the interface of social choice theory with computer science. This course provides a thorough introduction to both classical social choice theory and computational social choice, so as to enable students to conduct independent research in this field. Topics covered include voting theory, preference aggregation, judgment aggregation, fair division, matching theory, and mechanism design. The formal and computational techniques used include the axiomatic method, complexity-theoretic analysis, algorithm design, logical modelling, game-theoretic analysis, and the use of concepts from the field of knowledge representation.

Literature: Survey articles and original research papers.

C.2.7 Concurrency Theory

Learning outcomes:	K1, K2
Teaching methods:	Lectures; tutorials; computer labs
Assessment:	Homework; written exam
Teacher:	Alban Ponse
Credit points:	6 EC

Objectives: Learning about algebraic methods in the field of concurrency or grid theory: specification languages, modelling of processes, and distributed algorithms.

Content: Elementary process algebra, program algebra and thread algebra. Process algebra is an algebraic approach suitable for the specification and analysis of parallel, communicating systems: (concurrent) behavior can be expressed in process expressions and is subject to forms of algebraic reasoning, e.g., one can either prove or falsify that the implementation of a concurrent system satisfies after abstraction its specification. We will analyse a distributed algorithm (e.g., a leader election protocol). In program algebra (contrary to process algebra) one considers aspects of the form of programs that are not preserved after abstraction to behavior, such as programs with go-to instructions. This is meaningful in the study of program transformations that occur, for instance, in programming languages with multi-threading. Finally, we shortly consider thread algebra as a natural semantics for program algebra.

Literature: Original research papers.

C.2.8 Elements of Language Processing and Learning

Learning outcomes:	K1
Teaching methods:	Lectures; computer labs
Assessment:	Written exam; programming project
Teacher:	Khalil Sima'an
Credit points:	3 EC

Objectives: This course aims at providing the student with the background that is needed for studying the main statistical models that are used in the field of Computational Linguistics.

Content: We will depart from shallow labelling tasks and consider only tasks that involve hierarchical structure (e.g., syntactic trees) and/or hidden structure (alignment of words and their translations in machine translation). For these tasks the course will concentrate on nonparametric models and cover the fundamentals of probabilistic modelling and statistical learning from data by supervised and unsupervised statistical learning algorithms.

Literature: C.D. Manning and H. Schütze. *Foundations of Statistical Natural Language Processing*. MIT Press, 1999. Also: original research papers.

C.2.9 Formal Learning Theory

Learning outcomes:	K1, K2
Teaching methods:	Lectures; tutorials
Assessment:	Homework; written exam
Teacher:	Nina Gierasimczuk and Dick de Jongh
Credit points:	6 EC

Objectives: To acquire basic knowledge of formal learning theory and its relation with dynamic epistemic logic and belief revision.

Content: An introduction to formal learning theory starting with the notion of identification in the limit (E.M. Gold, Language Identification in the Limit, *Information and Control*, 1967) with its many variations (Jain, Osherson, Royer and Sharma, *Systems that Learn*, MIT Press, 1999). We concentrate on the approach of Angluin and Smith (Inductive Inference: Theory and Methods, *ACM Computing Surveys*, 1983). There will be a short introduction to Belief Revision Theory (Alchourrón, Gärdenfors and Makinson, On the Logic of Theory Change, Partial meet Contraction and Revision Functions, *Journal of Symbolic Logic*, 1985) and dynamic epistemic and doxastic logic (e.g., Van Ditmarsch, Van der Hoek and Kooi, *Dynamic Epistemic Logic*, Springer-Verlag, 2007; Van Benthem, Dynamic Logic for Belief Revision, *Journal for Applied Non-Classical Logics*, 2007). Links between the above areas in recent work by Martin, Osherson, Kelly, Smets, Baltag will then be discussed as in the thesis of N. Gierasimczuk, *Knowing One's Limits. Logical Analysis of Inductive Inference*, ILLC, 2010.

Literature: See above.

C.2.10 Introduction to Modern Cryptography

Learning outcomes:	K1, K2, S5
Teaching methods:	Lectures, tutorials
Assessment:	Homework; student presentations
Teacher:	Christian Schaffner
Credit points:	6 EC

Objectives: To provide an introduction to modern cryptography.

Content: Cryptography has a very long and exciting history. For centuries, political leaders and military forces have used cryptographic techniques, primarily to communicate securely. Modern cryptography is concerned with an enormous variety of scenarios where the involved parties do not fully trust each other such as Internet banking, electronic voting, integrity of data, security of computer networks and many more. This course offers an introduction to this fascinating subject. After a quick treatment of historic cryptographic schemes, we will set out the formal definitions to be able to investigate perfectly-secret and computationally-secure encryption, pseudorandomness, hash functions, and message authentication codes and block ciphers. While these primitives are referred to as symmetric-key primitives (because the involved parties use the same keys), another important class are public-key (or asymmetric) primitives which allow for public-key encryption and digital signatures. The most well-known example is the widely used RSA system. If time allows, we will cover more advanced cryptographic notions such as secret sharing, bit commitment, zero knowledge and multi-party computation. In recent years, cryptography has been transformed from an *ad hoc* collection of mysterious tricks into a rigorous science based on firm mathematical grounds. Our treatment will therefore be rather formal and precise in the mathematical definitions. This is NOT a course in computer security. You will not learn how to break or hack systems. We will not teach you “how to secure your system”; cryptography is only one aspect of security.

Literature: J. Katz and Y. Lindell. *Introduction to Modern Cryptography*. Chapman and Hall, 2008.

C.2.11 Kolmogorov Complexity

Learning outcomes:	K1, K2
Teaching methods:	Lectures
Assessment:	Take-home exam
Teacher:	Leen Torenvliet
Credit points:	6 EC

Objectives: To learn to use the “Kolmogorov method” (randomness of individual objects) in proof methods and analysis of problems.

Content: This course is a general course on Kolmogorov complexity and many of its applications. Kolmogorov complexity is a modern theory of information and randomness. The course teaches the students the basic concepts of Kolmogorov complexity and how to use this tool in their own research. Topics include: plain Kolmogorov complexity, randomness, prefix Kolmogorov complexity, incompressibility method, information distance, applications in various fields ranging from average-case analysis of algorithms to bioinformatics and from document comparison to Internet search, prefix complexity, universal distribution (Solomonoff-Levin), Solomonoff prediction, and minimum description length (MDL) hypothesis selection. We will

not be able to cover the complete textbook, rather we will focus more on recent developments and especially on applications of Kolmogorov complexity.

Literature: M. Li and P. Vitányi. *Introduction to Kolmogorov Complexity and Its Applications* (3rd edition). Springer-Verlag, 2008.

C.2.12 Language and Games

Learning outcomes:	K1, K2, S4, S5, IM
Teaching methods:	Lectures
Assessment:	Homework; project paper
Teacher:	Michael Franke and Elliott Wagner
Credit points:	12 EC

Objectives: The aim of this course is to familiarise students with the basics of (classical and evolutionary) game theory and its applications in questions pertaining to the nature and use of language.

Content: Linguistic behavior is frequently likened to a game that interlocutors play, with implicit rules governing what counts of conventionally proper behavior, i.e., what can and ought to be said and inferred in particular situations. This course takes this comparison seriously. After covering the basics of game theory, both classical and evolutionary, the course will discuss a number of different ways in which game theory can be used to explain linguistic phenomena, such as the evolution of meaning, strategic language use, persuasion, and implicatures.

Literature: Lecture notes and original research papers.

C.2.13 Language and Optimality

Learning outcomes:	K2, S5, IM
Teaching methods:	Lectures; seminars
Assessment:	Homework; written exam; final paper
Teacher:	Reinhard Blutner and Henk Zeevat
Credit points:	6 EC

Objectives: At the end of this course the student has acquired the technical skills to read formalised material in the Optimality Theory (OT) literature as well as the theoretical know-how to construct advanced OT systems. Further, the course should enable the student to see the close connections between symbolic/non-symbolic AI, cognitive psychology, linguistics, and philosophy of mind.

Content: The course provides an overview of the main empirical background and the important techniques of optimality theoretic linguistics. In the first part a concise introduction into the basics of optimality theory (OT) is given including probabilistic variants of the standard theory. It is demonstrated that OT is not only restricted to the area of phonology but has important applications in syntax, semantics and pragmatics as well. In the second part we will discuss actual research topics such as OT pragmatics, OT syntax, bidirectional OT and its relation to (evolutionary) game theory, applications to language acquisition, language change and language evolution, computational aspects of OT, the relation between stochastic OT and other probabilistic models of language, OT and connectionism, non-linguistic topics: OT in music theory, ethics, and Greek poetical metre.

Literature: Original research papers.

C.2.14 Logic and Conversation

Learning outcomes:	K2, S3
Teaching methods:	Lectures
Assessment:	Homework
Teacher:	Jeroen Groenendijk and Floris Roelofsen
Credit points:	6 EC

Objectives: To get a working knowledge of contemporary methods and insights in the logical-philosophical analysis of discourse.

Content: The theme of the course is the interplay between semantics and pragmatics in the interpretation of natural language discourse, and the role of logic in formulating semantic and pragmatic theories. Traditionally, logic is concerned with the characterization of valid reasoning and argumentation, and therefore focuses on informative content, defined in terms of truth conditions. When analyzing discourse, however, other notions become of interest as well. For instance, besides informative content, inquisitive content also plays a crucial role, and besides entailment/validity, logical notions of relatedness and relevance take center stage.

Literature: Original research papers, book chapters.

C.2.15 Logic, Knowledge and Science

Learning outcomes:	K2, IM
Teaching methods:	Lectures
Assessment:	Homework
Teacher:	Sonja Smets
Credit points:	6 EC

Objectives: Students obtain an overview of a number of current debates in formal epistemology and in the philosophy of the natural sciences. They learn to discuss the foundational issues and their philosophical implications.

Content: In this course we use formal tools coming from logic, probability theory and game theory to study a number of important themes in epistemology and the philosophy of the natural sciences. We will cover a variety of topics: the nature of knowledge and its relation to belief change; knowledge in empirical science and theory change; truth tracking and scientific inquiry; logical accounts of information, evidence and justification; truth-approximation theory (verisimilitude); formal accounts of causality; chance versus probability in nature; the epistemological consequences of quantum theory; and paradoxes such as the Sleeping Beauty Problem, Monty Hall, Fitch Paradox, the Lottery Paradox, and the EPR Paradox.

Literature: Original research papers, book chapters, handouts.

C.2.16 Machine Learning: Principles and Methods

Learning outcomes:	K2, S5
Teaching methods:	Lectures; tutorials
Assessment:	Written exams; project; student presentations
Teacher:	Maarten van Someren
Credit points:	6 EC

Objectives: To provide an overview of machine learning methods and models of inductive learning.

Content: The course will consist of three components: (1) a very fast refreshment of machine learning (using a few chapters from Mitchell's book *Machine Learning*) covering decision tree learning, neural networks, instance-based learning, and clustering; (2) theoretical models of machine learning such as Bayesian learning, minimal description length, and bias-variance decomposition; and (3) examples of methods and applications. Emphasis will not be on a collection of algorithms but on explaining why and when learning algorithms work. The course has a theoretical, conceptual flavour.

Literature: T. Mitchell. *Machine Learning*. McGraw Hill, 1997.

C.2.17 Mathematical Structures in Logic

Learning outcomes:	K2
Teaching methods:	Lectures; tutorials
Assessment:	Homework
Teacher:	Alessandra Palmigiano
Credit points:	8 EC

Objectives: This course aims at providing the basic toolbox for understanding and doing research in a field of modern logic. This field links logics with several kinds of mathematical structures (topological spaces, partial orders and more in general relational structures, algebras and categories) via the notion of semantic interpretation.

Content: The scope of the course covers general background on order theory (partial orders, lattices, distributive and complete lattices, Galois connections, formal concept analysis), category theory (categories, functors, natural transformations, Yoneda Lemma, adjoints, Adjoint Functor Theorem, ...), universal algebra (algebraic signatures, homomorphisms, congruences, basic constructions, homomorphism theorems, equational logic, Birkhoff's theorem), general topology (topological spaces, continuous functions, open and closed functions, special classes of points/sets: interior/frontier/closure/accumulation, topologies via closure and interior operators (Kuratowsky axioms), separation axioms, compactness, ...), as well as more advanced themes at the interface between these fields, such as duality theory, coalgebra, Chu spaces, formal topology. Each of these topics will be treated with a special focus on its applications and relevance to logic.

Literature: Selected material from the following books (as well as handouts and lecture notes): B.A. Davey and H.A. Priestley, *Introduction to Lattices and Order*, Cambridge University Press, 2002. S.N. Burris and H.P. Sankappanavar, *A Course in Universal Algebra*, Springer-Verlag, 1981. S. Vickers, *Topology via Logic*, Cambridge University Press, 1996.

Remark: Mathematical Structures in Logic is taught as part of the national MasterMath programme in 2012/13 (therefore worth 8 EC rather than 6 EC).

C.2.18 Music Cognition

Learning outcomes:	K2, S3, S5
Teaching methods:	Lectures; seminars
Assessment:	Summaries; final paper
Teacher:	Henkjan Honing
Credit points:	6 EC

Objectives: To provide insights in the aims, methods and recent results in the field of music cognition.

Content: Why do we have music? Is it a mere cultural phenomenon or is music biologically constrained? And if the latter is the case, is it possible to identify which biological and/or cognitive traits make us musical animals? Most evolutionary scientists agree that music is in fact pointless. “As far as biological cause and effect are concerned, music is useless [...] it is a technology, not an adaption” (Pinker, 1997). This statement—and the reference to music as “auditory cheesecake”, a mere pleasure-generating substance—did not increase Pinker’s popularity among those studying music. Nevertheless, he succeeded well in starting up a discussion under music scholars and cognition scientists on why we have music, and why it could be relevant for cognitive science to study music at all. This course discusses recent developments in the research field of music cognition, such as the role of perception, attention, and memory in music listening, as well as the shaping role of these cognitive mechanisms in the origins of music. Topics include (a) the origins of music, (b) the cognition of rhythm and pitch, (c) musical competence, (d) the similarities and differences between music and language, and (e) the computational modelling of music cognition. The topics might change due to recent developments. All topics are introduced in a one-hour lecture, followed by a seminar in which each week at least two (recent) papers will be discussed. For this the students are asked to bring in issues for a plenary discussion and/or prepare position statements. The course is closed with an essay elaborating on one of the topics that were discussed in the course. Students are expected to be familiar with the main terminology of music and music cognition research. Those unfamiliar with music or the field of music cognition are advised to read: W.F. Thompson *Music, Thought, and Feeling*, Oxford University Press, 2008.

Literature: Original research papers.

C.2.19 Neural Nets and Symbolic Reasoning

Learning outcomes:	K2, IM
Teaching methods:	Lectures; seminars
Assessment:	Written exam; programming exercise; final paper
Teacher:	Reinhard Blutner
Credit points:	6 EC

Objectives: The course should enable the student to see the close connections between AI, cognitive psychology, linguistics, and philosophy of mind.

Content: Parallel distributed processing is transforming the field of cognitive science. In this course, basic insides of connectionism (neural networks) and classical cognitivism (symbol

manipulation) are compared, both from a practical perspective and from the point of view of modern philosophy of mind. Discussing the proper treatment of connectionism, the course debates common misunderstandings, and it claims that the controversy between connectionism and symbolism can be resolved by a unified theory of cognition—one that assigns the proper roles to symbolic computation and numerical neural computation.

Literature: Original research papers.

C.2.20 Neurophilosophy of Free Will

Learning outcomes:	K2, S3
Teaching methods:	Lectures; seminars
Assessment:	Final paper
Teacher:	Julian Kiverstein
Credit points:	6 EC

Objectives: To expose students to current debates in philosophy and cognition.

Content: It is common to find neuroscientists claiming that free will doesn't exist (see for instance the recent popular science book by Victor Lamme). Neuroscientists claim to have shown that conscious intentions are an epiphenomenon that do not cause our actions. In this course we will look at whether the neuroscientific research really warrants such a skeptical conclusion. We will argue that it doesn't, but that neuroscience nevertheless has a good deal to teach us about the biological basis of voluntary action. This will seem an odd conclusion for anyone that supposes there is an opposition between determinism and free will. Our assumption in this course will be that there is no such incompatibility—we can live in a deterministic universe and have free will. Neuroscience can help us to understand how this can be the case. Course readings will be taken from philosophical and neuroscience journals. There will be some connections between this course and the *Neurophilosophy of Self* course, so it will be an advantage for students to take both courses.

Literature: Original research papers.

C.2.21 Neurophilosophy of Self

Learning outcomes:	K2, S3
Teaching methods:	Lectures; seminars
Assessment:	Final paper
Teacher:	Julian Kiverstein
Credit points:	6 EC

Objectives: To expose students to current debates in philosophy and cognition.

Content: There are many different theories of the self in philosophy including views that deny that selves exist. In this course we'll be assuming that selves exist and asking what if anything we can learn about the nature of the self from neuroscience. Some other issues we will examine concern the relationship between selves and other people, memory and the self; the unity of consciousness, embodiment and to what extent we have privileged access to our own minds. The course readings will be taken from philosophical and neuroscience journals. No prior knowledge of neuroscience will be assumed.

Literature: Original research papers.

C.2.22 Philosophy of Language: An Extensive Introduction

Learning outcomes:	K1, S3
Teaching methods:	Seminars
Assessment:	Written exam; student presentations
Teacher:	Elsbeth Brouwer
Credit points:	6 EC

Objectives: To acquire knowledge of general topics and positions in philosophy of language. To develop skills in assessing and producing philosophical arguments, as well as presentational bibliographical skills.

Content: This course provides an introductory overview of the central topics and theories in contemporary, mainly analytical philosophy of language. We will systematically review different views on the nature of linguistic meaning, in relation to representation and reality. You will read mainly primary texts on the subject of meaning by authors in a range of fields—from classical philosophy, semantics and linguistics to developmental psychology and neurophilosophy. Topics include: Frege’s Platonic conception of meaning; Wittgenstein’s language games; Grice’s principle of cooperation; Whorf’s linguistic relativism; Quine’s radical translation; Chomsky’s universal grammar; and Merleau-Ponty’s conception of embodied meaning.

Literature: Original research papers and the following book: A.P. Martinich. *The Philosophy of Language* (2nd edition). Oxford University Press, 1990.

C.2.23 Pragmatics and the Lexicon

Learning outcomes:	K1, K2, S5, IM
Teaching methods:	Lectures
Assessment:	Homework; take-home exam; student presentations; project
Teacher:	Henk Zeevat
Credit points:	6 EC

Objectives: The course is addressed to students with diverse backgrounds (computer science, philosophy, logic, psychology), and it aims to provide an introduction to the study of natural language use (pragmatics) and the structure of the lexicon. For this, it explores research on three themes: anaphora and presupposition, the structure of concepts, and pragmatic enrichment. The goal of the course is to attain a thorough understanding of the classical literature on these three themes. This is achieved by reading and presenting research literature, and by developing some ideas in the final project, which is either a software project or an essay.

Content: The course is an introduction to pragmatics, but also covers some areas of current research. The central question is the nature of the human lexicon as the basis of pragmatic processes like anaphora and presupposition, pragmatic enrichment, disambiguation of concepts, and the way these processes can be defined on the basis of that lexical information. The aim is to construct a computational and cognitive theory of these processes. The course will cover three themes: anaphora and presupposition, the structure of concepts and pragmatic enrichment. The first theme is a classical one and has a bearing on the conception of natural language semantics and pragmatics, and will be used to introduce the topic and read some classical papers in pragmatics. The second theme starts from the central problem in artificial natural language understanding, ambiguity, and applies it on the word level. Do words correspond with a long list of sentences and is lexical disambiguation a question of selecting an item from

that list, or is it possible to arrive at better models? The question of pragmatic enrichment or explication (e.g. ‘drink’ meaning alcoholic drink in many contexts), and the role of lexical information in enrichment will be the third theme covered.

Literature: Original research papers.

C.2.24 Quantum Computing

Learning outcomes:	K2
Teaching methods:	Lectures; tutorials
Assessment:	Homework; final exam
Teacher:	Ronald de Wolf
Credit points:	6 EC

Objectives: Today’s computers—both in theory (Turing machines) and practice (PC’s and smart phones)—are based on classical physics. However, modern quantum physics tells us that the world behaves quite differently. A quantum system can be in a superposition of many different states at the same time, and can exhibit interference effects during the course of its evolution. Moreover, spatially separated quantum systems may be entangled with each other and operations may have “non-local” effects because of this. Quantum computation is the field that investigates the computational power and other properties of computers based on quantum-mechanical principles. Its main building block is the qubit which, unlike classical bits, can take both values 0 and 1 at the same time, and hence affords a certain kind of parallelism. The laws of quantum mechanics constrain how we can perform computational operations on these qubits, and thus determine how efficiently we can solve a certain computational problem. Quantum computers generalize classical ones and hence are at least as efficient. However, the real aim is to find computational problems where a quantum computer is much more efficient than classical computers. For example, Peter Shor in 1994 found a quantum algorithm that can efficiently factor large integers into their prime factors. This problem is generally believed to take exponential time on even the best classical computers, and its assumed hardness forms the basis of much of modern cryptography (particularly the wide-spread RSA system). Shor’s algorithm breaks all such cryptography. A second important quantum algorithm is Grover’s search algorithm, which searches through an unordered search space quadratically faster than is possible classically. In addition to such algorithms, there is a plethora of other applications: quantum cryptography, quantum communication, simulation of physical systems, and many others. The course is taught from a computer science perspective but should be accessible for physicists as well.

Content: Introduction to the use of quantum mechanics for computational purposes. The first half of the semester focuses on quantum algorithms: the circuit model, the early quantum algorithms, Shor’s algorithm and breaking RSA, Grover’s search algorithm, quantum random walks, and limitations of quantum computers. The second half focuses on quantum communication: entanglement, quantum information theory (with applications to some classical problems), communication complexity, cryptography, error-correction and fault-tolerance.

Literature: Lecture notes.

C.2.25 Seminar Mathematical Logic

Learning outcomes:	K2, S3, S5
Teaching methods:	Seminar
Assessment:	Student presentations
Teacher:	Benedikt Löwe
Credit points:	3 EC

Objectives: Students need to learn to read research papers and present mathematical ideas. The goal of this seminar is to give students an opportunity to train their reading skills in mathematics and learn how to present.

Content: Selected research papers will be handed out to the students who then have to read them, understand them and present them to the seminar.

C.2.26 Statistical Structure in Language Processing

Learning outcomes:	K2, S5
Teaching methods:	Lectures; tutorials
Assessment:	Written exam; project
Teacher:	Khalil Sima'an
Credit points:	6 EC

Objectives: The course aims at providing the student with enough skills and background for conducting research in the field of statistical computational linguistics.

Content: The amount of language data that is available to us electronically is increasing with the day. With this eminent increase, a question arises as to the possibility of inducing latent structure in this data that can be useful for further tasks such as machine translation. The different kinds of latent structure that is possible depends on the data and the task, and will usually demand suitable statistical models and learners. The course will study methods for inducing a variety of latent structure for tasks such as language modeling, machine translation and adaptation across domains.

Literature: Original research papers.

C.2.27 Topics in Dynamic Epistemic Logic

Learning outcomes:	
Teaching methods:	Lectures; seminars
Assessment:	Homework; student presentations; final paper
Teacher:	Alexandru Baltag
Credit points:	6 EC

Objectives: First, to present to students the main concepts and formalism of Dynamic Epistemic Logic (DEL), including recent developments on connections to other fields (from Epistemology and Learning Theory to Game Theory, Social Software, Pragmatics, Quantum Information, etc.). Second, to enable students to acquire some research experience, by discussing some of the outstanding conceptual challenges in the field, as well as more technical open questions, and by giving them guidance and encouragement to tackle some of these issues in their final projects.

Content: This course is addressed to students and researchers interested in logics for reasoning about multi-agent belief revision, belief updates and knowledge updates induced by various forms of communication or interaction. We start by presenting the main concepts of “standard DEL” (as covered, e.g., in the book *Dynamic Epistemic Logic* and in several ESSLLI courses with the same name): multi-agent epistemic Kripke models, public announcements, epistemic event models, product update, and the corresponding dynamic logics. Then we present the more recent “belief-revision-friendly” version of DEL and its main concepts (plausibility models, the Action-Priority Update), by combining the techniques of Dynamic Epistemic Logic with the insights and models from Belief Revision theory. We formalize various types of doxastic attitudes (belief, strong belief, safe belief, conditional belief, degrees of belief, group belief), notions of defeasible “knowledge”, belief upgrades and belief-revision policies, etc. We give some axiomatisations and apply these notions to communication strategies and the pragmatics of Natural Language, to rationality and strategic reasoning in Game Theory, to the formalization of key concepts in modern Epistemology, and to the analysis of various epistemic-doxastic paradoxes and puzzles (Fitch’s knowability paradox, the Puzzle of the Perfect Believer, the Muddy Children, the Surprise Examination, etc.). Further, we present various extensions of this setting (to dynamics of probabilistic beliefs, dynamics of evidence and justification, etc.), as well as recent work at the interface of DEL with Learning Theory, Epistemology, Social Choice Theory, Quantum Information, Secure Communication, etc. We discuss some of the on-going conceptual challenges and the open technical questions encountered in the field, and we encourage and guide students to start tackling some of these problems.

Literature: Original research papers, book chapters, handouts.

C.2.28 Transcendental Logic, Space and Time

Learning outcomes:	K1, K2, S5, IM
Teaching methods:	Lectures; seminars
Assessment:	Participation in online discussion forum; final paper
Teacher:	Michiel van Lambalgen
Credit points:	6 EC

Objectives: To allow students to assess the relevance of Kant to contemporary debates in cognitive science and philosophy of mathematics.

Content: This course is a continuation of *Kant, Logic and Cognition*, to which we refer for a general introduction. The results obtained there will be applied to the study of space, time and causality.

Literature: Kant’s *Critique of Pure Reason* (Cambridge edition) as well as: B. Longuenesse. *Kant and the Capacity to Judge*. Princeton University Press, 1998.

C.2.29 Unsupervised Language Learning

Learning outcomes:	K2, S5
Teaching methods:	Lectures; computer labs
Assessment:	Homework; student presentations; project paper
Teacher:	Jelle Zuidema
Credit points:	6 EC

Objectives: To provide an overview of the use of unsupervised learning techniques in natural language processing.

Content: During the last decade there has been a resurgence in language learning techniques that operate with unlabeled data. These techniques work on the basis of huge amounts of text and statistics. Their aim is to induce syntactic structure and semantic interpretation by means of word sequences without external knowledge. Some of these techniques have contributed to better machine translation and speech recognition systems. This course gives a state-of-the-art overview of unsupervised language learning models, with a focus on unsupervised grammar learning, and their current applications in AI and NLP.

Literature: Original research papers.

C.3 Non-Taught Components

In this section we describe the curriculum components that are not offered in the form of regular taught courses.

C.3.1 Research Project

Learning outcomes:	IR, K2, S1, S2, S3, S4, S5, IM
Teaching methods:	Various
Assessment:	Various
Teacher:	Ulle Endriss (coordinator)
Credit points:	6 EC

Objectives: To gain experience with conducting independent research.

Content: Each January and June (the third block of each semester, which is free of regular taught courses), the MSc Logic offers a small number of *coordinated projects* for students to choose from (see <http://www.illc.uva.nl/MScLogic/courses/projects.html>). Students can also approach a potential project supervisor (a senior member of staff, a postdoc, a PhD student, or an academic visitor at the ILLC) and enquire about doing an *individual project* with him or her. Individual projects can be undertaken at any time (not necessarily in January or June) and, depending on the workload, can be worth more or fewer credits than 6 EC. Projects often, but not always, include the writing of a paper. Each student must complete at least one research project worth 6 EC to be able to graduate, but may do more (students typically complete 2–3 projects before starting their thesis work).

The following are examples for typical coordinated projects offered in recent years:

- Dependence Logic
- Social Dynamics of Information and its Distortions
- Justification Logic
- Category Theory
- The Haskell Road to Logic, Maths and Programming
- Interpretability and Incompleteness
- Normative Foundations and Mathematical Modelling of Social Welfare
- Assessing the Reliability of an Annotation Scheme for Indefinites
- Algorithmic Randomness and Computability Theory
- Empirically Motivated Logical Representations in Lexical Semantics

The following are examples for recent individual projects:

- Basics in Descriptive Set Theory
- Visualisation of Fair Division Procedures
- Lattice-Based Cryptography and Fully Homomorphic Encryption
- Theoretical Frameworks in Linguistics
- Learning Theory and Belief Revision
- Brandom's *Making it Explicit*
- The Universal Model of the Negationless Fragment of Intuitionistic Logic
- Generating Imperative Code from Algebraic Specifications
- Internal Categoricity of Arithmetic and Set Theory
- Epistemic *vs.* Deontic Modals

C.3.2 Thesis

Learning outcomes:	IR, K2, S1, S2, S3, S5, IM
Teaching methods:	Individual research supervision
Assessment:	Written thesis; oral defense
Teacher:	Ulle Endriss (coordinator)
Credit points:	30 EC

Objectives: To fully master the skills required to carry out interdisciplinary research in Logic, Language and Information.

Content: A thesis in the MSc Logic is a report on a substantial piece of scientific work, usually including a significant amount of original research, that clearly demonstrates the student's capacity to independently conduct interdisciplinary research in the area of Logic, Language and Information. The thesis represents the equivalent of one semester of full-time work. This work may be of a theoretical or a practical nature. The student's academic mentor is available to assist the student with finding a supervisor, and the student then agrees on a suitable topic with that supervisor. The choice of supervisor, who will usually but not necessarily be a member of the senior scientific staff of the Institute for Logic, Language and Computation (ILLC), requires the approval of the programme director.

C.3.3 Research Seminars

Each student student is required to attend at least 10 sessions at a research seminar before they commence their thesis work. No credit points are assigned for this activity.

During term time, there are several such seminars taking place at the ILLC almost every week and students are free to attend any of these events. Students are also encouraged to attend similar events elsewhere and to participate in workshops and conferences. The following are all regular event series that are firmly established at the ILLC:

- **Logic Tea:** This is a seminar series organised by ILLC PhD students, with some help from MSc Logic students, that is specifically aimed at students. The topics are wide ranging, particularly in philosophy, mathematics, computer science, and artificial intelligence. Speakers are mostly PhD students and Master's students, and sometimes visitors from abroad.
- **Cool Logic:** Cool Logic is an internal seminar, where (*only*) MSc Logic and PhD students of the ILLC can meet and keep each other updated about recent and ongoing work. It is

more informal than the Logic Tea, and students are free to present unfinished results. It is organised by Master's students, with some help from PhD students.

- **DIP Colloquium:** The DIP (Discourse and Philosophy) Colloquium is organised by the ILLC's Logic and Language section and reflects the current research interests of that group: cognition and reasoning, formal semantics and pragmatics, computational linguistics, and philosophy of logic and language.
- **Colloquium on Mathematical Logic:** The Colloquium is intended to bring together researchers working in mathematical logic and logic-related areas of theoretical computer science and philosophy. It is organised jointly with Utrecht and Nijmegen.
- **Computational Linguistics Seminar:** This seminar is devoted to everything to do with computational linguistics—that is, research that is or can be implemented in a computer program, and tries to process or account for natural language data (which includes language modelling, statistical modelling, pattern recognition and machine learning methods, formal linguistic grammars, speech recognition, machine translation, computational semantics, and other topics that one currently finds at ACL, COLING, or in the *Computational Linguistics* journal).
- **Computational Social Choice Seminar:** This is a series of occasional talks that address issues at the interface of computer science (including logic, multiagent systems and artificial intelligence) and mathematical economics (including social choice theory, game theory and decision theory).
- **Seminar on Logic and Interactive Rationality:** The LIRa Seminar focuses on the logical, philosophical and computational aspects of agency, rational interaction and social-informational dynamics. The seminar covers research topics lying at the interface of logic with game theory, decision theory, learning theory, formal epistemology, social choice theory, computer science, philosophy of science, and philosophy of language. Core areas of interest are modal logic approaches to interaction, as well as other approaches, e.g., game semantics, dynamic semantics for natural language, (co)algebraic approaches, or (in)dependence-friendly logics.
- **SMART Cognitive Science Lectures:** This lectures series with internationally renowned cognitive scientists is organised by the SMART (Speech & language, Music, Art, Reasoning & Thought) Cognitive Science initiative, which is part of the *zwaartepunt* Brain & Cognitive Science at the Faculty of Humanities and run in close collaboration with the Cognitive Science Center Amsterdam.

On top of this, there often are new initiatives. For instance, the current academic year saw the birth of a new seminar series on *Provability, Interpretability, Intuitionism and Arithmetic*, organised together with Utrecht and Nijmegen.

APPENDIX D

TEACHING AND EXAMINATION REGULATIONS

On the following pages we reproduce the official Teaching and Examination Regulations of the MSc Logic (*Onderwijs- en Examenregeling*, or simply OER, in Dutch). The OER is split into two parts. Part A concerns general regulations that apply to all Master's programmes offered at the UvA's Faculty of Science, while Part B is specific to the MSc Logic. We include the version of the academic year of 2012/13.



UNIVERSITY OF AMSTERDAM

FACULTY OF SCIENCE

Teaching and Examination Regulations

Part A

Master's programmes FNWI

Academic year 2012-2013

Preamble

These Teaching and Examination Regulations (*Onderwijs- en examenregeling*, OER), hereinafter referred to as: the Regulations, include all the rules and regulations, as prescribed under the Dutch Higher Education and Research Act (*WHW*), hereinafter referred to as: the Act, in respect of the teaching and examinations of the Master's programmes at the Faculty of Science (*Faculteit der Natuurwetenschappen, Wiskunde & Informatica*, FNWI) and the Institute for Interdisciplinary Studies (*Instituut voor Interdisciplinaire Studies*, IIS), namely:

- Artificial Intelligence
- Astronomy and Astrophysics
- Biological Sciences
- Biomedical Sciences
- Chemistry
- Brain and Cognitive Sciences
- Earth Sciences
- Forensic Science
- Grid Computing
- Information Studies
- Life Sciences
- Logic
- Mathematics and Science Education
- Mathematical Physics
- Mathematics
- Physics
- Software Engineering
- Stochastics and Financial Mathematics
- System and Network Engineering

The Master's programmes offered jointly by the University of Amsterdam (UvA) and VU University Amsterdam (VU) are covered in these Regulations, in the sense that the regulations of the programmes in question have been harmonised as much as possible.

This document consists of two parts: Part A and Part B. Part A includes general information that applies to all the Master's programmes on offer. Part B deals with specific aspects of the individual programmes, such as the aim and exit qualifications, additional entry requirements, organisation of the curriculum, description of the content and study load of the components, and, if applicable, additional regulations.

These Regulations have been drawn up by the dean of the Faculty of Science on 25 June 2012, with reservations to a number of subjects on which the Faculty Student Council did not give its approval yet at that date. The approval for these specific subjects has been given on 29 August 2012, which means all terms have been met.

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PART A – GENERAL INFORMATION

Chapter 1 – General provisions

Article 1.1 – Applicability of the Regulations

These Regulations apply to the teaching and examinations of the Master's programmes in: Artificial Intelligence, Astronomy and Astrophysics, Biological Sciences, Biomedical Sciences, Chemistry, Brain and Cognitive Sciences, Earth Sciences, Forensic Science, Grid Computing, Information Studies, Life Sciences, Logic, Mathematics and Science Education, Mathematical Physics, Mathematics, Physics, Software Engineering, Stochastics and Financial Mathematics, and System and Network Engineering, hereinafter individually referred to as: the programme. The programme is offered within the Faculty of Science and the Institute for Interdisciplinary Studies, hereinafter referred to as: the Faculty.

Article 1.2 – Definitions

The following definitions are used in these Regulations:

- | | |
|---------------------------|---|
| 1. academic year: | the period beginning on 1 September and ending on 31 August of the following calendar year; |
| 2. the Act: | the Dutch Higher Education and Research Act (<i>Wet op het hoger onderwijs en wetenschappelijk onderzoek</i> , WHW); |
| 3. component: | a unit of study of the programme within the meaning of the Act, for example a course or internship; |
| 4. course catalogue: | the course catalogue provides information on the content of the programme and its components. |
| 5. credit: | an ECTS credit, with a workload of 28 hours of study; |
| 6. curriculum: | the totality and cohesiveness of the components, teaching activities/methods, contact hours, testing and examination methods and recommended literature; |
| 7. Examinations Board: | the Examinations Board of one or more study programmes of the faculty, within the meaning of Section 7.12 of the Act; |
| 8. examiner: | the person appointed by the Examinations Board for the purpose of holding examinations and determining their results, within the meaning of Section 7.12c of the Act; |
| 9. examination: | an assessment of the student's knowledge, understanding and skills relating to a component. The examination can be held in either written or oral form. The assessment is expressed in terms of a final mark. In the case of an oral examination, components which form part of the examination and on which the final mark is therefore partly based, such as a presentation, do not fall within the scope of the definition and are not seen as the examination itself. An examination may consist of one or more partial interim or other examinations. A resit always covers the same material as the original examination; |
| 10. final examination | the decision of the Examinations Board that the student has completed the programme; |
| 11. fraud and plagiarism: | the student's actions or failures to act that make it wholly or partially impossible to accurately judge his/her knowledge, understanding and skills (see the Regulations Governing Fraud and Plagiarism for UvA Students in Appendix 4); |
| 12. interim examination: | examination which covers a part of the content of a component. |

13. joint degree:	a degree awarded by an institution together with one or more institutions in the Netherlands or abroad, after the student has completed a study programme (a degree programme, a major or a specific curriculum within a degree programme) for which the collaborating institutions are jointly responsible.
14. Master's thesis:	a component of 12 or more ECTS credits comprising research into the literature and/or contributing to scientific research and/or an internship, always resulting in a written report. In some study programmes, a literature study is part of the curriculum. In general, fewer credits are awarded for this literature study than for a Master's thesis. This component therefore falls outside the scope of the definition of a Master's thesis. Where necessary, the definition of a Master's thesis is further refined in Part B of these Regulations (with specific information on the individual programmes);
15. practical exercise:	the participation in a practical training or other educational learning activity, aimed at acquiring certain (academic) skills. Examples of practical exercises are: researching and writing a thesis, carrying out a research assignment, taking part in field work or an excursion taking part in another educational learning activity aimed at acquiring specific skills, participating in and completing an internship;
16. portfolio:	the collection of educational products (written and/or electronic) representing the student's achievements within the programme he/she has chosen;
17. programme:	the prescribed combination of components including teaching methods, learning activities, examinations and literature.
18. programme charter:	the part of the Student Charter specific to the programme in accordance with Section 7.59 of the Act. The programme charter is included in the UvA Course Catalogue. If applicable, regulations are set out in the course catalogue;
19. student:	the person enrolled at the University to pursue education and/or take examinations as part of the programme;
20. seminar:	a class in which the material is addressed primarily on a problem- or case-oriented basis;
21. teaching period:	the period, during the semesters, in which the teaching of a programme is offered (see the Academic Calendar UvA 2012-2013 in Appendix 2).
22. the University:	the University of Amsterdam;
23. workload:	the workload of the unit of study to which an examination applies, is expressed in terms of credits = ECTS credits (ECTS = European Credit and Transfer Accumulation System). The workload for 1 year (1,680 hours) is 60 ECTS credits;

The other terms have the meanings ascribed to them in the Act.

Chapter 2 – Admission to the programme

Article 2.1 – Entry requirements for the Master's programmes

1. The entry requirements for the specific Master's programmes can be found in Part B of these Regulations.
2. If the intended programme includes multiple programmes, a specific specialisation/minor in the Bachelor's programme may be required for admission to the different programmes.

Article 2.2 – Pre-Master’s programme (schakelprogramma)

If, in the opinion of the Examinations Board, an admission request does not satisfy the set requirements but these requirements can be expected to be met within a reasonable period of time, the applicant can be given the opportunity to satisfy the requirements by means of a supplementary pre-Master’s programme. The maximum number of ECTS credits for such a pre-Master’s programme is 30. The content of the pre-Master’s programme will be determined by the programme director. The content itself must be approved by the Examinations Board and the Central Student Administration (CSA).

Article 2.3 – English language

Admission to the programme requires sufficient command of the English language. A student may take one of the following tests to establish language competence:

- TOEFL (Test of English as a Foreign Language). The minimum required TOEFL scores are: 235 for the computer test; 580 for the written test; 90 for the Internet test;
- IELTS (International English Language Testing System). The minimum required IELTS score is 6.5 and at least 6 on each sub-score (listening/reading/writing/speaking);
- A Cambridge International Examinations test. The minimum required scores are: First Certificate in English (FCE) score A+; Certificate in Advanced English (CAE) score A/B+; Certificate of Proficiency in English (CPE) score B.

Those possessing a Bachelor’s degree from a Dutch university satisfy the requirement of sufficient command of the English language.

Article 2.4 – Admissions procedure

1. The Examinations Board of the programme is responsible for admission to the programme.
2. With a view to admitting students to the programme, the Examinations Board assesses the candidate’s knowledge, understanding and skills. In this assessment the Board includes knowledge of the language in which the programme will be taught. The Board may request experts within or outside the University to test certain types of knowledge, understanding and skills, in order to supplement written evidence of the programme/programmes the student has completed.
3. The admission assessment takes place once or twice a year. The specifics of the individual programmes can be found in Part B of these Regulations.
4. A request for admission to the programme must be submitted to the Examinations Board before 1 May in the case of Dutch students, before 1 April in the case of EU students and before 1 February in the case of non-EU students. Under exceptional circumstances, the Examinations Board may consider a request submitted after this closing date.
5. Admission is granted on condition that, by the relevant starting date at the latest, the candidate fulfills the provisions of Article 2.1 regarding knowledge and skills, as evidenced by the diplomas that he/she has obtained for completed programmes.
6. Candidates receive either confirmation of admission or a negative decision. An appeal against a negative decision can be lodged with the Examination Appeals Board (COBEX).

Article 2.5 – Intake dates

1. Intake into the programme is possible at the beginning of the first semester of an academic year (‘September’) and/or at the beginning of the second semester (‘February’). The specifics of the individual programmes can be found in Part B of these Regulations. The intake date(s) mentioned in this paragraph ensure(s) a programme that can be expected to be completed within the official period.
2. When the programme commences, the student must have fully completed the Bachelor’s programme or the pre-Master’s programme allowing admission to this programme.

3. If intake takes place at a date other than that stated in paragraph 1 of this Article, the feasibility of the programme being completed within the set time cannot be guaranteed.

Article 2.6 – Recognition of acquired competences

Those who have not yet been admitted to the programme may be eligible for recognition of acquired competences. A reasoned, written request to this effect must be submitted to the Examinations Board. The criteria in the assessment of such requests can be found in Part B of these Regulations.

Chapter 3 – Content and organisation of the programme

Article 3.1 – Aim of the programme and exit qualifications

Information about the aim of the programme and exit qualifications can be found in Part B of these Regulations.

Article 3.2 – Organisation of the programme

The programme is organised on a full-time and/or part-time basis, as specified in Part B of these Regulations.

Article 3.3 – Language of instruction for the programme

The language of instruction for the programme is English. This means that the Code of Conduct for Foreign Languages at the UvA 2000 and the provisions laid down in Section 7.2 of the Act apply (see Appendix 3).

Article 3.4 – Scope of the programme

The programme has a workload of 60 or 120 ECTS credits and concludes with a final examination. The workload of the individual programmes can be found in Part B of these Regulations.

Article 3.5 – Curriculum

Information about the curriculum can be found in Part B of these Regulations.

Article 3.6 – Components completed elsewhere

1. Components successfully completed elsewhere during the programme may supplement the student's examination programme, subject to prior permission from the Examinations Board. For components completed elsewhere that are listed in Part B of these Regulations, no permission of the Examinations Board is necessary.
2. Exemptions for components successfully completed at a higher education institution prior to beginning the programme may only be granted on the basis of Article 5.10 of these Regulations.

Article 3.7 – Free curriculum

Subject to certain conditions, the student has the option of compiling a curriculum of his/her own choice which deviates from the curricula mentioned in Article 3.5 of these Regulations. The concrete details of such a curriculum require the prior permission of the relevant Examinations Board. In order to acquire permission, at least one half of the proposed curriculum must consist of components of the study programme in question.

Article 3.8 – Joint degrees

Information about joint degrees can be found in Part B of these Regulations, if applicable.

Article 3.9 – Majors

1. The student can choose between one of two majors, provided they are offered within the specific programme. The majors are:

- Major in Management, Policy Analysis and Entrepreneurship
- Major in Science Communication

The options for taking these and/or other majors can be found in Part B of these Regulations.

2. Regarding the major in Management, Policy Analysis and Entrepreneurship:

The major in Management, Policy Analysis & Entrepreneurship consists of 60 ECTS credits. It must be combined with a research programme, comprising at least 60 ECTS credits (courses, internship and literature study), and with the general compulsory components in order to meet the general requirements of the programme. The exit qualifications of this major can be found as an appendix to Part B of these Regulations (for those programmes which offer the option of taking this major). Further information on this major can be found on the website of VU University Amsterdam.

3. Regarding the major in Science Communication:

The major in Science Communication consists of 60 ECTS credits. It must be combined with a research programme, comprising at least 60 ECTS credits (courses, internship and literature study), and with the general compulsory components in order to meet the general requirements of the programme. The exit qualifications of this major can be found as an appendix to Part B of these Regulations (for those programmes which offer the option of taking this major). Further information on this major can be found on the website of the VU University Amsterdam.

4. Students have to go through a separate intake procedure for admission to the major in Management, Policy Analysis & Entrepreneurship and the major in Science Communication.

5. It is not permitted to take the obligatory research part of the programme and the major simultaneously.

Article 3.10 – Double Master's programme (two-year programmes)

In order to be awarded two Master's degrees or to have stated on the Master's diploma that two Master's programmes have been completed within the discipline, the following requirements must be met:

- a. The total programme of the candidate should amount to at least 180 ECTS credits.
- b. The candidate's work for the programme (lectures, research work, etc.), must be of such a standard that all the compulsory requirements of each of the two programmes have been met.
- c. The candidate must have conducted separate research work for both Master's degrees. This may consist of two separate research projects with supervisors from the respective study programmes. In the case of an integrated research project, this must be supervised by two staff members appointed from the two study programmes. Both staff members must assess the work as a pass.
- d. The Examinations Boards of both study programmes must approve the student's double Master's programme before the student commences on the double Master's programme.

Article 3.11 – Elective components

1. In the case of one-year programmes, students may only choose Master's-level elective components as part of their programme.
2. In the case of two-year programmes, in exceptional cases students may choose Bachelor's-level elective components as part of their programme. The Examinations Board will determine whether an elective component at the Bachelor's level will be seen as part of the programme and the number of credits that will be allocated to the elective component.
3. In terms of content, elective components must not show too much similarity to the components of the student's standard curriculum. The acceptable degree of similarity will be decided by the Examinations Board.

4. An elective component will only be seen as part of the programme if the Examinations Board has given its prior approval.

Chapter 4 – Teaching

Article 4.1 – Participation in components and rules for priority admission

1. Every student must enroll for every component that he or she wants to participate in. To participate in components, the student must enroll within the period indicated in the UvA Course Catalogue and according to the procedures mentioned there. The student may be refused the opportunity to participate if he/she does not enroll or fails to enroll in time.
2. If a student has registered for a component, he or she will also be registered for the examination and the resit pertaining to that component.
3. Admission to components with limited capacity takes place on the basis of previously established and published admission criteria and rules for priority admission, and on the understanding that students enrolled in the programme are given priority over others in enrolling for components in the compulsory part of their programme.

Article 4.2 – Sequence and admission requirements

1. Information about sequence and admission requirements can be found in Part B of these Regulations, if applicable.
2. In cases where the result of a component has not been determined within the time periods mentioned in Article 5.6, this component may not be required as prior knowledge for the subsequent component.

Article 4.3 – Participation in practical training and study group sessions

The requirements for this can be found in Part B of these Regulations, if applicable.

Article 4.4 – Students with a disability

1. Students with a disability can submit a written request to qualify for special adaptations in the components, practical training sessions and examinations. These adaptations will accommodate as much as possible the student's individual disability, but may not alter the quality or degree of difficulty of the component or examination.
2. A recent certificate from a doctor or a psychologist or, in the case of dyslexia, from a registered testing agency – the Dutch Health Care Professionals (*BIG*), the Dutch Professional Association of Psychologists (*NIP*) or the Dutch Association of Educationalists (*NVO*) – must accompany the request mentioned in paragraph 1 of this Article. Where possible, this certificate must include an estimate of the degree to which the student's disability is expected to impede his/her study progress.
3. The dean or, on his/her behalf, the director of the educational institute or the programme director will decide on the adaptations concerning the teaching facilities. The Examinations Board will decide on requests for adaptations concerning tests/examinations.

Chapter 5 – Testing and examining

Article 5.1 – General

1. Testing during the component establishes the student's academic skills and whether the student is achieving the intended learning objectives sufficiently.
2. The programme charter states what the student must achieve in order to pass the component, as well as the criteria for student assessment.
3. The Examinations Board may, at the student's request, permit a different form of assessment than that indicated by the UvA Course Catalogue.

Article 5.2 – Registering for examinations

1. Every student must register for every component that he or she wants to participate in. The UvA Course Catalogue describes the registration procedure. Participation in examination may be refused if the student does not register or fails to register for the component in time.
2. Only students who have registered for a component can take part in the examination or resit for that component.
3. If a student does not pass the examination and the resit of a component, he/she is obliged to take the whole component again in order to receive credits.
4. In addition to paragraph 3 of this Article, in some Master's programmes the assessment of certain interim examinations will remain valid, whereby the student does not have to retake certain subcomponents. The subcomponents for which this exception is granted are listed in Part B of these Regulations, if applicable.
5. If a student has not registered in the prescribed manner, no result will be entered in the records under the student's name and no credits will be awarded for the component.

Article 5.3 – Testing/examination opportunities

1. For every component, the student has one opportunity to resit examination during the 12-month period starting from the commencement of the teaching that prepares the student for that examination. The first opportunity for the examination falls within the teaching period in which that component is offered. Resits are in principle offered outside the main teaching periods. For each component a schedule of examinations and resits will be made with all examinations scheduled outside teaching periods.
2. Contrary to the provisions of paragraph 1 of this Article, the assessment of a practical component will only take place at the end of the teaching period of the component.
3. Contrary to the provisions of paragraph 1 of this Article, students will be given at least one opportunity per year to take the examination in a component that has been offered in the preceding academic year but that will not be offered in the current academic year or in the future.

Article 5.4 – Students with a disability

Information regarding testing and examining for students with a disability can be found in Article 4.4.

Article 5.5 – Oral examinations

1. If an oral examination is desired, the examiner must submit a written and motivated request to the Examinations Board. If the request is granted, the conditions cited in paragraphs 2 to 8 of this Article must be met.
2. An oral examination will be public unless the student files an objection to this effect, or, in an exceptional case, if the Examinations Board or examiner determines otherwise.
3. An examiner will give an oral examination to only one student at a time unless the Examinations Board determines otherwise.
4. A second examiner will always be present as an observer at an oral examination.
5. The examiner will make an assessment of the oral examination.
6. An assessment will be retained for at least two years after the result of the examination has been determined.
7. Only with the consent of the student may the examiner replace a written examination with an oral examination.

Article 5.6 – Determining and announcing results

1. The examiner determines the result (= mark) of an oral examination as soon as the examination is finished and informs the student accordingly by means of a written statement.

2. The examiner determines the result of a written or other form of examination component as quickly as possible, and in any event within 15 working days of the examination date, and also submits the necessary data to the programme administration so that the results can be registered.
3. The student must have been notified of the result of an examination at least 15 working days before the resit of the examination in the relevant subject. In exceptional cases, the dean can permit deviation from this time period.
4. In case of a conflict par. 3 prevails over par. 2.
5. The examiner determines the result of an interim examination no later than 5 working days before the next interim examination will be held, and in any event no later than 10 working days after the interim examination has been held.
6. The final result of a Master's thesis must be determined within 20 working days after it has been submitted.
7. The faculty administration is responsible for notifying the student of the result no later than 5 working days after the examiner has submitted the result to the faculty administration.
8. The student must receive notification of the result of an examination at least 15 working days before the resit of the examination in the relevant component.
9. During a research project or internship, the student is permitted to ask for an interim assessment by the supervisor(s) once only. This assessment will include a recommendation concerning the student's progress and performance. No credits are allocated on the basis of this interim assessment. A written statement of the interim assessment must be given to the student.

Article 5.7 – Marks

1. Marks are given on a scale from 1 to 10, with a maximum of one decimal after the point.
2. The final assessment of a component is a pass if the student obtains a mark of 6.0 or higher. The mark of 5.5 will not be given as the final result of a component.
3. In cases where the examination of a component consists of two or more parts, each of which are graded separately, the weighted mean of these marks must be rounded off using the following table:

from (inclusive)	to (exclusive)	Final mark
0.01	1.25	1
1.25	1.75	1.5
1.75	2.25	2.0
2.25	2.75	2.5
2.75	3.25	3.0
3.25	3.75	3.5
3.75	4.25	4.0
4.25	4.75	4.5
4.75	5.50	5.0
5.50	6.25	6.0
6.25	6.75	6.5
6.75	7.25	7.0
7.25	7.75	7.5
7.75	8.25	8.0
8.25	8.75	8.5
8.75	9.25	9.0
9.25	9.75	9.5
9.75	10.0 (incl.)	10

4. Contrary to the provisions of paragraph 1 of this Article, an examination component may be concluded with the 'pass' designation. The names of the relevant examination components can be found in Part B of these Regulations, if applicable.
5. The most recent result determines the final mark.
6. When a student does not fulfill all the requirements of a component, the examiner will register the mark 'did not fulfill all requirements' (*niet aan de eisen voldaan, n.a.v.*).
7. When a student does not take part in any (interim) examination, the examiner will register the mark 'no show' (*niet aanwezig, n.a.*).

Article 5.8 – Validity period of examinations

1. If programmes are taken on a full-time basis, the validity period of passed examinations is two years in the case of one-year programmes and three years in the case of two-year programmes. If programmes are taken on a part-time basis, the validity period of passed examinations is three years in the case of one-year programmes and four years in the case of two-year programmes.
2. The validity period of passed interim examinations is until the end of the academic year (31 August), unless stated otherwise in Part B of these Regulations.
3. In individual cases, the Examinations Board is authorised to extend the validity period of successfully completed examinations for a period that it determines or to decide that an additional or replacement examination must take place.

Article 5.9 – Right of inspection

1. In the event of a written examination, and on request, the examiner will grant the student who took the examination the right to inspect the assessed work up to **30** days after the announcement of the result. The student may make copies of the assessed work and the standards on the basis of which the assessment was made.
2. During the time period mentioned in paragraph 1 of this Article, any student who took the examination may inspect the questions and assignments of the test in question and the standards on the basis of which the assessment was made. The method used to assess the examination enables the student to verify how the result was determined.
3. In the case of a written examination such as an assignment, paper, etc., the examiner will grant the student who took the examination the right to inspect the assessed work, by providing the student with a motivated assessment of the work, up to 30 days after the result is announced.

Article 5.10 – Exemption

1. At the written request of the student, the Examinations Board may exempt the student from taking one or more examination components, if the student:
 - a) has passed a component of an academic or higher professional education programme that is equivalent in both content and level;
 - b) has demonstrated through his/her work and/or professional experience that he/she has sufficient knowledge and skills with regard to the relevant component.
 The Examinations Board will make a decision within 28 days of receiving the written request.
2. This exemption does not apply to the Master's thesis.
3. Exemptions from examinations (or parts thereof), if granted, will be valid for the same period as that of examinations.
4. The student may also apply to the Examinations Board for exemption from participation in practical exercises. This exemption may be granted, inter alia, on conscientious grounds. The Examinations Board will determine which alternative requirements the student must meet.
5. A maximum of 30 ECTS credits in the curriculum in the case of one-year programmes and 60 ECTS credits in the curriculum in the case of two-year programmes can be accumulated through granted exemptions.

Article 5.11 – Master’s thesis

The Master’s thesis examiner and a second reader assess the quality of the final Master’s thesis. The final mark is determined by the examiner after consultation with the second reader.

Article 5.12 – Fraud and plagiarism

1. The provisions of the Regulations Governing Fraud and Plagiarism for UvA Students apply in full, and form part of the Teaching and Examination Regulations (see Appendix 4).
2. Electronic detection software programs may be used to detect plagiarism in texts. In submitting a written text, a student implicitly consents to the written text being entered into the database of the relevant detection program.
3. The following applies as a supplement to the Regulations Governing Fraud and Plagiarism for UvA students:
 - a. The sanctions described in the Regulations Governing Fraud and Plagiarism for UvA Students are the maximum sanctions. The Examinations Board is free to implement less severe sanctions.
 - b. It is permitted to submit written texts that have been submitted earlier for other component assignments or other comparable written texts (Article 3.f of the Regulations Governing Fraud and Plagiarism for UvA Students), as long as these written texts are referenced correctly.
 - c. Students are permitted to complete an examination even if the examination administrator suspects or observes fraud during the examination.
 - d. The Examinations Board will be involved only in the case of repeated misquotations.

Article 5.13 – Final examination

1. A diploma can only be awarded after the student has satisfied all the requirements, including the payment of tuition fees. All components have to be passed before the final examination can be undertaken. The Examinations Board determines the mark of the final examination.
2. The Examinations Board determines the results and date of the final examination after it has established that the student has passed all the examination components.
3. The Executive Board sets twelve examination dates per academic year for the final examination of the programme (28 September 2012, 31 October 2012, 30 November 2012, 21 December 2012, 31 January 2013, 28 February 2013, 29 March 2013, 29 April 2013, 31 May 2013, 28 June 2013, 31 July 2013, 30 August 2013).
4. The examination date on the diploma is the first day after the date on which the student has applied for the diploma. The graduation ceremony may be held at a later date than the date of the final examination.
5. By way of exception to paragraph 4 of this Article, the student will receive a diploma dated 31 August 2012, when the following criteria are met:
 - a. the student has applied for the diploma before 1 October 2012;
 - b. the student has completed the last component of the final examination by 31 August 2012 at the latest.
6. The Examinations Board may award a degree classification (*judicium*). If the student has shown exceptional competence, the Examinations Board may decide to grant the ‘cum laude’ qualification to the diploma. The guidelines which the Examinations Board takes into account are mentioned in the Rules and Regulations of the Examinations Boards FNWI 2012-2013. Other degree classifications are added to the diploma supplement.
7. Following a reasoned request by a student who qualifies for being awarded a diploma, the Examinations Board may delay setting the date of the final examination.
8. The Examinations Board may test the student’s knowledge in one or more components of the study programme before establishing the result of the final examination, if and insofar as the results of the components in question give cause to do so.
9. In cases where a student takes longer than the official 3 years of study to finish his or her chosen Master’s programme, the student’s chosen Master’s programme must be equivalent in terms

of level and content to the study programmes listed in the Regulations up to a maximum of 4 years ago.

Article 5.14 – Degree

A student who passes the final examination of a programme is awarded a Master of Science degree. This can also be a joint degree. The degree awarded is stated on the diploma.

Article 5.15 – Diplomas and transcripts

1. The Examinations Board grants a diploma as proof that the student has passed his/her final examination. The Examinations Board also grants a diploma supplement in English, signed by the chair of the Examinations Board, indicating the components of the examination, the workload and the assessment. The diploma states the qualification linked to the examination.
2. If a student successfully completes more than one examination but the Examinations Board cannot grant him/her a diploma, he/she may request and receive from the Board a transcript listing, in any event, the interim or other examinations passed.

Chapter 6 – Academic student counselling and study progress

Article 6.1 – Administration of study progress

The dean of the faculty is responsible for the correct registration of the students' study results. The UvA's student information system (SIS), in which every student can view his/her results electronically, shows the registered assessment of the examination component.

Article 6.2 – Academic student counselling

Enrolled students are eligible for academic student counselling. The types of academic student counselling available can be found in the UvA Course Catalogue.

Article 6.3 – Unsuitability (judicium abeundi)

1. Based on the provisions of Section 7.42a of the Act, the dean or the Examinations Board may, in exceptional cases, ask the Executive Board to terminate or refuse a student's enrolment for a programme, if that student's actions or remarks show that he/she is unsuitable either for practising one or more of the professions for which the programme in question is preparing the student or for the practical preparation for professional practice.
2. If a student is suspected of being unsuitable as described in paragraph 1 of this Article, the Examinations Board or the dean will institute an inquiry, of which the student shall be informed immediately. The Examinations Board or the dean will not issue any recommendation without carefully considering the interests involved and giving the student the opportunity to be heard.

Chapter 7 – Transitional and final provisions

Article 7.1 – Right of appeal

1. An appeal against decisions of the Examination Board or the examiners may be lodged with the Examination Appeals Board within 6 weeks after publication of the results.
2. Students who are of the opinion that errors have been made during the assessment procedure can take the following steps:
 - a. submit a written request for re-assessment to the examiner;
 - b. lodge an appeal against the assessment with the Examinations Board;
 - c. lodge an appeal against a negative decision of the Examinations Board with the Examination Appeals Board.
3. The examiner will re-assess an examination as requested by the student within 10 working days.

4. A student may lodge an appeal against the result with the Examination Appeals Board within six weeks of the announcement of the result. A request for reassessment does not affect the time period for lodging an appeal.

Article 7.2 – Hardship clause

In the event of demonstrable extreme unreasonableness and unfairness, the Examinations Board may permit deviations from the provisions of these Regulations in favour of the student.

Article 7.3 – Transitional provisions

The Examinations Board shall propose a transitional arrangement, with due regard for the Act's provisions regarding examinations and examination components, for students who, on the date these Regulations come into force, have passed one or more but not all of the examination components and whose interests are damaged by provisions in these Regulations that deviate from those in older versions.

Article 7.4 – Amendments

1. The dean shall establish amendments to these Regulations by independent decision – having heard the programme committee and with due regard for the authority of the relevant advisory bodies.
2. Amendments to these Regulations do not apply to the current academic year unless they can be reasonably assumed not to damage the students' interests.
3. Amendments to these Regulations will be made known to students.

Article 7.5 – Publication

The dean shall ensure a fitting publication of these Regulations and the rules and guidelines referred to in Section 7.12b of the Act.

These Regulations can be accessed at www.student.uva.nl (FNWI – Regulations) and can be found in the digital UvA Course Catalogue (www.studiegids.uva.nl).

Article 7.6 – Effective date

These Regulations shall come into force as of 1 September 2012 and replace all previous Regulations. Thus drawn up by the dean of the Faculty of Science on 25 June 2012.

Appendix 1: Overview of the Bachelor's and Master's Programmes

Additional admission requirements may be set and a letter of admission required for all non-follow-on Master's programmes.

Bachelor's Programme	CROHO	Follow-on Master's Programme¹	CROHO
Aardwetenschappen	56986	Earth Science	66986
Betagamma	50250	<i>depending on the major</i>	
Bio-exact	50012	Life Sciences	60225
Biologie	56860	Biological Sciences	60707
Biomedische Wetenschappen	56990	Biomedical Sciences	66990
Informatica	56978	Grid Computing	60299
Informatiekunde	56842	Information Studies	60229
Kunstmatige Intelligentie	56981	Artificial Intelligence	66981
Natuur- en Sterrenkunde	56984	-Physics	60202
		-Astronomy and Astrophysics	60230
Psychobiologie	50014	Biomedical Sciences	66990
Scheikunde	56857	Chemistry	66857
Wiskunde	56980	Mathematics	66980
Future Planet Studies	(not yet available)	<i>depending on the major</i>	

Other Master's programmes offered by the Faculty:

- Brain and Cognitive Sciences
- Logic
- System and Network Engineering
- Software Engineering
- Forensic Science
- Mathematical Physics
- Stochastics and Financial Mathematics

¹ master's programme to which a bachelorstudent with a prescribed diploma will be admitted without further conditions.

Appendix 2: Academic Calendar UvA 2012-2013 (in Dutch)

UvA Academische kalender 2012/2013

Intreeweek 2012 27 t/m 31 augustus 2012 (week 36)

Eerste semester

week	36	37	38	39	40	41	42	43	november					december					januari					februari				
	O	O	O	O	O	T	O	O	O	O	O	O	O	O	O	O	O	O	V	V	O	O	O	O				
ma	3	10	17	24	1	8	15	22	29	5	12	19	26	3	10	17	24	31	7	14	21	28						
di	4	11	18	25	2	9	16	23	30	6	13	20	27	4	11	18	25	1	8	15	22	29						
wo	5	12	19	26	3	10	17	24	31	7	14	21	28	5	12	19	26	2	9	16	23	30						
do	6	13	20	27	4	11	18	25	1	8	15	22	29	6	13	20	27	3	10	17	24	31						
vr	7	14	21	28	5	12	19	26	2	9	16	23	30	7	14	21	28	4	11	18	25	1						

Tweede semester

week	6	7	8	9	10	11	12	13	april					mei					juni				
	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	inhaal	O	O	O	O
ma	4	11	18	25	4	11	18	25	1	8	15	22	29	6	13	20	27	3	10	17	24		
di	5	12	19	26	5	12	19	26	2	9	16	23	30	7	14	21	28	4	11	18	25		
wo	6	13	20	27	6	13	20	27	3	10	17	24	1	8	15	22	29	5	12	19	26		
do	7	14	21	28	7	14	21	28	4	11	18	25	2	9	16	23	30	6	13	20	27		
vr	8	15	22	1	8	15	22	29	5	12	19	26	3	10	17	24	31	7	14	21	28		

onderwijs en toetsing

geen onderwijs of tentamens

Kerstmis:

Dinsdag 25 en woensdag 26 december

Nieuwjaar:

Dinsdag 1 januari

Goede Vrijdag:

Vrijdag 29 maart

Pasen:

Zondag en Maandag 31 en 1 april

Koninginnedag:

Dinsdag 30 april

Dag van de Arbeid:

Woensdag 1 mei

Bevrijdingsdag:

Zondag 5 mei

Heelvaart:

Donderdag 9 mei

Pinksteren:

Zondag en Maandag 19 en 20 mei

Opening Academisch Jaar

Maandag 3 september

Appendix 3: Code of Conduct for Foreign Languages at the UvA 2000

Gedragcode vreemde talen UvA
(vastgesteld door het College van Bestuur d.d. 21 september 2000)

1. Deze gedragscode regelt uitsluitend de taal waarin het initiële onderwijs (hoorcollege, werkgroepen, practica, en dergelijke) wordt verzorgd of tentamens/examens worden afgenomen en heeft geen betrekking op het onderwijsmateriaal (boeken, syllabi en dergelijke) en eventueel door de student te maken werkstukken of scripties.
2. Het onderwijs wordt gegeven en de tentamens/examens worden afgenomen in het Nederlands.
3. In afwijking van het gestelde onder 2 kan een andere taal dan het Nederlands worden gehanteerd, indien de specifieke aard van het onderwijs daartoe noodzaakt.
4. Het gebruik van een vreemde taal in een opleiding wordt vastgelegd in de betreffende onderwijs- en examenregeling (OER).
5. Aan het gebruik van een vreemde taal in (delen van) de opleiding dienen primair onderwijskundige redenen ten grondslag te liggen. Onderwijskundige redenen zijn in ieder geval aanwezig indien:
 - 5.1. de opleiding specialismen bevat waarvoor kennis van de taal, een andere dan het Nederlands, onmisbaar is;
 - 5.2. het onmisbaar wordt geacht om onderdelen in een andere dan de Nederlandse taal te geven als onderdeel van vaardigheid in het desbetreffende vakgebied van de opleiding;
 - 5.3. het onderdelen betreft die speciaal gericht zijn op buitenlandse studenten.
6. Het gebruik van een vreemde taal mag niet leiden tot verzwaring van de studielast, tot aantasting van het kwaliteitsniveau van de opleiding of tot benadeling van studenten bij tentamens.

Appendix 4: Regulations Governing Fraud and Plagiarism for UvA Students

REGULATIONS GOVERNING FRAUD AND PLAGIARISM FOR UvA STUDENTS

Adopted by the Executive Board in 2008, last amended in May 2010

Disclaimer: This translation is provided for information purposes only. In the event of a difference of interpretation, the original Dutch version of this document is binding.

Article 1 Definitions

1. Fraud and plagiarism are defined as any act or omission on the part of the student which makes an accurate assessment of his/her knowledge, insight and skills partially or wholly impossible.
2. Fraud is taken to include in any event:
 - a. being in possession during an examination of any aids (pre-programmed calculator, mobile telephone, books, outlines, notes, etc.) the use of which is not expressly permitted;
 - b. attempting during an examination to read what another candidate is writing, or exchanging information inside or outside the examination room;
 - c. assuming the identity of another person during an examination;
 - d. allowing someone else to assume one's identity during an examination;
 - e. obtaining possession of the questions in the examination paper prior to the scheduled date or time of the examination concerned;
 - f. fabricating and/or falsifying survey or interview answers or research data.
3. Plagiarism is taken to include in any event:
 - a. making use of or reproducing another person's texts, data or ideas without complete and correct acknowledgement of the sources;
 - b. presenting the structure or central body of ideas taken from third-party sources as one's own work or ideas, even if a reference to other authors is included;
 - c. failing to clearly indicate in the text – for instance by means of quotation marks or a particular layout – that literal or near-literal quotations have been included in the work, even if a correct reference to the sources has been included;
 - d. paraphrasing the contents of another person's texts without sufficient reference to the sources;
 - e. reproducing another person's audio, visual or test materials, or software or program codes without reference to the sources, and in doing so passing these off as one's own work;
 - f. submitting a text that has previously been submitted, or is similar to a text that has previously been submitted, in the context of assignments for other courses;
 - g. reproducing the work of fellow students and passing it off as one's own;
 - h. submitting papers obtained from a commercial agency or written (whether or not for payment) by another person.
4. 'Examination Board' is taken to mean the Examination Board of the study programme responsible for the course concerned.
5. 'Examination' is taken to mean any examination per course component of the knowledge, insight and skills of the student, which results in an assessment.

Article 2 Complicity

1. Sanctions may be imposed on both the perpetrator and the co-perpetrator of fraud and plagiarism.
2. If the work of a fellow student is reproduced with the consent and/or cooperation of the fellow student, the latter is a co-perpetrator of plagiarism.

3. If one of the authors of a joint paper commits plagiarism, the other authors are co-perpetrators of plagiarism if they could have known or should have known that the other author committed plagiarism.

Article 3 Detection of plagiarism

Electronic detection software programs may be used to detect plagiarism in texts. In submitting a text, a student implicitly consents to the text being entered into the database of the detection program concerned.

Article 4 Procedure

1. If a case of fraud and/or plagiarism is detected, the examiner shall immediately inform the student and, at the same time, notify the Examination Board in writing, with submission of the texts and findings.
2. The Examination Board shall give the student the opportunity to be heard within a period of 2 weeks.
3. The Examination Board shall determine whether fraud or plagiarism has been committed and shall notify the student in writing of its decision and sanctions in accordance with Article 4 in conjunction with Article 5, within a period of 4 weeks, stating the possibility of appeal with the Examinations Appeals Board.
4. If plagiarism is detected or suspected in a specific paper, the Examination Board may decide to investigate papers previously submitted by the same student(s) for plagiarism. The student is obliged to cooperate with any such investigation and may be required to provide digital versions of previous papers.
5. Sanctions imposed shall be recorded in the student's records.

Article 5 Sanctions in the event of fraud

Where fraud has been established, the Examination Board shall impose the following sanctions:

1. In the event of conduct as specified in Article 1, paragraph 2 under a and b, the examination submitted shall be declared invalid and the student shall be excluded from participation in the first subsequent examination or possibly the first two subsequent examinations for the course concerned.
2. In the event of conduct as specified in Article 1, paragraph 2 under c to f, the work that has been produced with the aid of fraud shall be declared invalid and the student shall be totally excluded from participation in all interim or other examinations or any other forms of assessment in the study programme for a maximum period of 12 months. In the event of serious fraud, the Examination Board may advise the Executive Board to permanently terminate the enrolment of the student concerned.
3. In the event of conduct not covered by these Regulations and depending on the seriousness of the fraud, the Examination Board may impose the following sanctions:
the examination submitted may be declared invalid; the student may be excluded from participation in the examination concerned for a maximum period of 12 months; the student may be totally excluded from participation in all interim or other examinations or any other forms of assessment in the study programme for a maximum period of 12 months. In the event of serious fraud, the Examination Board may also advise the Executive Board to permanently terminate the enrolment of the student concerned.
4. If the student has already been penalised on a former occasion for fraud or plagiarism, he/she shall be totally excluded from participation in all interim or other examinations or any other forms of assessment for the study programme for a maximum period of 12 months, and shall be advised to leave the study programme. In the event of serious fraud and on the advice of the Examination Board, the Executive Board may also permanently terminate the enrolment of the student concerned.

5. The Examination Board shall not grant any exemptions based on results obtained elsewhere during the period of exclusion from examinations for the study programme that was imposed on the student in accordance with this Article.
6. If the student is enrolled for more than one study programme, the Examination Board shall consult with the Examination Board(s) of the relevant study programme(s) before imposing any sanction.
7. If the detected misconduct concerns a module of the Honours programme, the Examination Board may rule that further participation in the programme shall be denied.

Article 6 Sanctions in the event of plagiarism

The Examination Board shall impose the following sanctions in the event of plagiarism:

1. If the case involves conduct as specified in Article 1, paragraph 3, whereby certain sections of existing texts have been reproduced but the student has in fact conducted his/her own research, the paper submitted shall be declared invalid and the student shall be excluded from participation in the examination of the course concerned or totally excluded from participation in all interim or other examinations or any other forms of assessment for the study programme for a maximum period of 6 months. If the paper is related to a Bachelor's or Master's thesis, the supervisory activities of the thesis supervisor shall be suspended for the duration of this period.
2. In the event of conduct as specified in Article 1, paragraph 3, whereby the entire paper or considerable sections of it, including the research presented as being the student's own work, is derived from existing material and research or literature published elsewhere, the paper submitted shall be declared invalid and the student shall be excluded from participation in the examination of the course in question or totally excluded from participation in all interim or other examinations or any other forms of assessment for the study programme for a maximum period of 12 months. In the event of serious fraud and on the advice of the Examination Board, the Executive Board may also permanently terminate the enrolment of the student concerned. If the paper is related to a Bachelor's or Master's thesis, the supervisory activities of the thesis supervisor shall be suspended for the duration of this period.
3. If, after the investigation conducted in accordance with Article 4, paragraph 4, it becomes apparent that plagiarism has been committed on a former occasion, the Examination Board may rule that the results obtained previously for course components that were achieved by means of plagiarism shall be declared invalid.
4. In the event of conduct not covered by these Regulations, and depending on the seriousness of the plagiarism, the Examination Board may impose the following sanction: the paper submitted may be declared invalid and the student excluded from participation in the examination of the course in question or totally excluded from participation in all interim or other examinations or any other forms of assessment for the study programme for a maximum period of 12 months. In the event of serious fraud and on the advice of the Examination Board, the Executive Board may permanently terminate the enrolment of the student involved. If the paper is related to a Bachelor's or Master's thesis, the supervisory activities of the thesis supervisor shall be suspended for the duration of this period.
5. If the student has already been penalised on a former occasion for fraud or plagiarism, he/she shall be totally excluded from participation in all interim or other examinations or any other forms of assessment for the study programme for a maximum period of 12 months, and shall be advised to leave the study programme. In the event of serious fraud and on the advice of the Examination Board, the Executive Board may permanently terminate the enrolment of the student involved.
6. The Examination Board shall not grant any exemptions based on results obtained elsewhere during the period of exclusion from examinations for the study programme that was imposed on the student in accordance with this Article.

7. If the student is enrolled for more than one study programme, the Examination Board shall consult with the Examination Board(s) of the relevant study programme(s) before imposing any sanction.

8. If the detected misconduct concerns a module of the Honours programme, the Examination Board may rule that further participation in the programme shall be denied.

Article 7 Effective date, official title

These Regulations enter into force as of 1 September 2010, upon the simultaneous revocation of the 'Regulations Governing Fraud and Plagiarism for UvA Students 2007', and may be cited as the 'Regulations Governing Fraud and Plagiarism for UvA Students' (*Regeling Fraude en Plagiaat Studenten UvA*).

EXPLANATORY NOTES TO THE 'REGULATIONS GOVERNING FRAUD AND PLAGIARISM FOR UvA STUDENTS'

These uniform Regulations have been drawn up on the advice of the Working Group for the prevention and combating of plagiarism and fraud by students, and in consultation with the Examination Boards. The Regulations are part of a broader fraud and plagiarism policy and above all provide clear definitions of fraud and plagiarism and guidelines concerning possible sanctions.

Definitions

The Regulations apply to all students studying at the UvA, i.e. including exchange students, external students and contract students. Although plagiarism may also be considered a form of fraud, the two concepts are referred to separately. This simplifies the task of providing definitions and specifying the various sanctions. The definition in Article 1 is only applicable to interim and other examination situations. This means that the Regulations do not apply to plagiarism in draft chapters or other preparatory documents for a thesis or paper. If a lecturer or supervisor detects plagiarism in the preparatory phase, it stands to reason that he/she shall call the student to account and point out that if the draft text were to be submitted as the definitive text, this would lead to a problem. It is important that there never be uncertainty as to which particular Examination Board is dealing with an issue. Problems can arise in this regard, especially where electives are concerned. The principle underlying the Regulations is that the Examination Board under which the course component in question falls, bears responsibility. If the student is enrolled for more than one study programme, the Examination Board must consult with the Examination Board(s) of the study programme(s) concerned before imposing any sanction. Article 2 states that in addition to the perpetrator, the co-perpetrator or 'colluder' is also liable to sanctions. The 'perpetrator' takes the initiative to commit the act, whereas the 'co-perpetrator' actively participates in this. According to paragraphs 2 and 3, such collusion is punishable. A colluder may be re-proached for specific conduct or for refraining from specific conduct.

Procedure

In the event that fraud or plagiarism is suspected, the examiner shall immediately inform the Examination Board. The Examination Board is responsible for the subsequent procedure. This provision ensures that no undesirable opportunity for negotiation arises between the examiner and the student. Moreover, the Examination Board is in a better position to ensure the exercise of due care in the procedure and to safeguard the student's legal interests. The sanctions imposed shall be recorded in the student's records. This refers to the file – whether in written or electronic form – kept by the student administration of each faculty.

Sanctions

In accordance with the provisions of Section 7.12b, paragraph 2, of the Dutch Higher Education and Research Act (WHW), in the event of fraud and plagiarism the Examination Board is authorised to exclude the student from one or more interim or other examinations for the study programme as indicated by the Examination Board, for a maximum period of one year. A new provision in the WHW allows for the possibility that the Examination Board may advise the Executive Board to permanently terminate the enrolment of the student concerned. When a sanction is imposed, it must be clearly stated to which interim or other examinations in the study programme the exclusion applies. In determining the sanctions policy of these Regulations, the aim has been to follow the legal precedents already established by Examination Boards and the Examinations Appeals Board. Whether serious fraud has been committed on the grounds of which the Executive Board may decide to permanently terminate the enrolment of the student at the institution, shall be investigated on an individual basis.

Implementation

Under Section 9.5 of the WHW, the Executive Board may establish guidelines concerning the Dean's authority in accordance with Section 9.15, paragraph 1 of the WHW, to determine the Teaching and Examination Regulations. The Regulations Governing Fraud and Plagiarism include a guideline instructing the dean to incorporate the unabridged version of these Regulations in the Teaching and Examination Regulations no later than at the start of the academic year 2009-2010. Specific situations concerning study programmes may be included as supplementary regulations.

UNIVERSITY OF AMSTERDAM
FACULTY OF SCIENCE
EDUCATION AND EXAMINATION REGULATIONS
Academic Year 2012 - 2013
PART B

THE MASTER'S PROGRAMME IN LOGIC

September 1st 2012

Chapter 1	Objectives and Exit Qualifications of the Study Programme
Article 1.1	Objectives
Article 1.2	Exit qualifications
Chapter 2	Admission Requirements
Article 2.1	Admission to the study programme
Chapter 3	Organisation of the Curriculum
Article 3.1	The final examination of the study programme
Article 3.2	Full-time / part-time
Article 3.3	Semesters
Chapter 4	Content and Study Load of the Components
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Article 4.2	Content of the programme
Article 4.3	Study programme
Article 4.4	Electives Master of Science in Logic
Article 4.5	Graduation Procedure Master of Science in Logic
Article 4.6	Transitional provisions
Chapter 5	Additional regulations
Article 5.1	Order of the examinations
Article 5.2	Number of examination opportunities
Article 5.3	Traineeship
Article 5.4	Double Master's Programme

Chapter 1 Objectives and Exit Qualifications of the Study Programme

Article 1.1 Objectives

The aim of the Master of Science in Logic programme is to create an international, interdisciplinary and research-oriented learning environment in which students are educated as researchers in the area of Logic, Language and Information. Graduates will obtain the degree of Master of Science.

Article 1.2 Exit qualifications

On the basis of the acquired knowledge, understanding and skills, students that have successfully completed the programme are able to carry out interdisciplinary research in the area of Logic, Language and Information, either as a PhD student or in an application-directed environment.

1. The insight of a graduate of the MSc Logic is based on
 - a solid foundation in the most important aspects of logic, and its applications in computer science, linguistics, philosophy and mathematics;
 - specialized knowledge at an advanced level of one or more of the following research areas: Logic & Computation, Logic & Language, Logic & Mathematics, Logic & Philosophy.
2. The acquired skills lie in the area of research and communication. More specifically, a graduate of the MSc Logic is able to
 - formulate research questions, and address these in a research plan;
 - make a contribution to the theories and research methods in the area of expertise;
 - critically evaluate contributions to their field of expertise, based on an awareness of its research traditions and conventions;
 - collaborate with others in a multidisciplinary team;
 - deliver and defend presentations of their own work, both orally and in writing.
3. Finally, a graduate possesses
 - the intellectual mobility to transcend traditional boundaries between the academic disciplines that border the specialization area.

Chapter 2 Admission Requirements

Article 2.1 Admission to the study programme

1. Students have to apply for admission to the Master's Programme in Logic (application form, accompanied by a letter of motivation, transcripts, two letters of recommendation; see <http://www.ilc.uva.nl/MScLogic/application/>).
2. Applicants must have at least a Bachelor's or equivalent degree in one of the following fields:
 - computer science
 - artificial intelligence
 - mathematics
 - philosophy
 - linguisticsApplicants with a first degree in another field may also be considered, provided they have an appropriate formal background. The final decision lies with the Board of Examiners.
3. All applicants must have a reasonable background in logic, affinity with mathematical and formal thinking and some familiarity with mathematical proofs. In practice, this means that we expect that incoming students have had a formal introduction to logic up to the completeness theorem for first-order logic and have taken courses requiring mathematical or formal reasoning.
4. In addition, applicants are required to have a strong academic record, and must satisfy the English language requirements.
5. Advanced students (typically students who already have an MSc or MA degree in a related subject) can request the Board of Examiners to accept some of their European Credits (EC) from a different programme as transfer EC, exempting them from part of the 120 EC of the MSc in Logic on the basis of a strong academic record and relevant courses they have taken. Each application will be individually judged by the Board of Examiners. Depending on the number of transfer EC it is possible to complete the MSc programme in three or even two semesters.

Chapter 3 Organisation of the Curriculum

Article 3.1 The final examination of the study programme

The Master's Programme consists of a two-year programme with a total study load of 120 EC .

Article 3.2 Full-time / part-time

The study programme is provided on a full-time basis only.

Article 3.3 Semesters

The academic year is divided in two semesters. Each semester is divided in three periods of 8, 8, and 4 weeks (period a, b and c) respectively.

Students can start the study programme in semester 1 (September) or in semester 2 (February).

Chapter 4 Content and Study Load of the Components

Article 4.1 General

The MSc Logic is a two-year research master with four specialization areas ('tracks'):

- Logic and Computation (L&C)
- Logic and Language (L&L)
- Logic and Mathematics (L&M)
- Logic and Philosophy (L&P)

Article 4.2 Content of the programme

Article 4.2.1 Programme structure and content

1. The MSc Logic programme consists of:
 - Obligatory courses
 - Track Courses (varied number of EC; see 4.3)
 - Electives (varied number of EC; see 4.3)
 - Thesis Master of Logic (30 EC)
2. Obligatory Courses:
 - "Logic, Language and Computation" (3 EC)
 - "Research Project Master of Logic" (6 EC). Each student will have to take a total of at least 6 EC in research projects. These projects can either be done in period c of the first, second or third semester or as individual research projects at any time.
3. Track Courses:

The courses in the obligatory part are determined by the student's area of specialization:

 - Track Logic and Computation: "Computational Complexity" (6 EC) and "Recursion Theory" (6 EC).
 - Track Logic and Language: "Meaning, Reference and Modality" (6 EC), and "Structures for Semantics" (6 EC).
 - Track Logic and Mathematics: "Model Theory" (6 EC), and "Proof Theory" (6 EC).
 - Track Logic and Philosophy: "Meaning, Reference and Modality" (6 EC), "Kant, Logic and Cognition" (6 EC), and "Philosophical Logic" (6 EC).
4. Elective courses: to be chosen out of the courses in table 4.4. Up to 20 EC may be chosen from other master programmes.
5. Thesis Master of Logic (30 EC).
6. Students are expected to attend at least ten research colloquia and to participate in seminars such as: DIP colloquium; Logic Tea; Colloquium on Mathematical Logic; Computational Social Choice Seminar; Algebra|Coalgebra Seminar; Computational Linguistics Seminar, Dynamic Logic Seminar. This is a requirement for starting the Thesis Master of Logic.
7. The MSc Logic offers an additional course 'Basic Logic' (6 EC) covering the basics of mathematical logic for students from a humanities background. In the admission process, the Board of Examiners can require students to follow Basic Logic, or recommend that the student follows 'Basic Logic'. Other students need permission from the Board of Examiners to use 'Basic Logic' as part of their course list for graduation.

Article 4.2.2 Undergraduate level courses

Up to 12 EC of the elective EC can be used for undergraduate level courses (BA or BSc) to make up for deficiencies in the student's education prior to joining the MSc Logic. These will be determined in agreement with the student's academic mentor. The Board of Examiners can allow the inclusion of more than 12 EC of undergraduate EC.

Article 4.2.3 Elective courses

Elective courses will be chosen with the consent of the Board of Examiners.

Article 4.2.4 Transfer credits and exemptions

1. A student may apply to the Board of Examiners for the approval of transfer credits for courses taken at a different programme. This is only possible for courses at Master's level that are directly relevant to the MSc Logic programme and only in case there is no overlap with other courses taken by the student. By default, all transfer credits are registered with a pass grade and will not be taken into account to compute the student's grade point average. At most 40 EC of the student's course programme can consist of such transfer credits.
2. A student may also apply to the Board of Examiners for exemption from the requirement to take a track-specific obligatory course if they already possess the knowledge taught in that course. Such requests will only be granted in highly exceptional circumstances. If such a request is granted, the student must take additional elective course to obtain a sufficient number of ECs for graduation.

Article 4.3 Study Programme**Article 4.3.1 Track Logic and Computation**

	EC	Semester	period
Semester 1:			
Logic, Language and Computation	3	1	ab
Computational Complexity	6	1	b
(Inleiding Modale Logica/Introduction to Modal Logic)**	(6)	1	ab
(Research Project Master of Logic)*	(6)	1	a, b or c
Elective courses	9/15/21	1	ab
Semester 2:			
Recursion Theory	6	2	b
(Research Project Master of Logic)*	(6)	2	a, b or c
Elective courses	18/24	2	ab
Semester 3:			
(Research Project Master of Logic)*	(6)	1	a, b or c
Elective courses	24/30	1	ab
Semester 4:			
Thesis Master of Logic	30	2	abc

*: In the first, second or third semester.

** : Students with a deficiency in modal logic have to take the course "Introduction to Modal Logic" as an elective course.

Article 4.3.2 Track Logic and Language

	EC	semester	period
Semester 1:			
Logic, Language and Computation	3	1	ab
Meaning, Reference and Modality	6	1	a
(Research Project Master of Logic)*	(6)	1	a, b or c
Elective courses	15/21	1	ab
Semester 2:			
Structures for Semantics	6	2	b
(Research Project Master of Logic)*	(6)	2	a, b or c
Elective courses	18/24	2	ab
Semester 3:			
(Research Project Master of Logic)*	(6)	1	a, b or c
Elective courses	24/30	1	ab
Semester 4:			
Thesis Master of Logic	30	2	abc

*: In the first, second or third semester.

Article 4.3.3 Track Logic and Mathematics

	EC	semester	period
Semester 1:			
Logic, Language and Computation	3	1	ab
Proof Theory	6	1	a
(Inleiding Modale Logica/Introduction to Modal Logic) **	(6)	1	ab
(Research Project Master of Logic)*	(6)	1	a, b or c
Elective courses	9/15/21	1	ab
Semester 2:			
Model Theory	6	2	a
(Axiomatische Verzamelingsentheorie/Axiomatic Set Theory) ***	(6)	2	ab
(Research Project Master of Logic)*	(6)	2	a, b or c
Elective courses	12/18/24	2	ab
Semester 3:			
(Research Project Master of Logic)*	6	1	c
Elective courses	24/30	1	ab
Semester 4:			
Thesis Master of Logic	30	2	abc

*: In the first, second or third semester.

**: Students with a deficiency in modal logic have to take the course “Introduction to Modal Logic” (6 EC) as an elective course.

***: Students with a deficiency in set theory have to take the course “Axiomatische Verzamelingsentheorie (Axiomatic Set Theory)” (6 EC) as an elective course.

Article 4.3.4 Track Logic and Philosophy

	EC	semester	period
Semester 1:			
Logic, Language and Computation	3	1	ab
Meaning, Reference and Modality	6	1	a
(Research Project Master of Logic)*	(6)	1	a, b or c
Elective courses	15/21	1	ab
Semester 2:			
Kant, Logic & Cognition	6	2	a
Philosophical Logic	6	2	ab
(Research Project Master of Logic)*	(6)	2	a, b or c
Elective courses	12/18	2	ab
Semester 3:			
(Research Project Master of Logic)*	(6)	1	a, b or c
Elective courses	24/30	1	ab
Semester 4:			
Thesis Master of Logic	30	2	abc

*: In the first, second or third semester.

Article 4.4 Electives Master of Science in Logic**First and third semester:**

- Basic Logic (6 EC) - only for students with a weak mathematical background, students require permission of the Board of Examiners to enroll.
- Capita Selecta: Modal Logic, Algebra, Coalgebra (6 EC)
- Capita Selecta: Set Theory (6 EC)
- Computational Complexity (6 EC; elective only for tracks L&L, L&M and L&P, compulsory for track L&C)
- Computational Semantics and Pragmatics (6 EC)
- Computational Social Choice (6 EC)
- Concurrency Theory (6 EC)
- Elements of Language Processing and Learning (3 EC)
- Inleiding Modale Logica (Introduction to Modal Logic; 6 EC)
- Introduction to Modern Cryptography (6 EC)
- Language and Games (12 EC)
- Language and Optimality (6 EC)
- Logic and Conversation (6 EC)
- Logic, Knowledge and Science (6 EC)
- Machine Learning: Principles and Methods (6 EC)
- Meaning, Reference and Modality (6 EC; elective only for tracks L&M and L&C, compulsory for tracks L&L and L&P)
- Philosophical Logic (6 EC; elective only for tracks L&C, L&L, L&M, compulsory for track L&P)
- Philosophy of Language: An Extensive Introduction (6 EC)
- Proof Theory (6 EC; elective only for tracks L&C, L&L and L&P, compulsory for track L&M)
- Radical Interpretation, hermeneutics and Forms of Life (12 EC)

- Rationality, Cognition and Reasoning (12 EC)

Second and fourth semester:

- Advanced Strategic Game Theory (6 EC)
- Axiomatische Verzamelingsentheorie (Axiomatic Set Theory; 6 EC)
- Combinatorics with Computer Science Applications (6 EC: will be given in 2013-2014, will NOT be given in 2012-2013)
- Cognitive Models of Language (6 EC)
- Cooperative Games (6 EC)
- Ethics, ontology, life – Wittgenstein's later work (12 EC)
- Formal Learning Theory (6 EC)
- Kant, Logic and Cognition (6 EC; elective only for tracks L&M, L&L and L&C, compulsory for track L&P)
- Kolmogorov Complexity (6 EC)
- Mathematical Structures in Logic (6 EC)
- Model Theory (6 EC; elective only for tracks L&L, L&C and L&P, compulsory for track L&M)
- Music Cognition (6 EC)
- Neural Nets & Symbolic Reasoning (6 EC)
- Neurophilosophy of Free will (6 EC)
- Neurophilosophy of Self (6 EC)
- Pragmatics and the Lexicon (6 EC)
- Quantum Computing (6 EC)
- Reasoning with Uncertainty (6 EC)
- Recursion Theory (6 EC; elective only for tracks L&L en L&P, compulsory for tracks L&M and L&C)
- Seminar Mathematical Logic (3 EC)
- Statistical Structure in Language Processing (6 EC)
- Structures for Semantics (6 EC; elective only for tracks L&M, L&P and L&C, compulsory for track L&L)
- Topics in Dynamic Epistemic Logic (6 EC)
- Transcendental Logic, Space and Time (6 EC)
- Unsupervised Language Learning (6 EC)

Article 4.5 Graduation Procedure Master of Science in Logic

1. The official graduation procedure MSc in Logic (approved by the Board of Examiners) can be read and downloaded from the ILLC website:
<http://www.illc.uva.nl/MScLogic/graduation/index.html>.
2. Before starting with the Thesis students have to fill in the 'Approval of individual programme content MSc Logic' (to be downloaded from the website). Students can only do so when they have finished all coursework except for at most 20 EC. See Article 5.1.2.

Article 4.6 Transitional provisions

1. These regulations have been laid down in writing and formally approved by the Board of Examiners.
2. Students who started before 2010 and still need to pass the course 'Core Logic' can satisfy this requirement by passing 'Logic, Language, and Computation' instead.
3. In situations that are not covered by these regulations, the Board of Examiners will decide.

Chapter 5 Additional Regulations

Article 5.1 Order of the examinations

1. The student may participate in examinations of a component only after the student has shown that he/she has the necessary prerequisite knowledge. To that end, a student must have passed the subjects stated in the study guide (per course or component), which are considered to be prerequisite knowledge for that course or component.
2. The student may start with the thesis only if no more than 20 registered EC of the total of 90 EC for all courses are missing, and the student's study programme has been approved by the Board of Examiners.
3. The student cannot defend his/her thesis before all other courses from his study programme are passed and all grades are registered.
4. At the request of a student, the Board of Examiners may deviate from the provisions of paragraphs 1 and 2 for the benefit of this student.

Article 5.2 Number of examination opportunities

1. In accordance with Part A of these Regulations, a student will have the opportunity two times a year to take examinations.
2. Contrary to the provisions of paragraph 1, the assessment of projects in which several students have worked on an assignment will only be made at the end of the relevant teaching period. In principle, an individual resit is not possible.
3. If a student feels that on account of exceptional circumstances the assessment, referred to in paragraph 2, is not a realistic assessment of his/her effort, knowledge, skills or insights, the student may request the Board of Examiners to nevertheless permit an individual test and/or resit.

Article 5.3 Traineeship

1. A part of the free elective space may be used for an external traineeship.
2. For that purpose the student will prepare a subject description including the aim and content of the traineeship. The student will seek a supervisor for the traineeship amongst the staff of the master programme (or the staff of the related research institute).
3. A traineeship may amount to a maximum of 10 EC.
4. Participation in a summer school may also be regarded as an external traineeship.
5. The approval of the Board of Examiners is required for a traineeship to be included in the student's study programme.

Article 5.4 Double Master's Programme

1. In order to obtain two Master's degrees the student must pass the compulsory components of both programmes.
2. Students first have to follow the other programme completely, and then the MSc Logic as "fast track student" (according to which 40 EC will be exempted).
3. If a component is compulsory in both study programmes, the number of EC to be obtained in the set of elective courses of one of the two study programmes will be increased by the number of EC of that compulsory component, to be determined by the Board of Examiners.
4. The student must conduct two research theses with two separate defences.
5. The Boards of Examiners of the two study programmes must both approve the student's study programme.

APPENDIX E

ASSESSMENT OF MSc THESES

In this appendix we reproduce the guidelines given to the members of a thesis committee. This text was approved by the MSc Logic’s Board of Examiners on 14 December 2011 and the procedure described here has been implemented since August 2012 (with minor amendments approved by the Board of Examiners on 8 October 2012).

E.1 Guidelines for the Assessment of MSc Theses

- (1) The research thesis presented by the student serves as a demonstration of thorough knowledge of the selected topics and of a solid grasp of the pertinent research methods. It should prove that the candidate possesses high-level independent learning, written communication and information retrieval skills.
- (2) In order to be accepted as an MSc thesis, the text needs to meet the minimal standards regarding the following five criteria:
 - **correctness**
 - **writing**
 - **difficulty**
 - **originality**
 - **independence**

The meaning and scope of these criteria is described in below.

- (3) In order to get a *cum laude* grade (8 or higher), a thesis must be evaluated as “above the university average for Master’s thesis” for all five criteria, and well beyond this level for at least one of them.
- (4) Two weeks after the official version of the thesis was submitted to the committee (at least seven days before the thesis defense), each committee member has to send a brief assessment to the committee chair. This assessment should contain:
 - (a) An indication of the possible grades (can be an interval).
 - (b) A brief statement (one to two sentences) on each of the five evaluation criteria (the statement can be “I cannot judge this”).

In case at least one committee member has doubts about the acceptability of the thesis, the committee chair will open a discussion about whether the thesis defense has to be cancelled. After hearing from all committee members, the thesis committee chair will cancel the defense if there is no committee consensus that the thesis can be accepted.

- (5) The committee chair will compile the committee comments on the criteria into a draft of the *Thesis Evaluation* that will be sent to all committee members the day before the defense and that will be brought to the defense. During the committee discussion after the student's presentation, the committee will edit this draft and create a consensus for the official *Thesis Evaluation*. The text will consist of a brief comment (one to two sentences) on each of the five criteria, a comment on the presentation, and a summarising paragraph. The text does not mention any grades. The grade of the thesis will be determined based on this text, taking all five criteria as well as the presentation into account.
- (6) After the committee deliberations, the chair will invite the student to join the committee and will announce the verdict in the form of the summarising paragraph of the *Thesis Evaluation*. The student will receive a signed information sheet stating the grade.
- (7) Within one week after the defense, the committee chair finalises the *Thesis Evaluation* on the basis of the discussion in the committee and creates the official *Thesis Evaluation* that is signed by the Board of Examiners and handed to the student and the ESC for the registration of the grade.

E.2 Description of Criteria

Correctness. The criterion of correctness judges whether the thesis contains mistakes, either of mathematical or scholarly nature. Mistakes can be mathematical or technical errors, historical mis-attributions, improper use of experimental or other empirical techniques, faulty arguments, improper bibliographical work, or, in general, any lack of skill that will be expected of a researcher in the field of the thesis. For a *cum laude* grade, only minor and easily fixable mistakes of this type may be contained in the thesis.

Writing. The criterion of writing judges the level of academic writing of the candidate. This includes the technical jargon of the field of the thesis and the accepted writing style of papers in that research area as well as the communication to a wider academic audience, highlighting the achievements of the thesis for a non-specialist readership. For a *cum laude* grade, a thesis has to exhibit a firm command of both writing skills.

Difficulty. The criterion of difficulty encompasses things like the mathematical subtlety of the topic, the problems with the empirical experiments that were encountered, the amount of reading that was required, and in general scholarly and scientific skills that were required for writing the thesis, depending on the area the thesis is written in.

Originality. Originality is not a requirement for MSc theses in general, but is one of the main discerning factors for the different *cum laude* grades. Originality is witnessed by results that go beyond the published literature, possibly even including results that are strong enough to be published in a good journal or a proceedings volume of a selective conference of the field. The *cum laude* grades require at least some level of originality.

Independence. As with originality, independence is not a requirement for MSc theses in general, but is one of the main discerning factors for the different *cum laude* grades. The research in an MSc thesis was independent when some results were produced by the student without direct intervention of the supervisor. The *cum laude* grades require at least some level of independence.

APPENDIX F

ACADEMIC STAFF

In this appendix we provide an overview of the academic staff allocated to the MSc Logic.

F.1 Staff Listing

Teaching in the MSc Logic is provided by a large number of individuals. One of the strengths of the programme is that it is flexible enough to accommodate, for instance, one-off intensive courses and group projects offered by visiting scientists from abroad or joint research activities between Master’s students and PhD students. This makes it hard, if not impossible, to provide a full list of all teachers who have contributed to the programme over the years. Instead, we provide here a list of the *core group* of academic staff responsible for the programme. This group includes most of the senior scientists working at the ILLC, as well as two colleagues from the UvA’s Institute of Informatics. Together, this group has delivered well over 90% of the ECTS credit points awarded to MSc Logic students in recent years. Furthermore, this group includes all members of staff currently (in January 2013) serving as academic mentors or serving on any of the committees associated with the MSc Logic programme.

As per NVAO guidelines, for each member of staff we list their name, their position, the extent of their appointment (number of FTE at the UvA, covering both teaching and research), and their area of expertise. We do not explicitly list the highest academic qualification for each member of staff; it is the PhD in all cases.¹

- (1) **Name:** Maria Aloni (PhD Amsterdam, 2001)
Position: Assistant Professor (UD)
Appointment: 1.0 FTE
Expertise: formal semantics and pragmatics; philosophy of language
- (2) **Name:** Krzysztof Apt (PhD Warsaw, 1974)
Position: Full Professor (HGL)
Appointment: 0.2 FTE
Expertise: economics and computation; semantics of programming languages
- (3) **Name:** Alexandru Baltag (PhD Indiana-Bloomington, 1998)
Position: Associate Professor (UHD)
Appointment: 1.0 FTE
Expertise: modal logic; formal epistemology; logic in computer science; logic and game theory

¹To be precise, some members of staff are also in possession of a *habilitation* degree, on top of the PhD.

- (4) **Name:** Johan van Benthem (PhD Amsterdam, 1977)
Position: University Professor of Pure and Applied Logic
Appointment: 1.0 FTE
Expertise: modal logic; logic and computation; philosophical logic; logic and game theory
- (5) **Name:** Reinhard Blutner (PhD Leipzig, 1975)
Position: Assistant Professor (UD)
Appointment: 1.0 FTE
Expertise: formal semantics; theoretical linguistics; optimality theory; quantum cognition
- (6) **Name:** Rens Bod (PhD Amsterdam, 1995)
Position: Full Professor (HGL)
Appointment: 1.0 FTE
Expertise: computational linguistics; computational musicology; computational cognition; history of the humanities
- (7) **Name:** Elsbeth Brouwer (PhD Amsterdam, 2003)
Position: Instructor (*docent*)
Appointment: 0.8 FTE
Expertise: philosophy of language; philosophy of mind and cognition; epistemology
- (8) **Name:** Harry Buhrman (PhD Amsterdam, 1993)
Position: Full Professor (HGL)
Appointment: 0.2 FTE
Expertise: quantum computing; algorithms and complexity theory; computational biology
- (9) **Name:** Paul Dekker (PhD Amsterdam, 1993)
Position: Assistant Professor (UD)
Appointment: 1.0 FTE
Expertise: philosophy of language; formal semantics and pragmatics
- (10) **Name:** Jan van Eijck (PhD Groningen, 1985)
Position: Full Professor (HGL)
Appointment: 0.2 FTE
Expertise: natural language and programming language semantics; modal and epistemic logic
- (11) **Name:** Ulle Endriss (PhD London, 2003)
Position: Associate Professor (UHD)
Appointment: 1.0 FTE
Expertise: logic in artificial intelligence; economics and computation; knowledge representation; multiagent systems
- (12) **Name:** Raquel Fernández (PhD London, 2006)
Position: Assistant Professor (UD)
Appointment: 1.0 FTE
Expertise: computational linguistics; semantics and pragmatics; dialogue modelling

- (13) **Name:** Jeroen Groenendijk (PhD Amsterdam, 1984)
Position: Full Professor (HGL)
Appointment: 1.0 FTE
Expertise: philosophy of language; formal semantics and pragmatics
- (14) **Name:** Henkjan Honing (PhD London, 1991)
Position: Full Professor (HGL)
Appointment: 1.0 FTE
Expertise: music cognition
- (15) **Name:** Dick de Jongh (PhD Wisconsin-Madison, 1968)
Position: Professor Emeritus
Appointment: 1.0 FTE
Expertise: nonclassical logics; intuitionism; formal learning theory
- (16) **Name:** Julian Kiverstein (PhD Edinburgh, 2006)
Position: Assistant Professor (UD)
Appointment: 1.0 FTE
Expertise: phenomenology; embodied cognitive science
- (17) **Name:** Michiel van Lambalgen (PhD Amsterdam, 1987)
Position: Full Professor (HGL)
Appointment: 0.8 FTE
Expertise: logic in cognitive science; mathematical logic; probability theory; philosophy of language
- (18) **Name:** Benedikt Löwe (PhD Berlin, 2001)
Position: Associate Professor (UHD)
Appointment: 0.5 FTE
Expertise: mathematical logic; philosophy of mathematics; applications of logic
- (19) **Name:** Alessandra Palmigiano (PhD Barcelona, 2005)
Position: Assistant Professor (UD)
Appointment: 1.0 FTE
Expertise: algebraic logic; duality theory; nonclassical logics
- (20) **Name:** Alban Ponse (PhD Amsterdam, 1992)
Position: Associate Professor (UHD)
Appointment: 1.0 FTE
Expertise: process algebra; semantics of programming languages
- (21) **Name:** Piet Rodenburg (PhD Amsterdam, 1986)
Position: Instructor (*docent*)
Appointment: 1.0 FTE
Expertise: universal algebra; term rewriting
- (22) **Name:** Robert van Rooij (PhD Stuttgart, 1997)
Position: Assistant Professor (UD)
Appointment: 1.0 FTE
Expertise: philosophical logic; formal semantics and pragmatics; philosophy of language

- (23) **Name:** Khalil Sima'an (PhD Utrecht, 1999)
Position: Associate Professor (UHD)
Appointment: 1.0 FTE
Expertise: natural language processing; computational linguistics
- (24) **Name:** Sonja Smets (PhD Brussels, 2001)
Position: Associate Professor (UHD)
Appointment: 1.0 FTE
Expertise: philosophical logic; philosophy of science; logical foundations of quantum physics; formal epistemology
- (25) **Name:** Martin Stokhof (PhD Amsterdam, 1984)
Position: Full Professor (HGL)
Appointment: 1.0 FTE
Expertise: philosophy of language; formal semantics
- (26) **Name:** Leen Torenvliet (PhD Amsterdam, 1986)
Position: Associate Professor (UHD)
Appointment: 1.0 FTE
Expertise: algorithms and complexity theory
- (27) **Name:** Jouko Väänänen (PhD Manchester, 1977)
Position: Full Professor (HGL)
Appointment: 0.1 FTE
Expertise: set theory; model theory; philosophy of mathematics; logic in computer science
- (28) **Name:** Frank Veltman (PhD Amsterdam, 1985)
Position: Full Professor (HGL)
Appointment: 1.0 FTE
Expertise: logical analysis of natural language
- (29) **Name:** Yde Venema (PhD Amsterdam, 1992)
Position: Full Professor (HGL)
Appointment: 1.0 FTE
Expertise: modal logic; algebraic logic
- (30) **Name:** Ronald de Wolf (PhD Amsterdam, 2001)
Position: Full Professor (HGL)
Appointment: 0.2 FTE
Expertise: quantum computing; algorithms and complexity theory
- (31) **Name:** Henk Zeevat (PhD Amsterdam, 1991)
Position: Associate Professor (UHD)
Appointment: 1.0 FTE
Expertise: theory of grammar; formal semantics and pragmatics; philosophy of language; computational linguistics
- (32) **Name:** Jelle Zuidema (PhD Edinburgh, 2005)
Position: Assistant Professor (UD)
Appointment: 1.0 FTE
Expertise: natural language processing; language cognition; evolution of language

F.2 Basic Teaching Qualification Certificate (BKO)

The BKO is a recently developed training and certification programme for basic didactic skills for university lecturers. All universities in the Netherlands aim at having the majority of their teaching staff certified under this scheme in the coming years.

As of December 2012, **six people** regularly teaching on the MSc Logic programme held a BKO certificate (Brouwer, Endriss, Fernández, Van Lambalgen, Palmigiano, Smets). We expect at least another eight members of the regular teaching staff to complete the BKO training programme in the course of 2013.

Together the six academics with a BKO typically deliver around 1.5 FTE per year in teaching and supervision tasks to the MSc Logic (57 EC in courses in 2011/12, together with an average contribution to supervision tasks). Given that the overall number of FTE spent on the MSc Logic in a typical year is 6.9 FTE (see Appendix F.3), this group is responsible for around **22%** of the programme of the MSc Logic.

Three MSc Logic teachers (Ponse, Veltman, Venema) furthermore hold a formal teaching qualification for highschool Mathematics (*eerstegraads onderwijsbevoegdheid wiskunde*).

F.3 Student-Teacher Ratio

In this section we document how we have calculated the student-teacher ratio given in Section 2.4.4. Recall that the NVAO defines the student-teacher ratio as “the ratio between the total number of full-time students enrolled and the total number of FTE’s logged by the teaching staff of the programme in the most recent academic year”. All data reported below is from the academic year of 2011/12.

Number of students. The number of students enrolled in the MSc Logic in the academic year of 2011/12 has been **67** (to be precise, we use 1 January 2012 as our point of reference). At the same time, there were **3** *Logic Year* and exchange students associated with the programme (who receive the same attention as regular MSc Logic students and therefore need to be taken into account when calculating the student-teacher ratio).

FTE logged for regular courses. In the academic year of 2011/12, the MSc Logic has offered regular courses adding up to a total of 265 EC (source: UvA *Study Guide*). This figure excludes courses offered by other programmes (such as the *MSc Brain and Cognitive Sciences*) explicitly offered to MSc Logic students (the number of MSc Logic students taking such courses is of the same order of magnitude as the number of students from other programmes taking MSc Logic courses). At the UvA’s Faculty of Science a standard course worth 6 EC is usually equated with 0.1 FTE. Hence, the number of FTE logged for courses has been:

$$\frac{265 \text{ EC}}{6 \text{ EC}} \times 0.1 \text{ FTE} \approx \mathbf{4.4 \text{ FTE}}$$

FTE logged for supervision. In the academic year 2011/12 we awarded a total of 393 EC in student research projects (source: FNWI-ESC database). Roughly one third of these were for individual projects and the rest for group projects of 3–12 students per project. Almost all projects were worth 6 EC. Considering the relative workload of running a student project *vs.* teaching a regular course, we count 0.02 FTE per student per 6 EC project on average. That is, the number of FTE for projects amounts to:

$$\frac{393 \text{ EC}}{6 \text{ EC}} \times 0.02 \text{ FTE} \approx \mathbf{1.3 \text{ FTE}}$$

In the academic year of 2011/12 (to be precise, between 1 October 2011 and 30 September 2012), 24 students defended their thesis in the MSc Logic (see Appendix H). If we count 0.05 FTE per thesis supervised, which is appropriate in view of the workload for the supervisor (a thesis is worth 30 EC), we obtain the following sum:

$$24 \times 0.05 \text{ FTE} = \mathbf{1.2 \text{ FTE}}$$

Overall number of FTE. We obtain a sum of $4.4 + 1.3 + 1.2 = \mathbf{6.9 \text{ FTE}}$. Note that this figures do not account for the time spent on administrative tasks, such as committee memberships (e.g., in the Board of Examiners), nor do they include the time spent by academic staff advising students as part of their duties as mentors. They also do not account for the contribution made by teaching assistants (which usually are PhD students).

Student-teacher ratio. In conclusion, we obtain the following student-teacher ratio:

$$(67 + 3) \text{ students} / 6.9 \text{ FTE} \approx \mathbf{10.1 \text{ students per FTE logged}}$$

APPENDIX G

PROGRAMME OFFICIALS

In this appendix we list the people occupying the various official positions in the MSc Logic programme by name. We take January 2013 as our point of reference.

G.1 Director and Administration

The director of the programme is Dr. Ulle Endriss. His work is supported by the programme manager, Tanja Kassenaar.

The MSc Logic is part of the *Graduate School of Informatics* at the UvA's Faculty of Science. The school is directed by Dr. Andy Pimentel (based at the Institute for Informatics). The Master's programmes in the school are supported by a programme coordinator, Kristien van Lunen (based at the Education Service Centre).

G.2 Board of Examiners

- Prof. Dr. Benedikt Löwe (chair)
- Dr. Maria Aloni
- Dr. Alexandru Baltag
- Prof. Dr. Jeroen Groenendijk
- Prof. Dr. Dick de Jongh

G.3 Educational Committee (OC)

- Andreea Achimescu (student, vice-chair)
- Nikhil Maddirala (student)
- Ryan Nefdt (student)
- Iris van de Pol (student)
- Prof. Dr. Frank Veltman (staff, chair)
- Dr. Alexandru Baltag (staff)
- Dr. Paul Dekker (staff)
- Dr. Henk Zeevat (staff)

G.4 Academic Mentors

- Dr. Maria Aloni

- Prof. Dr. Rens Bod
- Dr. Ulle Endriss
- Dr. Raquel Fernández
- Prof. Dr. Dick de Jongh
- Prof. Dr. Benedikt Löwe
- Dr. Piet Rodenburg
- Dr. Robert van Rooij
- Prof. Dr. Martin Stokhof
- Prof. Dr. Frank Veltman

G.5 Student Mentors

- Andreea Achimescu
- Hans Grathwohl
- Vlasta Sikimic
- Sebastian Speitel

APPENDIX H

RECENT MASTER'S THESES

In this appendix we list the MSc Logic theses of the two most recent academic years (to be precise, we list all theses defended between 1 October 2010 and 30 September 2012). For each thesis, we provide the name and the specialisation of the student, the title of the thesis, the name(s) of the supervisor(s), and the date of the defense. The full list of MSc Logic theses, going back to 1997, is available from the website of the ILLC at the following address:

<http://www.illc.uva.nl/Research/Reports/reportlist.php?Series=MoL>

Each entry in the list below is labelled with its number in the *MoL Thesis Series*.

(1) MoL-2012-07:

Student: Fenner Tanswell (L&P)
Thesis: Proof and Prejudice: Why Formalising Doesn't Make You a Formalist
Supervision: Benedikt Löwe
Defense: 26 September 2012

(2) MoL-2012-12:

Student: Haitao Cai (L&L)
Thesis: Causation and the Semantics of Counterfactuals
Supervision: Michiel van Lambalgen
Defense: 21 September 2012

(3) MoL-2012-14:

Student: Vahid M. Hashemi (L&C)
Thesis: Extracting Trends from Incomplete Ordinal Preferences
Supervision: Ulle Endriss
Defense: 20 September 2012

(4) MoL-2012-11:

Student: Tong Wang (L&M)
Thesis: An Ehrenfeucht-Fraïssé Game for the Logic $L_{\omega_1\omega}$
Supervision: Jouko Väänänen and Benedikt Löwe
Defense: 19 September 2012

(5) MoL-2012-16:

Student: Aleks Knoks (L&P)
Thesis: Abnormality Counts!
Supervision: Frank Veltman
Defense: 19 September 2012

- (6) MoL-2012-06:
Student: Alwin Blok (L&C)
Thesis: Interaction, Observation and Denotation: A Study of Dialgebras for Program Semantics
Supervision: Vincenzo Ciancia
Defense: 19 September 2012
- (7) MoL-2012-13:
Student: Riccardo Pinosio (L&C)
Thesis: Kant's Transcendental Synthesis of the Imagination and Constructive Euclidean Geometry
Supervision: Michiel van Lambalgen
Defense: 18 September 2012
- (8) MoL-2012-17:
Student: Nal E. Kalchbrenner (L&C)
Thesis: Walking the Graph of Language: On a Framework for Meaning and Analogy
Supervision: Reinhard Blutner and Raquel Fernández
Defense: 7 September 2012
- (9) MoL-2012-10:
Student: Paula Henk (L&M)
Thesis: Supremum in the Lattice of Interpretability
Supervision: Dick de Jongh and Albert Visser [Utrecht]
Defense: 6 September 2012
- (10) MoL-2012-18:
Student: Stefanie Kooistra (L&L)
Thesis: Logic in Classical and Evolutionary Games
Supervision: Johan van Benthem
Defense: 5 September 2012
- (11) MoL-2012-15:
Student: Kyndylan Nienhuis (L&C)
Thesis: Automatic Verification of Programs with Indirection
Supervision: Jan van Eijck
Defense: 4 September 2012
- (12) MoL-2012-08:
Student: Fabio Zanasi (L&C)
Thesis: Expressiveness of Monadic Second-Order Logics on Infinite Trees of Arbitrary Branching Degree
Supervision: Alessandro Facchini and Yde Venema
Defense: 31 August 2012
- (13) MoL-2012-05:
Student: Pawel Lojko (L&L)
Thesis: Inquisitive Semantics and the Paradoxes of Material Implication
Supervision: Floris Roelofsen and Jeroen Groenendijk
Defense: 27 August 2012

- (14) MoL-2012-19:
Student: Yves Fomatati (L&M)
Thesis: Sahlqvist Correspondence for Intuitionistic Modal μ -Calculus
Supervision: Alessandra Palmigiano
Defense: 27 July 2012
- (15) MoL-2012-09:
Student: Antonio Florio (L&P)
Thesis: Science in Axiomatic Perspective
Supervision: Sara Uckelman
Defense: 29 June 2012
- (16) MoL-2012-20:
Student: Marta Sznajder (L&L)
Thesis: Dynamic Semantics for Intensional Transitive Verbs: A Case Study
Supervision: Frank Veltman
Defense: 18 June 2012
- (17) MoL-2012-04:
Student: Daan Staudt (L&C)
Thesis: Completeness for Two Left-Sequential Logics
Supervision: Alban Ponse
Defense: 31 May 2012
- (18) MoL-2012-03:
Student: Thomas Peetz (L&C)
Thesis: On Context-Free Grammar Induction by Incremental Compression
Supervision: Maarten van Someren and Pieter Adriaans
Defense: 26 March 2012
- (19) MoL-2012-01:
Student: Viktoriia Denisova (L&L)
Thesis: Ontological Commitment of Natural Language Semantics
Supervision: Martin Stokhof
Defense: 23 March 2012
- (20) MoL-2012-02:
Student: Sylvia Boicheva (L&C)
Thesis: Mechanism Design without Money
Supervision: Krzysztof Apt
Defense: 27 January 2012
- (21) MoL-2011-21:
Student: Bruno Jacinto (L&L)
Thesis: Consequence in Context: Two-Dimensional Semantics Meets Logical Consequence
Supervision: Maria Aloni and Catarina Dutilh Novaes
Defense: 23 December 2011
- (22) MoL-2011-19:
Student: Annemieke Reijngoud (L&L)
Thesis: Voter Response to Iterated Poll Information
Supervision: Ulle Endriss
Defense: 15 December 2011

- (23) MoL-2011-18:
Student: Andreas van Cranenburgh (L&L)
Thesis: Discontinuous Data-Oriented Parsing through Mild Context-Sensitivity
Supervision: Remko Scha
Defense: 3 November 2011
- (24) MoL-2011-20:
Student: Floor Rombout (L&P)
Thesis: “|”: Frege, Russell and Wittgenstein on the Judgment Stroke
Supervision: Catarina Dutilh Novaes and Martin Stokhof
Defense: 28 October 2011
- (25) MoL-2011-16:
Student: Gabriela A. Rino Nesin (L&L)
Thesis: Completing Partial Algebra Models of Term Rewriting Systems
Supervision: Piet Rodenburg
Defense: 23 September 2011
- (26) MoL-2011-17:
Student: Rogier Jacobsz (L&M)
Thesis: The Cylindric Algebras of 4-Valued Logic
Supervision: Piet Rodenburg
Defense: 19 September 2011
- (27) MoL-2011-15:
Student: Johannes Marti (L&M)
Thesis: Relation Liftings in Coalgebraic Modal Logic
Supervision: Yde Venema
Defense: 8 September 2011
- (28) MoL-2011-14:
Student: Zhenhao Li (L&M)
Thesis: Degrees of Non-determinacy and Game Logics on Cardinals under the Axiom of Determinacy
Supervision: Benedikt Löwe
Defense: 8 September 2011
- (29) MoL-2011-08:
Student: Ilan Frank (L&M)
Thesis: Information and Representation in Computational Social Choice
Supervision: Ulle Endriss
Defense: 6 September 2011
- (30) MoL-2011-03:
Student: Lars Wortel (L&P)
Thesis: Side Effects in Steering Fragments
Supervision: Alban Ponse and Paul Dekker
Defense: 5 September 2011
- (31) MoL-2011-05:
Student: Sophie Arnoult (L&L)
Thesis: Smoothing a PBSMT Model by Factoring Out Adjuncts
Supervision: Khalil Sima'an
Defense: 31 August 2011

- (32) MoL-2011-06:
Student: Noortje Venhuizen (L&L)
Thesis: Negation in Questions
Supervision: Floris Roelofsen and Galit Weidman Sassoon
Defense: 30 August 2011
- (33) MoL-2011-10:
Student: Cian Chartier (L&L)
Thesis: Tarski's Threat to the T-Schema
Supervision: Frank Veltman
Defense: 30 August 2011
- (34) MoL-2011-04:
Student: Douwe Kiela (L&P)
Thesis: Variable Binding in Biologically Plausible Neural Networks
Supervision: Michiel van Lambalgen and David Neville
Defense: 30 August 2011
- (35) MoL-2011-11:
Student: Kasper H. Christensen (L&L)
Thesis: Counterfactual Dependencies
Supervision: Frank Veltman
Defense: 29 August 2011
- (36) MoL-2011-09:
Student: Irma Cornelisse (L&L)
Thesis: Context Dependence of Epistemic Operators in Dynamic Evidence Logic
Supervision: Johan van Benthem and Eric Pacuit [Tilburg]
Defense: 25 August 2011
- (37) MoL-2011-07:
Student: Navid Talebanfard (L&C)
Thesis: Tightening the Compression Hierarchies
Supervision: Harry Buhrman
Defense: 25 July 2011
- (38) MoL-2011-02:
Student: Peter Fritz (L&P)
Thesis: Matrices and Modalities: On the Logic of Two-Dimensional Semantics
Supervision: Paul Dekker and Yde Venema
Defense: 29 June 2011
- (39) MoL-2011-13:
Student: Willem M. Baartse (L&M)
Thesis: Finding the Phase Transition for Friedman's Long Finite Sequences
Supervision: Andreas Weiermann [Ghent] and Dick de Jongh
Defense: 23 June 2011
- (40) MoL-2011-12:
Student: Spencer C. Johnston (L&P)
Thesis: Buridan's Theory of Logical Consequence
Supervision: Catarina Dutilh-Novaes
Defense: 30 May 2011

- (41) MoL-2011-01:
Student: Tom F. Sterkenburg (L&C)
Thesis: Sequences with Trivial Initial Segment Complexity
Supervision: George Barmpalias
Defense: 3 February 2011
- (42) MoL-2010-17:
Student: Bert Christiaan Regenboog (L&C)
Thesis: Reactive Valuations
Supervision: Alban Ponse
Defense: 15 December 2010
- (43) MoL-2010-18:
Student: Alexandru Marcoci (L&P)
Thesis: The Surprise Examination Paradox in Dynamic Epistemic Logic
Supervision: Johan van Benthem and Sonja Smets [Groningen]
Defense: 14 December 2010
- (44) MoL-2010-19:
Student: Remi Turk (L&C)
Thesis: A Modern Back-end for a Dependently Typed Language
Supervision: Andres Löb [Utrecht] and Piet Rodenburg
Defense: 19 October 2010

APPENDIX I

STUDENT PUBLICATIONS

Around 30–40% of the final theses defended by MSc Logic students result in a publication. In addition, the work our students do for their MSc Logic research projects or for regular courses also sometimes leads to a publication. These publications include journal papers, archival conference papers, and workshop papers. To give an impression of the range of publishable work produced by the programme, in this appendix we list 50 papers published by MSc Logic students during the five-year period from 2008 to 2012 (this list is *not* exhaustive). All of the papers listed have undergone some form of peer review.

I.1 Selected Student Publications from 2008

- (1) **Giosuè Baggio**. Processing Temporal Constraints: An ERP Study. *Language Learning*, 58:35–55, 2008. Based on thesis work (2004).
- (2) **Chris Brumwell**. Questions and Epistemic Modals in Dialogue. *Proceedings of the Student Session of the 20th European Summer School in Logic, Language and Information (ESSLLI-2008)*. Hamburg, 2008. Based on preparatory work for a thesis defended in 2009.
- (3) **Silvia Gaio**. Granular Models for Vague Predicates. *Proceedings of the 5th International Conference on Formal Ontologies in Information Systems (FOIS-2008)*. IOS Press, 2008. Based on thesis work (2008).
- (4) **Jesse Harris**. On the Syntax and Semantics of Heim’s Ambiguity. *Proceedings of the 27th West Coast Conference on Formal Linguistics*. UCLA, 2008. Based on thesis work (2007).
- (5) **Szymon Klarman**. Judgment Aggregation as Maximization of Epistemic and Social Utility. *Proceedings of the 2nd International Workshop on Computational Social Choice (COMSOC-2008)*. University of Liverpool, 2008. Based on final paper for the course *Computational Social Choice* (2007).
- (6) **Raul Andres Leal**. Predicate Liftings Versus Nabla Modalities. *Electronic Notes in Theoretical Computer Science*, 203(5):195–220, 2008. Partly based on thesis work (2007).
- (7) **Boaz Leskes** and Leen Torenvliet. The Value of Agreement; A New Boosting Algorithm. *Journal of Computer and System Sciences*, 74(4):557–586, 2008. Based on thesis work (2005).

- (8) **Brammert Ottens** and Ulle Endriss. Comparing Winner Determination Algorithms for Mixed Multi-unit Combinatorial Auctions. *Proceedings of the 7th International Conference on Autonomous Agents and Multiagent Systems (AAMAS-2008)*. IFAAMAS, 2008. Short Paper. Based on thesis work (2007).
- (9) **Federico Sangati** and Willem Zuidema. Communication, Cooperation, and Coherence. *Proceedings of the 7th Evolution of Language Conference (EVLANG7)*. Barcelona, 2008. Based on an individual project (2007).

I.2 Selected Student Publications from 2009

- (10) **Ivano Ciardelli**, Jeroen Groenendijk, and Floris Roelofsen. Attention! ‘Might’ in Inquisitive Semantics. *Proceedings of the 19th Semantics and Linguistic Theory Conference (SALT-2009)*, 2009. Based on thesis work (2009).
- (11) **Ivano Ciardelli** and Floris Roelofsen. Generalized Inquisitive Logic: Completeness via Intuitionistic Kripke Models. *Proceedings of the 12th Conference on Theoretical Aspects of Rationality and Knowledge (TARK-2009)*. Stanford, 2009. Based on final paper for the course *Semantics and Pragmatics* (2008).
- (12) **Tijmen Daniëls** and Eric Pacuit. A General Approach to Aggregation Problems. *Journal of Logic and Computation*, 19(3):517–536, 2009. Based on thesis work (2007).
- (13) **Edgar G. Daylight**,¹ Wouter M. Koolen, and Paul Vitányi. Time-bounded Incompressibility of Compressible Strings and Sequences. *Information Processing Letters*, 109(18):1055–1059, 2009. Based on a project that was part of the course *Kolmogorov Complexity & MDL Learning* (2008).
- (14) **Silvia Gaio**. A Granular Account for Gradable Adjectives. *Logique et Analyse*, 52(208), 2009. Based on thesis work (2008).
- (15) **Sam van Gool**. Canonical Extensions of Partially Ordered Sets: Reconstructing the Lost Adjunction. *Proceedings of the 4th Conference on Topology, Algebra and Categories in Logic*. Amsterdam, 2009. Extended Abstract. Based on thesis work (2009).
- (16) **Ansten Klev**. Infinite Time Extensions of Kleene’s $\mathcal{O}$. *Archive for Mathematical Logic*, 48(7):691–703, 2009. Based on thesis work (2007).
- (17) **Lena Kurzen**. Reasoning about Cooperation, Actions and Preferences. *Synthese*, 169(2):223–240, 2009. Based on thesis work (2007).
- (18) **Fenrong Liu**. Diversity of Agents and their Interaction. *Journal of Logic, Language and Information*, 18(1):23–53, 2009. Based on thesis work (2004).
- (19) **Federico Sangati** and Willem Zuidema. Unsupervised Methods for Head Assignments. *Proceedings of the 12th Conference of the European Chapter of the Association for Computational Linguistics (EACL-2009)*. Athens, 2009. Based on thesis work (2007).

¹Edgar G. Daylight is the *nom de plume* of our former student Karel Van Oudheusden.

I.3 Selected Student Publications from 2010

- (20) **Andreas van Cranenburgh**, Galit Weidmann Sassoon, and Raquel Fernández. Invented Antonyms: Esperanto as a Semantic Lab. *Proceedings of the 26th Annual Meeting of the Israel Association for Theoretical Linguistics (IATL-26)*. Bar-Ilan University, 2010. Based on a January project (2010).
- (21) **Pablo Cubides Kovacsics**. An Application of the Decomposition Theorem. *Proceedings of Model Theory Kirishima 2010: New Developments of Independence Notions in Model Theory*. RIMS Kokyuroku, 2010. Based on thesis work (2009).
- (22) Jan van Eijck and **Floor Sietsma**. Multi-agent Belief Revision with Linked Preferences. In *Logic and the Foundations of Game and Decision Theory: Revised and Selected Papers of LOFT-2008*. Springer-Verlag, 2010. Based on an individual project (2007).
- (23) **Christian Geist**, Benedikt Löwe, and Bart Van Kerkhove. Peer Review and Knowledge by Testimony in Mathematics. In *Philosophy of Mathematics: Sociological Aspects and Mathematical Practice*. College Publications, 2010. Based on final paper for the course *Philosophy of Mathematics* (2008).
- (24) **Loes Olde Loohuis** and Yde Venema. Logics and Algebras for Multiple Players. *The Review of Symbolic Logic*, 3(3):485–519, 2010. Based on thesis work (2008).
- (25) **Sara Ramezani** and Ulle Endriss. Nash Social Welfare in Multiagent Resource Allocation. In *Agent-Mediated Electronic Commerce: Designing Trading Strategies and Mechanisms for Electronic Markets*. Springer-Verlag, 2010. Postproceedings of AMEC-2009. Based on thesis work (2008).
- (26) Floris Roelofsen and **Sam van Gool**. Disjunctive Questions, Intonation and Highlighting. In *Selected Papers from the 17th Amsterdam Colloquium*. Springer-Verlag, 2010. Based on an individual project (2009).
- (27) Sara Uckelman and **Spencer Johnston**. John Buridan’s *Sophismata* and Interval Temporal Semantics. *Logical Analysis and History of Philosophy*, 13:133–147, 2010. Based on an individual project (2009).
- (28) **Maarten Versteegh**, Federico Sangati, and Willem Zuidema. Simulations of Socio-Linguistic Change: Implications for Unidirectionality. *Proceedings of the 8th International Conference on the Evolution of Language (EVOlang8)*. World Scientific, 2010. Based on final paper for the course *Evolutionary Game Theory & Language Evolution* (2008).
- (29) **Jacob Vosmaer**. A New Proof of an Old Incompleteness Theorem. *Bulletin of the Section of Logic*, 39(3–4):199–204, 2010. Based on a January project (2006).

I.4 Selected Student Publications from 2011

- (30) Jesse Alama, **Aleks Knoks**, and Sara Uckelman. Dialogue Games for Classical Logic. *Proceedings of the 20th International Conference on Automated Reasoning with Analytic Tableaux and Related Methods (Tableaux-2011)*. Bern, 2011. Short Paper. Based on a January project (2011).

- (31) George Barmpalias and **Tom Sterkenburg**. On the Number of Infinite Sequences with Trivial Initial Segment Complexity. *Theoretical Computer Science*, 412(52):7133–7146, 2011. Based on thesis work (2011).
- (32) George Barmpalias and **Charlotte Vlek**. Kolmogorov Complexity of Initial Segments of Sequences and Arithmetical Definability. *Theoretical Computer Science*, 412(41):5656–5667, 2011. Based on thesis work (2010).
- (33) **Ivano Ciardelli** and Floris Roelofsen. Inquisitive Logic. *Journal of Philosophical Logic*, 40(1):55–94, 2011. Based on thesis work (2009).
- (34) **Lorenz Demey**. Some Remarks on the Model Theory of Epistemic Plausibility Models. *Journal of Applied Non-Classical Logics*, 21(3-4):375–395, 2011. Based on a January project (2010).
- (35) **Christian Geist** and Ulle Endriss. Automated Search for Impossibility Theorems in Social Choice Theory: Ranking Sets of Objects. *Journal of Artificial Intelligence Research (JAIR)*, 40:143–174, 2011. Based on thesis work (2010).
- (36) **Scott Grimm**. Semantics of Case. *Morphology*, 21:(3–4):515–544, 2011. Based on thesis work (2005).
- (37) **Thomas Icard**. A Topological Study of the Closed Fragment of GLP. *Journal of Logic and Computation*, 21(4):683–696, 2011. Based on thesis work (2008).
- (38) Dick de Jongh and **Fan Yang**. Jankov’s Theorems for Intermediate Logics in the Setting of Universal Models. *Postproceedings of the 8th Tbilisi Symposium on Language, Logic and Computation (TbiLLC-2009)*. Springer-Verlag, 2011. Based on thesis work (2008).
- (39) **Szymon Klarman**, Ulle Endriss, and Stefan Schlobach. ABox Abduction in the Description Logic *ALC*. *Journal of Automated Reasoning*, 46(1):43–80, 2011. Based on thesis work (2008).
- (40) **Frank Nebel**. Graph-based Coalitional Games: An Analysis via Characteristics. *Proceedings of the 4th International Workshop on Game Theory in Communication Networks (Gamecomm-2011)*. Cachan, 2011. Based on thesis work (2010).

I.5 Selected Student Publications from 2012

- (41) Maria Aloni, **Andreas van Cranenburgh**, Raquel Fernández, and **Marta Sznajder**. Building a Corpus of Indefinite Uses Annotated with Fine-grained Semantic Functions. *Proceedings of the 8th International Conference on Language Resources and Evaluation (LREC-2012)*. Istanbul, 2012. Based on a January project (2011).
- (42) **Sophie Arnoult** and Khalil Sima’an. Adjunct Alignment in Translation Data with an Application to Phrase-Based Statistical Machine Translation. *Proceedings of the 16th Annual Conference of the European Association for Machine Translation (EAMT-2012)*. EAMT, 2012. Based on thesis work (2011).
- (43) Rens Bod and **Margaux Smets**. Empiricist Solutions to Nativist Problems Using Tree-Substitution Grammars. *Proceedings of the EACL Workshop on Cognitive Models of Language Acquisition and Loss*. Avignon, 2012. Partly based on thesis work (2010).

- (44) **Andreas van Cranenburgh**. Efficient Parsing with Linear Context-free Rewriting Systems. *Proceedings of the 13th Conference of the European Chapter of the Association for Computational Linguistics (EACL-2012)*. Avignon, 2012. Based on thesis work (2011).
- (45) Jan van Eijck, **Ji Ruan**, and Tomasz Sadzik. Action Emulation. *Synthese*, 185(1):131–151, 2012. Partly based on thesis work (2004).
- (46) **Peter Fritz**. Modal Ontology and Generalized Quantifiers. *Journal of Philosophical Logic*. Published online in 2012. Based on two individual projects (2010).
- (47) **Alexandru Marcoci**. The Surprise Examination Paradox in Dynamic Epistemic Logic. In *Future Directions for Logic. Proceedings of PhDs in Logic III*. College Publications, 2012. Based on thesis work (2010).
- (48) **Johannes Marti** and Yde Venema. Lax Extensions of Coalgebra Functors. *Proceedings of the 11th International Workshop on Coalgebraic Methods in Computer Science (CMCS-2012)*. Springer-Verlag, 2012. Based on thesis work (2011).
- (49) **Annemieke Reijngoud** and Ulle Endriss. Voter Response to Iterated Poll Information. *Proceedings of the 11th International Conference on Autonomous Agents and Multiagent Systems (AAMAS-2012)*. IFAAMAS, 2012. Based on thesis work (2011).
- (50) Floris Roelofsen, **Noortje Venhuizen**, and Galit Weidmann Sassoon. Positive and Negative Polar Questions in Discourse. *Proceedings of Sinn und Bedeutung 17*. Paris, 2012. Based on thesis work (2011).

APPENDIX J

ALUMNI SURVEY

In this appendix we report on a recent survey amongst MSc Logic graduates. This survey was carried out and its findings were summarised by Guusje Smit (ESC, Faculty of Science).

In February 2013, all those 135 MSc Logic graduates from the years 2005 to 2012 for which the programme management still has an email address were contacted and asked to fill in an online questionnaire. After three weeks, 73 alumni had completed the survey (that is, the response rate is a respectable 54%).

J.1 Summary of Results

J.1.1 Rating of the Programme

Alumni rate the programme as high. The programme scores an average of 8.7 (on a scale from 1 to 10). Respondents were asked whether they agreed or disagreed with certain statements concerning the programme. The respondents fully agreed most with the statement *“The scientific content of the programme was adequate”*. Also the statements *“The level of exposure to research was adequate”* and *“The programme had an adequate level of flexibility and choice”* the respondents mostly fully agreed with. On the statements *“The programme had an adequate level of internal cohesion”*, *“There were sufficient opportunities to practice working in a team with fellow students”*, and *“The programme offered adequate levels of feedback, guidance and supervision”* graduates responded mainly positively. And on the statement *“There was sufficient focus on the development of personal and professional skills”* the response is more negative than for the other statements, but the average is still positive.

50 respondents answered the questions *“If you were the programme director, what would you change?”* and *“what would you keep?”* This is 68% of the total respondents. The suggestions for change were mainly about topics such as lowering the workload for students, improving cohesion between different parts of the programme, adding courses in specific areas (particularly mathematical logic, philosophy, and computer science), and providing additional training for soft skills, including preparation for the academic and the non-academic job market. And the things they would keep: the freedom and flexibility within the programme, the interdisciplinary character of the programme, the excellent teaching staff, the projects and the connection with research, and the MoL Room.

J.1.2 Employment Opportunities

Alumni rate the employment opportunities after graduation as high. The average score is 7.8. It did not take them long to get a job after graduation. More than half of the respondents got

a job in less than a month. The most popular first job is a PhD position. The main fields of PhD's are Computer Science, Logic, and Philosophy. If people changed jobs, then they often chose a career in Science as well. Other jobs that were mentioned are: consultant, (highschool) teacher, and positions in the ICT industry.

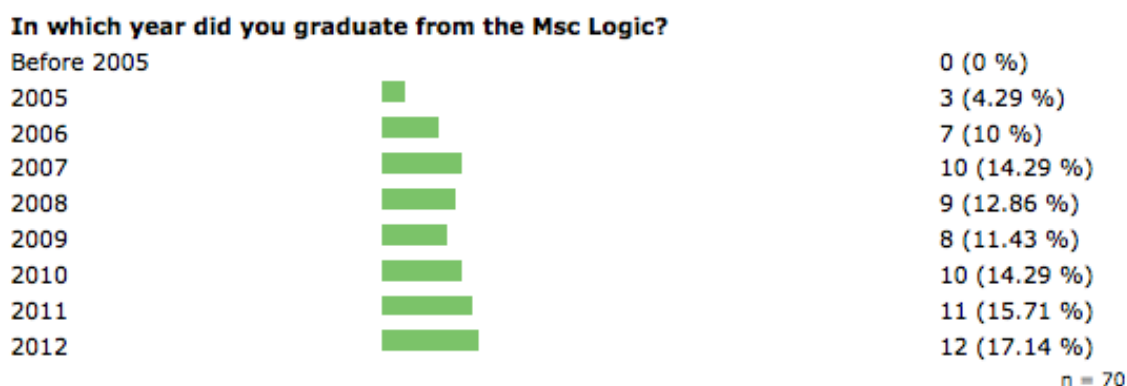
The relevance of skills and knowledge gained during the MSc Logic is rated as 7.4 on average. As an explanation people point out the following reasons. A lot of the respondents who rated the relevance of skills and knowledge above average started a PhD in the area of their Master's thesis. The respondents who rated the relevance of skills and knowledge as average say that they used some of the skills, mostly analytical and theoretical skills, in their first job. Some people also pointed out that they still had to gain additional knowledge after graduation. When the relevance of skills and knowledge was rated below average it mainly had to do with the fact that the first job was not research-oriented, e.g., consultant or computer programmer.

J.1.3 Other Remarks

Most of the respondents stated that they stay in contact with fellow students (81%) as well as former teachers or supervisors (67%). In the commentary section the respondents mainly left very positive remarks about the programme.

J.2 Quantitative Results

J.2.1 Respondents



J.2.2 Rating of the Programme



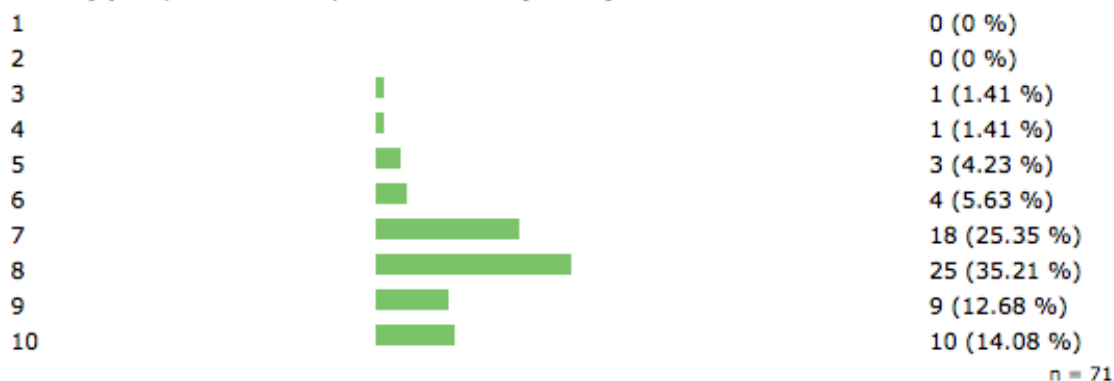
For each of the following statements, respondents were asked whether they agree or disagree.

$n = 73$	fully disagree	disagree	neutral	agree	fully agree
The scientific content of the programme was adequate.	0	0	1	21	51
The level of exposure to research was adequate.	0	1	2	21	50
The programme had an adequate level of internal cohesion.	2	6	13	38	14
The programme had an adequate level of flexibility and choice.	0	1	5	22	45
There were sufficient opportunities to practice working in a team.	2	2	9	25	35
There was sufficient focus on the development of personal and professional skills.	3	9	18	28	15
The programme offered adequate levels of feedback, guidance and supervision.	0	5	13	26	29

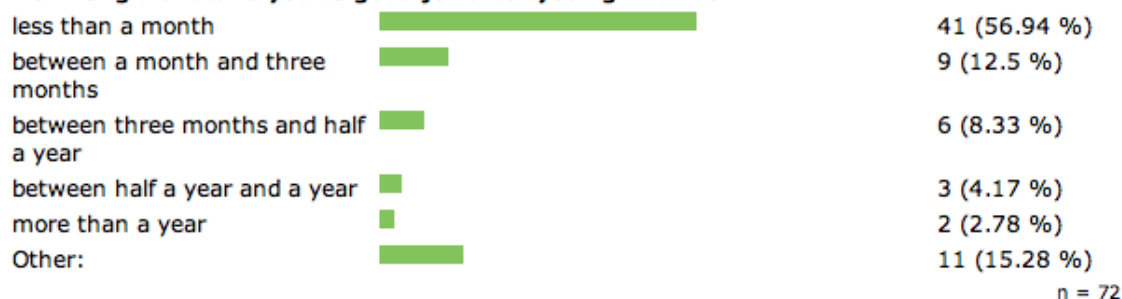
J.2.3 Employment Opportunities

On a scale of 1-10, how do you rate the employment opportunities after grad...

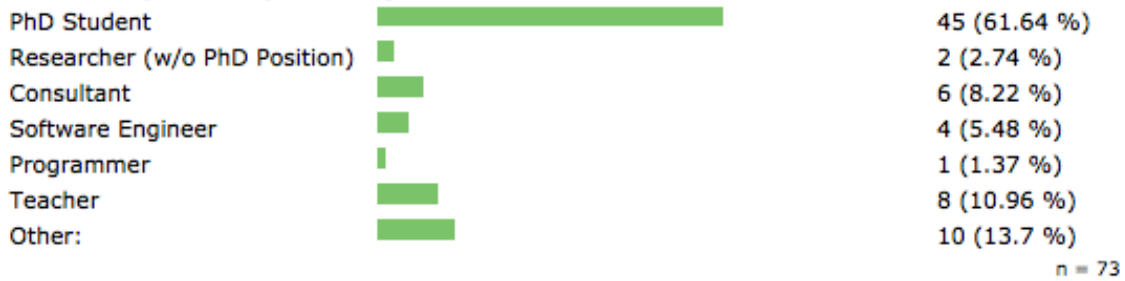
1: Very poor, 6: Sufficient, 10: Excellent (1 - 10)



How long did it take you to get a job after your graduation?



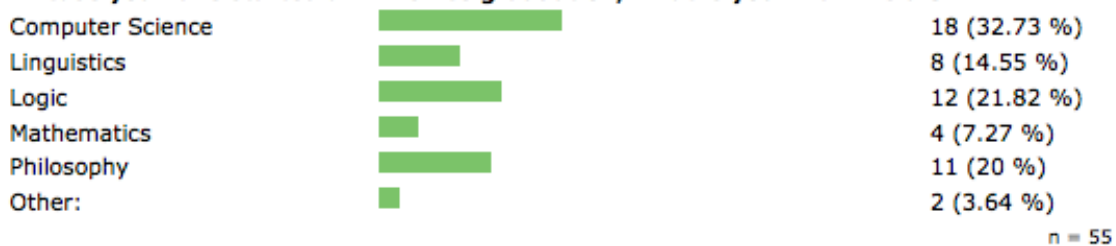
What was your first job after graduation?



Observe that the figures in the previous table add up to 76 (rather than 73), i.e., some respondents selected more than one category when answering.

As is clear from the next question about the main field of specialisation that alumni have started a PhD in, for some respondents the PhD was only the second job. Overall, 55 out of 73 respondents answered the next question, i.e., the overall proportion of alumni who started a PhD in this sample is 75%.

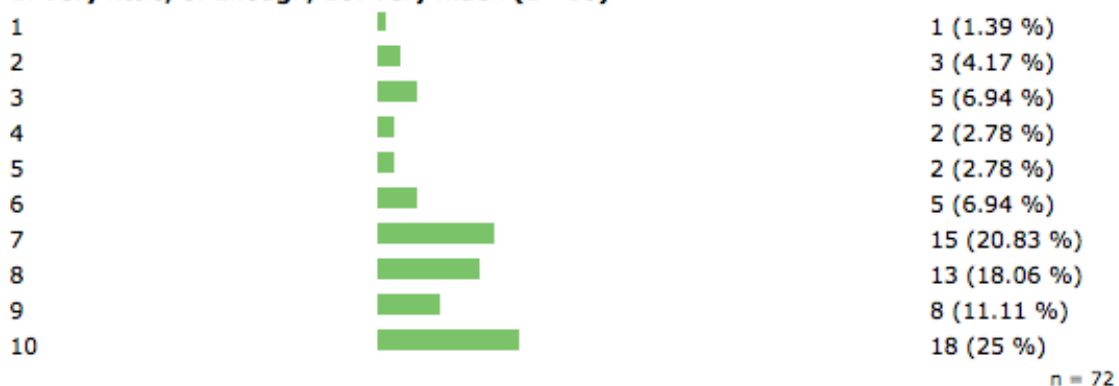
In case you have started a PhD since graduation, what is your main field of...



The two respondents who chose category *Other* stated their area of specialisation as Artificial Intelligence and Cognitive Science, respectively.

The final question under the heading of employment opportunities asks about the extent to which graduates have been able to use the knowledge and skills gained during their time in the MSc Logic in their professional life.

How much did you use the knowledge and skills you gained during your time i... 1: Very little, 6: Enough, 10: Very much (1 - 10)



APPENDIX K

DEVELOPMENTS SINCE THE PREVIOUS ACCREDITATION

In this appendix we briefly summarise the most important developments since the previous accreditation, which was carried out in the academic year of 2006/07.

K.1 Specific Committee Recommendations

In 2006 the committee evaluating the MSc Logic summarised their findings as follows:

“The assessment team was impressed by the programme [...] The students are in close contact with the most recent research in various areas. The courses are given by lecturers who themselves are active researchers and who bring their own research work into the courses. These lecturers in the programme are first-class researchers in the subject areas of logic and include the results of their research in the teaching. The assessment team also looks especially favourably upon the mentor system. In this system the students have the opportunity to follow their own individual programme, fitting their own situation and preferences. In the same time the mentor system is a guarantee that the students not only become researchers with a specialization but also have strong interdisciplinary qualities. The graduates of the programme obtain mostly PhD positions at prestigious universities around the world. Some of the first graduates occupy already important positions in the academic world. The programme has a global significance in educating researchers in the area of logic.”

Their main recommendations were the following:

“The assessment team holds the opinion that the programme should try to follow the strategy that the programme has followed thus far. [...] the programme should not grow too fast, should try to maintain a situation in which funding and grants for students remain within reach, should be careful for potential negative side-effects of the coming relocation and should avoid the bureaucracy by the rules and regulations that could be imposed upon the programme.”

The programme management has taken these recommendations to heart and succeeded to a large extent in implementing them:

- (1) **Strategy:** While various details (e.g., regarding course offerings) have changed on a regular basis (which we believe to be important to keep the programme fresh and up to date),

the overall strategy regarding the scientific and didactic orientation of the programme, as well as its day-to-day implementation, have remained constant over the years.

- (2) **Growth:** The programme has grown steadily but not excessively since the previous accreditation. Importantly, we have been able to maintain the same quality throughout this process of controlled growth: First, the selected students are still excellent, as is clear from their achievements at the time of admission. Second, we are still able to closely tutor students, as is clear, for instance, from the large number of (staff-intensive) individual projects offered. Third, we are still able to achieve the highest standards in our training, as is clear from the placement record of the programme.
- (3) **Funding:** Supporting students to obtain grants to fund their studies has become more challenging in recent years. Specifically, the fact that the Dutch government decided to discontinue the *Huygens Scholarship Programme* in 2012 resulted in a loss of typically five fully funded positions for Master's students per year. In response to this challenge, we continue to collaborate closely with the *Beth Foundation* which has been an important source of scholarships for years; we have become actively involved in creating new scholarship opportunities through the *Erasmus Mundus* programme; and we have stepped up our efforts in advising students when applying to other grant programmes on their own.
- (4) **Relocation:** The move to the Science Park of the MSc Logic programme and most of the ILLC offices in 2009 has had disadvantages (e.g., increased distance to teaching locations in the city centre) and advantages (e.g., modernised teaching facilities). Four years later, we can state with confidence that the relocation has not had a significant negative effect on the quality of the programme.
- (5) **Bureaucracy:** Due to a variety of legal requirements and general trends in the Dutch educational landscape, the amount of red tape has somewhat increased in recent years. However, the MSc Logic has been successful in largely protecting its students and its academic staff from excessive bureaucracy; everyday interaction between staff and students still works the same way it has in previous years.

K.2 Changes in the Programme

The general structure of the programme and its overall strategy have not changed in recent years. However, various details have. Some of these changes have been introduced in response to problems unveiled by our quality assurance system; some have been a reaction to increased (positive) pressure from the administration to formalise certain aspects of the running of the programme; and some have been a reflection of new trends and developments in the research area we serve. Below we list the most important examples for such changes:

- (1) **Logic, Language and Computation:** This core obligatory course (consisting largely of guest lectures and being worth 3 EC) was introduced in 2010 to replace the old course *Core Logic*, a 6 EC course that in addition provided an overview of the history of logic as well as basic training in formal modelling and the use of mathematical methods in a variety of areas. While initially a very popular course, our quality assurance system (both evaluation forms and the informal contact with academic mentors) at some point started to signal problems: The homework component of the course had grown inefficient in assessing students on this material in a meaningful way, and the workload was perceived as being too high for a course that did not provide training in a clearly defined subdiscipline.
- (2) **Track-specific obligatory courses:** In 2006/07 the Logic & Computation track and the Logic & Mathematics track were sharing two track-specific obligatory courses and only

each had one course that was unique to them. This meant that neither one of these two tracks had a clear profile. To a large extent this choice was due to shortages in staffing. In 2011 we were able to fully correct this problem: the track-specific courses for these two tracks are now disjoint. With *Recursion Theory* and *Computational Complexity*, the Logic & Computation track has a clear orientation towards theoretical computer science; and with *Proof Theory* and *Model Theory* the Logic & Mathematics track has a clear orientation towards mathematical logic.

- (3) **Elective courses:** Over the years, we have discontinued many elective courses and started new ones. This is MSc Logic policy: to keep the programme up to date and to give individual teachers the freedom to quickly adapt their course offerings to developments in their own research area and to changes in their own research interests. One notable trend has been the increase of courses related to game theory: In 2012/13, for instance, we have been offering two courses covering classical areas in game theory (*Advanced Strategic Game Theory* and *Cooperative Games*) and two interdisciplinary courses covering current research at the interface of game theory with other fields (*Language and Games* and *Computational Social Choice*). Another example is the introduction of the course *Computational Semantics and Pragmatics*, which not only was making up for a lack of representation of pragmatics in the programme in earlier years, but which also provides a link for students who are interested in both our rich offerings on formal semantics (which tend not to emphasise computational concerns) and those in computational linguistics (which tend to focus on syntax rather than semantics).
- (4) **Thesis assessment:** Up to 2011 the procedure followed in assessing Master's theses has been thorough but not well documented. In 2012 we improved this point by providing written guidelines on how an MSc Logic thesis should be graded. Under the new rules, every grade for a thesis is backed up by a short written report, improving transparency and accountability of the process (see Appendix E).
- (5) **Board of Examiners and OC:** Since 2011 the work of both the Board of Examiners and the OC takes place in the context of a more clearly defined regulatory framework, so as to improve transparency and accountability of these important bodies. The OC has always produced minutes of their meetings, but we have introduced an improved system for archiving these minutes. Both committees now produce an annual report on their activities. These changes have been instituted in response to wider changes at the Faculty of Science, as documented in the Faculty's Handbook for Quality Assurance in Education (*Handboek Kwaliteitszorg Onderwijs*).

K.3 Changes in the Environment

In 2009 the ILLC and the MSc Logic moved from the Euclides Building at Plantage Muidergracht to the Science Park. After some initial difficulties to do with the move itself and the increased distance to the city centre, the overall effect on the programme has been neutral. The teaching facilities at the Science Park are excellent and the close vicinity to the administration of the Faculty of Science has many practical advantages for students and staff alike. Still, a disadvantage of the relocation has been that the different locations at which (at least some) students attend lectures are now further apart than they were before. The scheduling team takes these difficulties into account when devising the timetable for the MSc Logic and tries to minimise the number of cases where classes that are likely to be elected by the same student and that are taught in different parts of the city are scheduled back to back.

In early 2013 the ILLC (with the MoL Room) moved to a different building within the Science Park (from Science Park 904 to Science Park 107). The new building provides more space and improved office facilities, and it provides more and better facilities for staff and students to casually meet and interact. While this new move brought with it some minor inconveniences (offices and lecture halls are now located on opposite sides of the street), the overall effect on both the institute and the Master's programme has clearly been positive. This is evident from informal feedback received from both staff and students.

APPENDIX L

REPORT ON INSTITUTIONAL QUALITY ASSURANCE ASSESSMENT

The outcome of the institutional quality assurance assessment of the University of Amsterdam by the NVAO is expected to become known at a later point in 2013. In the meantime, NVAO rules permit the evaluation of the taught programmes at the UvA on the assumption that this assessment will be successful.

APPENDIX M

GLOSSARY

BKO	Basiskwalificatie Onderwijs (Basic Teaching Qualification)
CWI	Centrum Wiskunde & Informatica
EC	European Credit: a credit point under the European Credit Transfer System
ESC	Education Service Centre (at the UvA's Faculty of Science)
ESSLLI	European Summer School in Logic, Language and Information
FTE	Full-Time Equivalent
FGW	Faculteit der Geesteswetenschappen (Faculty of Humanities)
FNWI	Faculteit der Natuurwetenschappen, Wiskunde en Informatica (Faculty of Science)
ICT	Information and Communication Technologies
ILLC	Institute for Logic, Language and Computation
HGL	Hoogleraar (Full Professor)
KNAW	Koninklijke Nederlandse Akademie van Wetenschappen
L&C	Logic and Computation (programme track/specialisation)
L&L	Logic and Language (programme track/specialisation)
L&M	Logic and Mathematics (programme track/specialisation)
L&P	Logic and Philosophy (programme track/specialisation)
Meervoud	Meer Vrouwelijke Onderzoekers als UD
MoL	Master of Logic
NVAO	Nederlands-Vlaamse Accreditatieorganisatie
NWO	Nederlandse Organisatie voor Wetenschappelijk Onderzoek
OC	Onderwijscommissie (Educational Committee)
OER	Onderwijs- en Examenregeling (Teaching and Examination Regulations)
UD	Universitair Docent (Assistant Professor)
UHD	Universitair Hoofddocent (Associate Professor)
UvA	Universiteit van Amsterdam (University of Amsterdam)