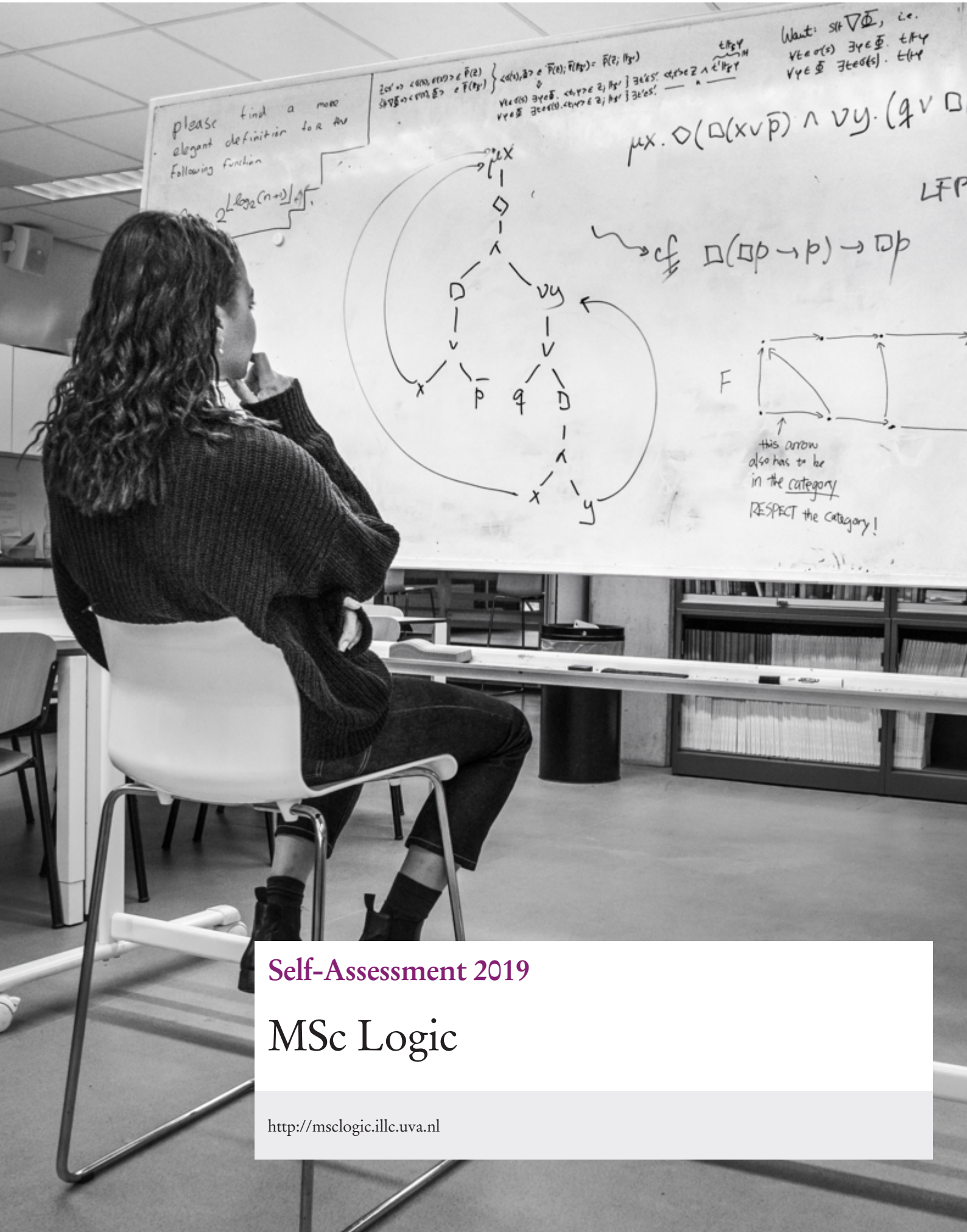
University of Amsterdam
Faculty of Science



Self-Assessment 2019

MSc Logic

http://msclogic.illc.uva.nl

Master of Science in Logic

University of Amsterdam

Self-assessment 2019

November 2019

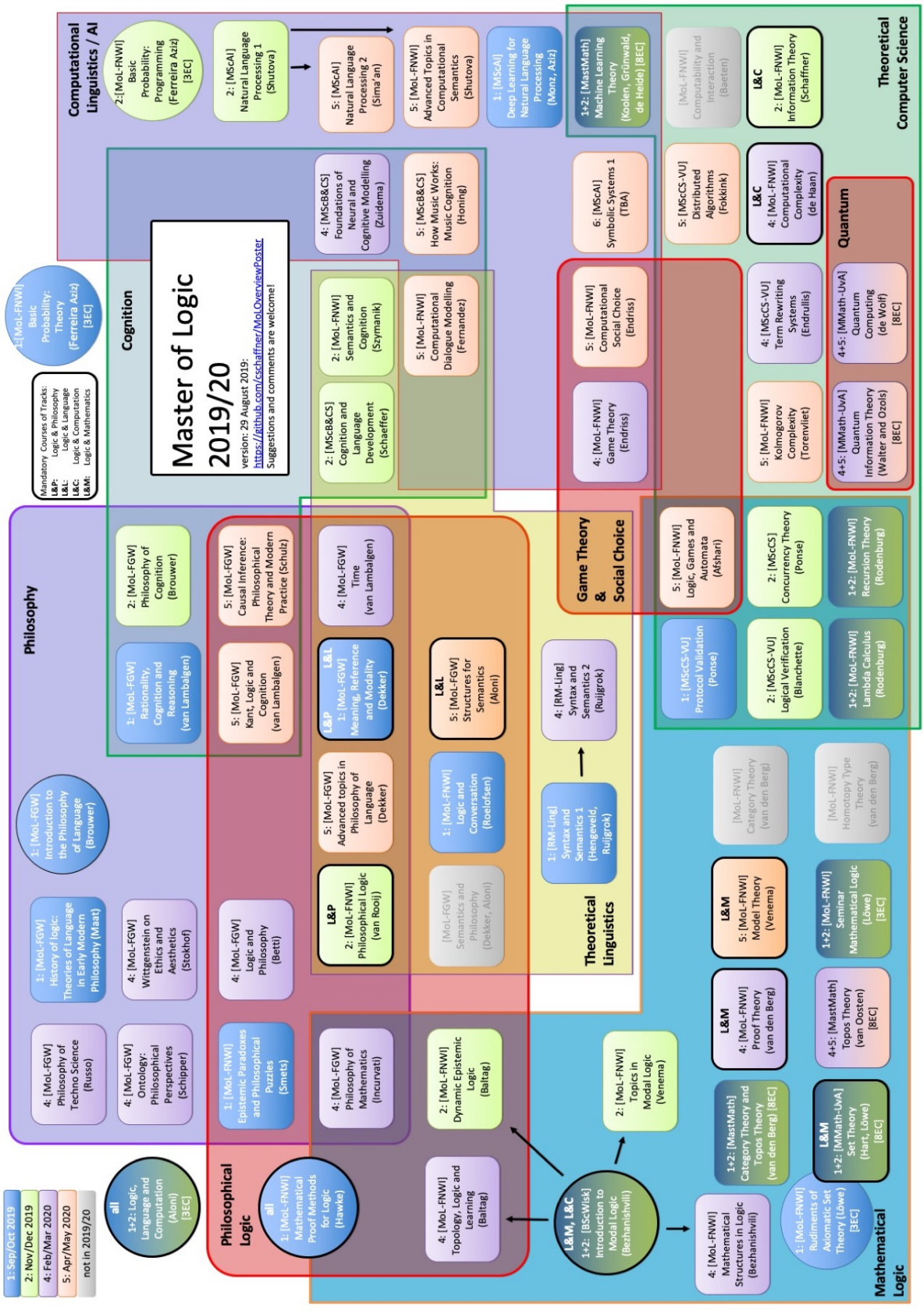


Figure 1: Overview poster of the MSc Logic 2019/20

Preface

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. Standing in the Amsterdam tradition of combining philosophical enquiry with formal methods (going back to Brouwer, Heyting and Beth), the MSc Logic covers a unique interdisciplinary area known as *Logic, Language and Information*, with logic (broadly conceived) as the methodology of choice to conduct foundational and applied research across the traditional disciplinary boundaries. The overall goal is to understand how minds and machines alike accomplish the tasks of representing, communicating, manipulating and reasoning with information. Advances in this area require the contributions of multiple inter-related disciplines. Besides mathematical and philosophical logic, formal semantics and pragmatics, philosophy of language, philosophy of mathematics and formal epistemology, as well as theoretical computer science, quantum computing and information, and logic in artificial intelligence, the programme also embraces neighbouring disciplines such as cognitive science, computational linguistics, and mathematical economics. It is this blend of a philosophical tradition, mathematical rigour, modern technologies and empirical investigations that makes logic a uniquely interdisciplinary field, combining the humanities and the exact sciences in both methodology and motivation.

The MSc Logic has been offered by the Institute for Logic, Language and Computation (ILLC) at the University of Amsterdam (UvA) since 1995. In the most recent accreditation, which took place in 2013, the panel assessed the programme as "one of the best, if not the best programme on logic in the world". We are proud of this tradition and in the last years we did our best to keep up to these standards by continuing to foster the integration of the programme with research at the ILLC and by further enriching the curriculum introducing new themes and advanced courses, some selected from neighbouring programmes. For the future we hope to continue to attract talented and enthusiastic students from all over the world who share with us a fascination for logic, its beauty and foundational character as well as its versatility as a tool to investigate a wide range of phenomena across disciplines and research traditions.

Maria Aloni, November 2019

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Part III: Appendices

INTRODUCTION

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.

Structure of this Document

The report follows the guidelines set out in the NVAO's Framework for Limited Programme Assessments. Under this framework, a programme is judged in terms of four so-called *standards:*

Standard 1: Intended Learning Outcomes.
Standard 2: Teaching-Learning Environment.
Standard 3: Assessment.
Standard 4: Achieved Learning Outcomes.

Part I of this document is a self-assessment of the MSc Logic in terms of these four standards. Part II contains a chapter contributed by MSc Logic students. Part III consists of several appendices with additional information, including a SWOT analysis of the programme. Some of these appendices are presented in electronic form on a password-protected dedicated site at:

https://msclogic.illc.uva.nl/Accreditation/Accreditation-2019

Genesis of this Document

Part I and III have been written by Maria Aloni (programme director), with support from Floris Roelofsen (chair of the Examinations Board), Benedikt Löwe (chair of the Admissions Board and former programme director), Christian Schaffner & Nick Bezhanishvili (chairs of the Programme Committee), Ulle Endriss (teacher, mentor and former programme director) and Tanja Kassenaar (programme manager). Part II has been written by Angelica Hill (student member of the Programme Committee of the MSc Logic) with input from the community of MSc Logic students. The accreditation website was prepared by Tanja Kassenaar. Assistance has been received from Peter van Ormondt, Caitlin Boonstra and Liza Lambert. Some of the text is based on the self-assessment report produced for the previous accreditation. Previous versions of this document have been read and commented on by representative groups of students as well as core members of the academic staff. The final version has been proofread by Dean McHugh (PhD student and MSc Logic alumno).

Administrative Data

The MSc Logic is a two-year Master's programme offered by the Institute for Logic, Language and Computation (ILLC) at the University of Amsterdam (UvA). The MSc Logic is part of

the Graduate School of Informatics (GSI) 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* (LY).

Regarding the Programme

- Name of the programme: Master of Science in Logic
- CROHO registration number: 60226
- 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)
- Mode of study: Full-time
- Language of instruction: English[1]
- Programme website: https://msclogic.illc.uva.nl

Regarding the Institution

- Name of the institution: University of Amsterdam
- Status of the institution: Publicly funded body providing higher education
- Outcome of the institutional quality assurance assessment: Positive (2019)

Personalia

- Programme director: Dr. M. Aloni
- Programme manager: Drs. T. Kassenaar
- Director of the Graduate School of Informatics: Dr. A.D. Pimentel
- Chair of Examinations Board (EB):
  Prof. B. Löwe (until 31/8/2018); Dr. F. Roelofsen (from 1/9/2018)
- Chair of the Educational Committee (OC):
  Dr. C. Schaffner (until 31/8/2019); Dr. N. Bezhanishvili (from 1/9/2019)
- Chair of the Admissions Board (AB): Prof. B. Löwe

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.

Success Rates	61%; 72%; 75%	cf. Section 2.2.4 (page 7)
Annual intake (MoL/LY)	46/1; 25/2; 44/7; 38/3; 31/10	cf. Section 2.3.3 (page 9)
Teaching Staff	100% PhD; 69% BKO	cf. Section 2.4.2 (page 12)
Student-Teacher Ratio	11.4 students per FTE	cf. Section H.2 (page 57)
Contact Hours	13h / 2h per week	cf. Section H.3 (page 58)

[1] Thanks to the strong international reputation of the ILLC, the MSc Logic attracts students from all over the world. In its first eight years, from 1995 to 2003 the programme was even only open for international students. Nowadays approximately 70% of the MSc Logic students comes from outside of the Netherlands. For these reasons the programme has an English name and has always been taught in English.

Part I: Standards 1–4

Chapter 1

Intended Learning Outcomes

1.1 Aims and Objectives of the Programme

The principal aim of the MSc 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*. The programme was established in 1995 with the goal to educate the next generation of researchers in the tradition of the ILLC, researchers who can integrate the rigour of the exact sciences with the inventiveness of the humanities; scholars who, in the best tradition of logic, search for foundations and aim at full understanding, not merely users of existing tools but developers of new technologies and designers of whole new areas of research. We have been successful in pursuing these ambitious goals, as demonstrated by the significant number of MSc Logic graduates who now hold tenured faculty positions at leading universities all over the world;[1] and by the fact that every year a majority of our graduates obtain PhD positions in various disciplines, many at prestigious universities.[2] We are at the same time aware that not all our graduates choose an academic career but are convinced that research-oriented skills are also a good preparation for jobs outside of academia, in particular for professions that are favoured by our graduates, which include management, consulting, teaching, software engineering and the ICT industry at large.

1.2 Exit Qualifications

At the programme level, the goals described above are concretised by a number of intended learning outcomes referred to as "exit qualifications" in the Teaching and Examination Regulations (known as the OER), reprinted in Appendix F.[3] As specified there:

[1] These include Stanford University, the University of Amherst, UCLA, Peking University, Tsinghua University, Carleton University, the Universidad Federal de Rio de Janeiro, Universitetet i Oslo, Universität Osnabrück, ENS Paris, University College London, Loughborough University, Vrije Universiteit Amsterdam, Universiteit van Amsterdam, and more.

[2] PhD placements in the last year (2018/19 graduates) include Oxford University (mathematics and philosophy), New York University (linguistics), Stanford University (philosophy), Université de Toulouse (computer science), CUNY (philosophy), Universitetet i Bergen (computer science), Scuola Normale Superiore di Pisa (philosophy), Universiteit Groningen (computer science), Københavns Universitet (logic), Universität Erlangen-Nürnberg (knowledge representation and reasoning), the Japan Advanced Institute of Science and Technology, and the ILLC (mathematical logic and philosophical logic).

[3] The exit qualifications of the MSc of Logic have been reformulated and made more precise in the summer of 2019. Appendix C reproduces the newest formulation together with the current version and an explanation of how the two versions relate to each other. The new formulation has been discussed and approved by a number of core lecturers, but formally it only has the status of a proposal by the programme director. If approved by the Examinations Board (EB), the Programme Committee (OC) and the Student Council of the Faculty of Science (FSR), it will be operative from September 2020.

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.

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 ability to carry out research (particularly, but not only, in an interdisciplinary context), while IM highlights the ability to interact fruitfully with peers from neighbouring disciplines.

The intended learning outcomes specified above are appropriate in view of the requirements of the domain of Logic, Language and Information described in Appendix B.1: 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.

1.3 International Positioning of the Programme

The MSc Logic is the only Master's programme of its kind in the Netherlands. Internationally, 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 B.2. The MSc Logic is the oldest and largest (in terms of student numbers) programme in our list. It is the most comprehensive Master's programme in Logic, Language and Information anywhere in the world and the only one that covers the four subfields of Logic & Computation, Logic & Language, Logic & Mathematics, and Logic & Philosophy as an area of specialisation.

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 (cf. Section 2.3). Another indicator is the fact that our graduates easily find PhD positions at leading universities and employment at highly respected companies (cf. Section 4.3). 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

As said, the chief aim of the MSc Logic is to educate future researchers. Therefore, the most relevant professional field is **academia** itself. The close embedding of the MSc of Logic in the ILLC ensures that the learning outcomes defined above are appropriate in view of the requirements of the universities that take on our students after graduation. The ILLC is 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. The teachers of 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 with 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. The research-oriented and communication skills described in our exit qualifications are also relevant for several jobs **outside of academia**. The ability to formulate a plan of action based on the critical evaluation of a complex body of information (cf. S1-S3), as well as the ability to write reports, give presentations and collaborate within an interdisciplinary and/or multidisciplinary team (cf. S4-S5) are vital skills for most of the professions favoured by our graduates, which include management, consulting, teaching, software engineering and the ICT industry at large (cf. again Section 4.3).

To further foster the alignment of the programme with the requirements of the professional field, since September 2018 the MSc Logic has a *Professional Advisory Board* consisting of three alumni: Thomas Icard (Stanford University); Annemieke Reijngoud (McKinsey & Company) and Yanjing Wang (Peking University). In May 2019 we received the first report from the Board (reproduced in Appendix L.3), which highlighted as strengths of our programme (i) the integration of coursework with research at ILLC; (ii) the strong and international student community and (iii) the interdisciplinarity of our curriculum. The report further contained a list of minor recommendations, one of which involved the creation of a non-academic mentorship programme (complementing our academic one) drawing from our alumni with the goal to strengthen the connections with industry and make it easier for our students to explore such opportunities. We enthusiastically followed their suggestion and, since September 2019, have a system of non-academic mentorship with a group of alumni who can be contacted by our students for career advice. This group includes representatives of different professions in industry and the public sector. The full list of non-academic mentors of the MSc of Logic is available at https://msclogic.illc.uva.nl/careers/Non-Academic-Mentors/.

Chapter 2

Teaching-Learning Environment

2.1 Educational Vision

The MSc Logic benefits from an open, research-based and flexible teaching-learning environment where a diverse group of excellent students, in direct daily contact with world-leading researchers, can design their own curriculum advised by their personal academic mentor. In the MSc Logic the general methodology employed to create the best possible teaching-learning environment is the programme's **I^3 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.

Internationality: The majority of the student population is drawn from outside the Netherlands and each cohort includes students from around 20 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: 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 curriculum. They do so with the help of a personal academic mentor.

2.2 The Programme

The MSc Logic is a two-year programme with four specialisation areas:

L&C: Logic and Computation;
L&L: Logic and Language;
L&M: Logic and Mathematics;
L&P: Logic and Philosophy.

The programme includes **obligatory courses** (roughly a quarter of the curriculum); **elective courses** (roughly half of the curriculum) spanning several disciplines and an intensive **research training** (roughly a third of the curriculum). The precise percentage depends on the track and on the background and individual choices of the student (cf. below). The focus on interdisciplinarity and research, with emphasis on formal methods, paired with a system of

mentorship providing academic guidance and individual attention, maximises the chances that students achieve the intended learning outcomes described in Section 1.2. Table 4.1, at page 18, represents which part of the curriculum contributes to which outcome.

2.2.1 Curriculum

The full curriculum is 120 EC and consists of coursework and research projects (comprising totally 90 EC) and an MSc research thesis (30 EC). For a diagrammatic overview of the curriculum, refer to Appendix D; for a full description of each individual component with an indication of how they contribute to the intended learning outcomes, refer to Appendix E.

Coursework The coursework (between 66 and 84 EC, based on the choice of the student concerning research projects) consists of an obligatory component in part determined by the student's area of specialisation and a free-choice component. The **obligatory courses** include:

Foundational

Logic, Language and Computation (overview of the research areas of ILLC);
Mathematical Proof Methods for Logic (training in proof techniques for logic).[1]

Track specific

L&C: Computational Complexity; Information Theory;
L&L: Meaning, Reference & Modality; Structures for Semantics;
L&M: Proof Theory; Model Theory; Set Theory;
L&P: Meaning, Reference & Modality; Philosophical Logic.

The course *Introduction to Modal Logic* has a special status, as it is shared with the local Bachelor's programme in Mathematics. Technically, it is a deficiency course: Students in the L&M or L&C track have to take the course if they have not covered this material in their undergraduate education. In practice, as the UvA is one of at best a handful of institutions in the world that teaches this kind of material at undergraduate level, almost all L&M and L&C students from outside of the UvA have to follow the course. Students from other tracks can follow the course as well (as elective), provided of course they do not yet possess the relevant knowledge.

In their free choice component, students can choose among the **electives** of the MSc Logic and relevant specialised courses at other Dutch universities (at most 18 EC). Track-specific obligatory courses of other tracks can be used as electives. Since 2015/16, the courses of the MSc Logic are displayed in an *overview poster* depicting the different areas represented in the curriculum (cf. Appendix D for the MoL overview poster 2018/19). The course offering reflects the interdisciplinary nature of the programme as many of the courses are placed at the intersections of different areas. The curriculum, however, also includes advanced specialised courses, some of these are formally "owned" by other programmes, but available to our students without restrictions.[2]

Research training To graduate, each student must complete **research projects** for at least 6 EC in addition to their Master's thesis, but students can choose to do more. In total, based on the choice of the student, between 6 and 24 EC of the curriculum can consist of

[1] Students with a strong mathematical logic background, typically students with a BSc in Mathematics who have followed relevant Mathematical Logic courses during their Bachelor's degree, are exempted from the obligation to take the course Mathematical Proof Methods for Logic.

[2] These other programmes currently are the *MA Philosophy*, the *MSc Artificial Intelligence*, the *MSc Brain and Cognitive Sciences*, the *Research Master in Linguistics*, the *MSc Mathematics* and the *MSc Computer Science*. Similarly, the MSc Logic "lends" several of its courses to these programmes.

research projects. Research projects come in two forms: *coordinated projects* offered in the periods free of regular teaching (January and June); and *individual projects* offered at any time of the year.[3] This is a great opportunity to bring students into direct contact with active researchers. We particularly encourage postdocs and PhD students to offer such projects. As part of their research training students are further expected to regularly attend local research colloquia and seminars. During term time there are several such events taking place almost every week. Students are also encouraged to participate in international summer schools, for example, the European Summer School in Logic, Language and Information (ESSLLI), and can obtain credits for such activities.

The final semester of the programme is dedicated to the thesis, which is worth 30 EC. An **MSc Logic thesis** is 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 in the area of Logic, Language and Information.

2.2.2 Study Methods

The programme makes use of a wide range of study methods. Some regular courses are delivered in the form of classical *lectures*, others adopt more student-centered (e.g., *flipped classroom*[4]) and team-based-learning methods. Many of the 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 are *computer lab sessions*. During coordinated and individual *research projects*, study methods can take an even wider range of forms.

2.2.3 Student Support and Guidance

Students receive support and guidance from a variety of sources. On top of the general provisions offered by the UvA and the Faculty of Science (cf. https://msclogic.illc.uva.nl/current-students/facilities/facilities/ for a full list), 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.

Student mentors: Each new student is furthermore assigned to a student mentor, i.e., a second-year student who provides 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.

Non-academic mentors: Since September 2019, current or recently graduated MSc Logic students interested in exploring the opportunities of the non-academic job market can

[3] Cf. https://msclogic.illc.uva.nl/current-students/courses/projects/ for a list of all coordinated projects offered over the years.

[4] In 2018, Christian Schaffner received a "Blended-Learning" Grant of roughly 10kEUR from FNWI for flipping the class in the L&C track-specific obligatory course *Information Theory*.

contact a non-academic mentor for career advice. Non-academic mentors are MSc Logic alumni who successfully pursued a career outside of academia.

Programme manager: The administrative management of the MSc Logic is in the hands of Tanja Kassenaar,[5] whose position is partly financed by the Education Service Centre (ESC) and partly by the ILLC. Together with the programme director, the programme manager 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 Examinations Board in its 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 student and every teacher personally, is of immense value to the programme and contributes much to its coherence and success.

A further 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.

2.2.4 Study Load, Feasibility and Success Rate

The MSc Logic is a demanding programme, but it is nevertheless feasible to complete it within the set time of two years. Having said so, our programme, like other Master's programmes, does face certain challenges in this respect. This section reviews two of them.

As shown in Table 2.1, which summarises the success and dropout rates for cohorts 2014-2018, only 42% of our students manage to graduate within two years.[6] An analysis of the common causes of delay shows that students often get stuck at the point when they have to switch from taking courses and doing small projects to committing to a large thesis project. To address this potential pitfall, in 2017, we introduced the MoL graduation trajectory with the goal to offer additional support to students in their thesis writing period.[7] This trajectory complements the individual guidance students receive from their academic mentors and from the programme manager who, every November, has individual meetings with all graduating students including those in their third or later years.

Cohort	N	within 2 years	within 3 years	total	dropout [1s/1y/2y]	studying
14-16	46	11 (24%)	28 (61%)	34 (74%)	10 (22%) [3/6/0]	2 (4%)
15-17	25	14 (56%)	18 (72%)	19 (76%)	2 (8%) [0/2/0]	4 (16%)
16-18	44	23 (52%)	33 (75%)	33 (75%)	4 (9%) [1/2/1]	7 (16%)
Average	38	16 (**42%**)	26 (**69%**)	29 (**76%**)	5 (**13%**)	4 (11%)

Table 2.1: Success and dropout rates (data collected on 1-10-2019)

A second challenge concerns the difficulty experienced by some students to combine the demanding programme of the MSc Logic with a healthy (social) life. Since 2016/17, the Programme Committee of the MSc Logic has a sub-committee specifically addressing this issue.

[5] From March 2017 to August 2018 Tanja Kassenaar was on (partial) leave and was replaced by Linda van Rijn (Spring 2017) and Sietske van der Pol (from September 2017 to August 2018).

[6] One of the students in the cohort 14-16 dropped out in their third year. For the cohort 16-18 there are still two students who can graduate within 3 years, these are the students who started in February 2017 and can graduate before February 2020.

[7] Cf. https://msclogic.illc.uva.nl/current-students/graduation/MoL-graduation-trajectory/.

This sub-committee monitors the (mental) health of our students by conducting yearly surveys and organises extra-curriculum activities to foster social cohesion among students. These social activities complement those organised by the student mentors and by Ex Falso, an informal committee consisting of both MoL and PhD students from ILLC. All these extra-curriculum activities are financially supported by the ILLC.

2.3 Admission and Incoming Students

2.3.1 Admission Procedure

The MSc Logic is a selective programme. Decisions about admissions are made by the Admissions Board (AB) following a procedure regulated by the OER (Part B, article 3). As specified in the OER and announced on the programme website (https://msclogic.illc.uva.nl/application/requirements/) successful applicants are expected to satisfy the following four admissions criteria:

(1) *Relevant BA*: a student should have a completed Bachelor's degree in mathematics, computer science, philosophy, or linguistics (or equivalent qualifications);

(2) *Logic background*: a student must have a strong logic background that includes the basics of mathematical logic such as the completeness and compactness theorem of first-order logic. They must have affinity with mathematical and formal thinking and sufficient familiarity with mathematical proofs;

(3) *Academic excellence*: a student must have a strong academic record, usually witnessed by high grades, in particular in subjects relevant for the MSc Logic. We usually expect students to belong to the top group of students from their undergraduate degrees;

(4) *English language requirement*: the UvA sets standards for English language requirements that all applicants must meet.

To apply, a student has to (i) fill in an online application form, which includes a list of questions concerning their technical background regarding basic logic and elementary mathematics, as well as existing knowledge in analytical philosophy, linguistics, and theoretical computer science and (ii) submit the following information: curriculum vitae; transcripts and diplomas; letter of motivation; contact of two faculty members who can act as reference; and results of English proficiency test (if applicable).

Each application is evaluated by the AB who check entry requirements (1) to (3) (the English language requirement is checked by the International Office and is not assessed by the AB). Students who meet all three criteria receive the recommendation "accept". However, the AB is aware that some students who do not meet the admissions criteria still deserve to be admitted: e.g., some students come from universities where no courses were offered that would have allowed them to satisfy the criterion *logic background*. That means that the AB does accept some applicants who only meet two of the three criteria and in very rare cases only one of them. The AB usually insists strictly on *academic excellence* and is more flexible on *relevant BA*. The AB can waive the *logic background* requirement if there is sufficient evidence that the student will easily acquire the needed familiarity with basic mathematical logic in their first semester.

The procedure of the assessment of applications is as follows: each member of the AB writes a report for each application, evaluates the three admission requirements (1) to (3), and gives

a recommendation: "accept", "borderline", or "reject". The chair of the AB makes the final decisions: applicants where the members of the AB agree on "accept" or "reject" are accepted or rejected, respectively. Borderline candidates or candidates where the members of the AB disagree are more closely evaluated, often after collecting further information from applicants and their references. In these evaluations, as mentioned above, academic excellence weighs more than the other criteria. Indeed, the quality of the students selected is generally excellent. This is not only apparent from the results they achieve within the programme (cf. Section 4.2), but also by the fact that our students are often successful in obtaining competitive grants to support their studies, such as the UvA Amsterdam Merit Scholarship (AMS), the Amsterdam Excellence Scholarship (AES) and the Amsterdam Science Talent Scholarship (ASTS). Another high-profile student grant programme is that of the Evert Willem Beth Foundation, which offers two scholarships exclusively to MSc Logic students every year.

2.3.2 Selectiveness

Table 2.2 presents statistics regarding admission to both the MSc Logic and the Logic Year programme, including February and September applications, from 2014/15 until 2018/19.

Year	Total	Rejected	Withdraw	Admitted	Declined Offer
14/15	98	18 (18%)	5 (5%)	75 (77%)	28
15/16	79	18 (23%)	5 (6%)	56 (71%)	29
16/17	108	27 (25%)	5 (5%)	76 (70%)	25
17/18	101	32 (32%)	5 (5%)	64 (63%)	23
18/19	150	64 (43%)	5 (3%)	81 (54%)	40

Table 2.2: Applications to MSc Logic and Logic Year

In the last five years we witnessed a substantial increase in the number of applications (from 98 to 150) with a decrease in the acceptance rate (from 77% to 54%). Every year a considerable percentage of students (average 41% of the admitted students) eventually decline our offer, mostly for personal or financial reasons and in a few cases because they were offered a PhD position elsewhere. Applications for September 2019 followed the same trend: 79 (63%) admitted students out of 124 applications (NB: February applications not included), with 38% of the admitted students who declined our offer.

2.3.3 Student Population

The *annual intake* of students has been stable around 40-50 students with the exception of 2015/16 when only 27 students joined our programme (this includes MoL and LY students, cf. Table 2.3). The intake for 2019/20 again follows the same trend with 44 MoL and 5 LY students who started in September 2019 (numbers for February 2020 are not yet available).

	14/15	15/16	16/17	17/18	18/19
MoL	42/4	22/3	41/3	35/3	27/4
LY	1/0	0/2	6/1	3/0	8/2
total	47	27	51	41	41

Table 2.3: Annual intake (Sep/Feb) of MSc Logic (MoL) and Logic Year (LY)

China	XX	X	Montenegro
Ecuador	X	XXXXXXXXXXXXXX	Netherlands
Denmark	X	XX	Poland
France	XX	X	Portugal
Germany	XXXXXX	X	Romania
Iceland	XX	X	Spain
India	X	X	Sweden
Indonesia	X	X	Switzerland
Ireland	X	XX	United Kingdom
Italy	XXXXXXX	XX	United States

Table 2.4: Countries of origin for cohort 2016–17 (X = 1 student)

Computer Science	XXXXXXXX
Linguistics	XXXXX
Mathematics	XXXXXXXXXXXXXXX
Philosophy	XXXXXXXXXXXXXXXXXXXXXX
Interdisciplinary	XXXXXX
Other	XXXXXXX

Table 2.5: Academic background for cohort 2016–17 (X = 1 degree)

Approximately 30% of our students are female and 70% are from outside of the Netherlands (55% from other European countries and 15% from outside of Europe). As shown in Tables 2.4 and 2.5,[8] their geographical origins are as varied as their academic backgrounds, evidencing the strong international and interdisciplinary orientation of the programme.

2.4 Academic Staff

The MSc Logic programme is delivered by an experienced group of people with substantial research and teaching credentials. To support this claim, we offer data for two groups of individuals, those who taught in at least one of the elective courses in 2018/19 (50 individuals, referred to as the **lecturers** in Table 2.6) and those who acted as first supervisor of at least one MSc thesis in the last two academic years (36 individuals, referred to as the **supervisors**).[9] Since the MoL electives consist of more than 60 courses offered in different programmes, the former group includes lecturers from outside ILLC and even UvA. The second group (the supervisors) instead mostly consists of ILLC researchers. At the union of these two groups we have 59 individuals (the **total staff**), a subset of which will be referred to as the **core staff** of the MSc Logic. This core group, which largely overlaps with the intersection of the lecturers and the supervisors, consist of permanent staff members of the ILLC (or IvI) and includes all programme officials and MoL academic mentors. All members of this core group hold a PhD, 62% are recipient of a major personal research grant and 81% hold a

[8] In Table 2.5, we count degrees rather than students. Many of our students have more than one bachelor's degree.

[9] Teaching in the MSc Logic is provided by a larger 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 however makes it hard, if not impossible, to provide a full list of all teachers who have contributed to the programme over the years.

Basic Teaching Qualification Certificate (BKO). The names, qualifications and expertise of the lecturers belonging to this core group are listed in Appendix H.

Group	PhD	Research Grant	BKO	Total (m/f)
Lecturers	50	29 (58%)	37 (74%)	50 (42/8)
Supervisors	36	23 (64%)	26 (72%)	36 (30/6)
Core staff	37	23 (62%)	30 (81%)	37 (29/8)
Total staff	**59**	**34** (58%)	**41** (69%)	**59** (50/9)

Table 2.6: Qualifications of MoL lecturers and supervisors

The group of lecturers and supervisors together deliver more than 90% of the teaching within the programme. The remaining percent consists of projects offered by other ILLC researchers (including PhD students) or visiting scientists, and tutorials offered by Teaching Assistants (TAs).[10] TAs work under the close supervision of the lecturers. Furthermore all PhD candidates at ILLC are required to follow the course "Teaching Skills for PhD candidates" organised by the Faculty of Science before they start their first TA task.

2.4.1 Research Credentials

Many of the teachers associated with the MSc Logic are leading researchers in their field. Most of them (58% of the lecturers, 64% of the supervisors and 62% of the core staff) have been recipients of a major research grant from the Dutch Research Council (NWO) or the European Research Council (ERC), while some have two or more. Here we give a representative (non-exhaustive) list of the grants received by MSc Logic lecturers and supervisors:

ERC Consolidator: Berto, Fernández, de Wolf.
ERC Starting: Betti, Incurvati, Roelofsen, Smets, Szymanik.
NWO Vici & Pionier: Betti, Endriss, van Lambalgen, Sima'an, Venema.
NWO Vidi: Aloni, Endriss, Fernández, Kamps, Ozols, Roelofsen, van Rooij, Schaffner, Sima'an, Smets, de Wolf.
NWO Veni: Aloni, Dotlacil, Fernández, de Haan, Lipman, Roelofsen, Schaffner, Schulz, Szymanik, Walter, de Wolf, Zuidema.

The MSc Logic is further 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, covering the period of 2012–2017, are given in Table 2.7 (the best possible grade is 1).

Criterion	Score
Research Quality	1
Relevance to Society	2
Viability	1

Table 2.7: Results of the ILLC research assessment 2012–2017

[10] Of the 43 core courses of the MSc Logic in 2018/19, which include all obligatory courses plus the ones directly administrated by ILLC at FNWI and at FGW (in the overview poster indicated as MoL-FNWI and MoL-FGW), 24 (56%) were assigned a TA, in 8 courses (19%) the TA only helped with grading while in 16 courses (37%) the TA also provided tutorials.

The ILLC is also home to excellent researchers who are not part of the group of teachers, but whose expertise is still available to MSc Logic students. This includes Johan van Benthem (NWO Spinoza laureate), Harry Buhrman (Vici laureate and leader of QuSoft), and Rens Bod (Vidi and Vici laureate).

2.4.2 Teaching Credentials

As per NVAO guidelines, in Table 2.8 we summarise the basic qualifications of the lecturers and supervisors of the MSc Logic and list the number of individuals holding a Master's degree (or equivalent), a PhD, and a Basic Teaching Qualification certificate (BKO). Of the 59 lecturers or supervisors of the MSc Logic, 34% are full professor, 69% hold a BKO (74% of the lecturers, 72% of the supervisors, and 81% of the core staff) and 100% hold both a Master's degree (or equivalent) and a PhD. Of the 18 individuals who do not hold a BKO, 6 are full or associate professors who only have a part-time position at the UvA (3 of them are emeriti), 3 are new hires who are in the process of getting their qualification, 7 are researchers or temporary instructors. The remaining two are experienced lecturers from outside of the ILLC; one of them is a full professor in the process of obtaining an exemption from the obligation of a BKO certification due to seniority.

Position	Master's	PhD	BKO	Total (m/f)
Full Professor (HGL)	20	20	14	17/3
Associate Professor (UHD)	13	13	12	11/2
Assistant Professor (UD)	15	15	12	12/3
Instructor (*docent*)	4	4	2	3/1
Researcher	7	7	1	7/0
Total	**59**	**59**	**41**	**50/9**

Table 2.8: Basic qualifications of MoL lecturers and supervisors

At last, MSc Logic teachers score high in student evaluations, according to the Dutch National Student Enquête, more than 85% of our students (88% in 2018) are very satisfied with the lecturers of the MSc Logic (referred to as *docenten* in the table in Appendix L.1).

2.5 Quality Assurance

The quality of the MSc Logic is responsibility of the programme director who every year decides the curriculum, the regulations and other features of the programme, advised by various actors but mostly by the **OC** (*Opleidingscommissie* or Programme Committee) of the MSc Logic.

The OC of the MSc Logic, which consists of four students, four teachers and a student secretary, meets at least four times a year to discuss the quality of the individual courses and the regulations and has the right to advise the director on all aspects of the programme.

An important instrument of quality assurance are the evaluations students are asked to fill in after every course and when requesting their diploma. These **student evaluations** are discussed by the OC, who, for each course, further produces an additional succinct *course report* containing positive and negative feedback for the course coordinator. The latter is then invited to prepare a written reaction and to make both the report and their reaction available to the relevant students. In case these evaluations indicate problems, the programme director can take action, either on her 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.

On top of the evaluation of individual courses, at the end of each semester the student members of the OC also organise two evaluations of the programme as a whole (aka **pizza evaluations**) and produce a report to which the director responds in written form. Besides the course offerings, these pizza evaluations also cover issues such as the mentor system and study facilities.

Since 2016, the OC further organises working-groups investigating and monitoring various aspects of the programme, including student well-being (already mentioned in Section 2.2.4), academic mentoring and the 8-8-4 system. These investigations often lead to specific recommendations, which are almost always implemented by the director.

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 is also in close contact with the student mentors and can sometimes identify problems that may not be easily visible to the academic staff.

Chapter 3

Assessment

3.1 Vision and Policy

The MSc Logic aims at conducting student assessments in a manner that (a) ensures that graduates achieve the appropriate level of competence, and also (b) is fair, coherent, transparent and accountable. In order to achieve these goals, a rich variety of testing methods are used and a system of regulations and procedures of quality assurance is in place, which will be illustrated below. In designing these procedures, the MSc Logic management was guided by the following principles: (i) quality, selection requirements, fairness and transparency of examinations should be guaranteed; (ii) the independence and expertise of the individual lecturers should be respected and valued; (iii) clemency towards students in trouble due to circumstances beyond their control should be shown; and (iv) over-regulation should be resisted (cf. Recommendations of the 2007 accreditation panel). By balancing these principles a light and efficient system of regulations and procedures came to place where (a) the responsibility for the quality of the examinations is laid as close as possible to the individual actors (examiners but also students), but to guarantee overall coherence, a centralised system of assessment of the Master's theses is in place; (b) rules and procedures are few and transparent, based on a large consensus and flexible enough to accommodate the individual needs of lecturers and students; and (c) top-down (often costly) measures of quality assurance are only enforced if their efficacy has been proven in an objective way.

Such a policy can only be successful in a programme like the MSc Logic where (i) staff and students feel strongly concerned and engaged with the quality of teaching and assessment and (ii) the lines of communication between management, lecturers and students are short and efficient. The strength of the MSc Logic lies with its individual actors. The main responsibility of the management is to foster an environment where everybody can contribute within their area of expertise and in an independent way and where everyone's contribution is important and valued.

In particular, we aim at giving lecturers and examiners as much autonomy in their decisions as possible and empower them while keeping the administrative burden on them as small as possible. As a consequence, the assessment policy of the MSc Logic is in line with the policies of the Faculty of Science of the University of Amsterdam but diverges from other UvA Master's programmes in that we do not ask lecturers to make so called "vakdossiers" (course dossiers), including "toetsmatrijzen" (exam matrices). Since 2019, the Examinations Board checks the exams and grade statistics which are posted on DataNose to guarantee overall coherence (cf. Section 3.3.2).

For the Master's theses, the MSc Logic has a much more elaborate policy than other programmes with at least one member of the Examinations Board involved in the assessment of each thesis (cf. Section 3.2). Furthermore, while at the Faculty of Science each graduate school has one shared Examinations Board (hereafter, EB) which is responsible for the quality of the assessments of all programmes within the school, the MSc of Logic has its own EB which operates independently from the Graduate School of Informatics.

3.2 Forms of Assessment

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, which are sometimes regarded as the standard way of assessing a student's performance, other forms of assessment are used such as regular homework (and take-home exams), term papers, in-class presentations, programming assignments, the design and execution of experiments, and combinations of several of these. Appendix E lists for each curriculum component the (main) form(s) of assessment used.

Of special significance is the assessment of the Master's *thesis*. Each thesis is supervised by an experienced scientist who can guarantee that the chosen subject and the level of difficulty are appropriate. An additional level of assurance is provided by the following measures: in January, as part of the MoL graduation trajectory, every second year student is expected to discuss their preliminary thesis plans in an *informal presentation* attended by other graduating students and the programme director; at the start of their thesis work (3 to 4 months before graduation) a student has to outline their research plan in a *Thesis Project* proposal, which needs to get countersigned by the main supervisor and a member of the Examinations Board (EB); two months before graduation a student is required to present their ongoing thesis project in a plenary *MoL thesis presentation* event where they can receive feedback from all ILLC researchers; students are further encouraged to discuss their thesis research with experts outside of their supervisory team in well-prepared *research meetings*, which can replace the mandatory MoL thesis presentation in exceptional cases. When completed each thesis is assessed by a *thesis committee*. This committee must consist of at least three people, including the supervisor(s). At least three members must have a PhD (all members must have a Master's degree). 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 EB; this is an important factor in ensuring the coherence of grading standards across thesis projects. Since 2012 the committee 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, research contribution, and level of independence of the student. To further improve transparency and accountability, the description of these criteria has been made more precise in 2017 and, since 2018, the guidelines given to the committee members (with description of criteria) have been made available to students via the MSc Logic website. These guidelines are reproduced in Appendix G.2.

3.3 Regulations and Procedures of Quality Assurance

3.3.1 Regulations and the Examinations Board

The system of student assessment within the MSc Logic is regulated by the OER, Part A (faculty policies applicable to all master's programmes), the OER, Part B (policies determined at

faculty level but applicable only to the MSc Logic), the Rules and Guidelines of the Examinations Board Logic (regels en richtlijnen van de examencommissie, or RRvE, policies determined by the EB itself, largely in line with the examination rules of the *Graduate School of Informatics*, except with respect to the examination of theses),[1] and the Regulations of Fraud and Plagiarism (applying to all programmes at the University of Amsterdam). The first three documents are in Appendix F.

The Examination Board (EB) of the MSc Logic is independent from the Examinations Boards of other master's programmes within the Faculty of Science. It currently has six members: the chair, four internal members who are also lecturers in the MSc Logic and one external member from Utrecht University. Members are appointed for a term of three years. Often they stay on the board for two consecutive terms, so for six years in total. This ensures sufficient continuity. The EB is assisted by the programme manager and by an "ambtelijk secretaris" from the Faculty of Science. The chair of the EB also regularly meets with the programme director. Routine decisions (cum laude requests, exemption requests, academic plans) are usually made by the chair of the EB without consultation of the entire Board. Any decisions that the chair considers likely to generate discussion are discussed and decided by the whole Board, usually by e-mail. The EB usually meets twice a year to discuss matters of general policy and issues which cannot be decided by email. In the academic year 2018/19, two meetings were held, on 12 November 2018 and 11 January 2019.

3.3.2 Quality Assurance

The quality of assessments in the MSc Logic is a shared responsibility of all members of the teaching-learning community but its formal responsibility lies with the EB and it is further assured by a number of procedures which involve, besides the EB, different institutional actors (Programme Director, Examiners, OC, Students, Academic Mentors). In what follows, we illustrate what measures are in place to guarantee *fairness*, *coherence*, *transparency*, and *accountability* of assessments within the MSc Logic, as well as the *validity* of the exams and the *reliability* of their evaluations. In Appendix G, we summarise the specific roles of the various actors in our quality assurance procedures.

Fairness in examinations means that individual students are evaluated based on their academic performance alone (taking into account disabilities; for example, at the UvA, students with dyslexia or other conditions may be given more time during a written exam). Fairness of assessments is a shared responsibility of lecturers and students. Should a student feel that a particular examination has been inappropriate or that they have been treated unfairly, they can lodge a formal complaint with the EB. This hardly ever happens, also because given the short communication line between students, lecturers and management, these issues are normally settled before leading to a formal complaint, but when it does, the Board has the means to resolve such problems. Suspected cases of plagiarism or fraud are also handled by the EB.

Coherence means that the assessment standards across curriculum components are comparable and that a similar performance results in a similar grade. To guarantee coherence across the curriculum, every final thesis assessment is closely monitored by an EB member (as described above); furthermore, the EB checks the exams of courses which either present

[1] In 2017, the *Graduate School of Informatics* published an *Assessment Plan for GSI masters* which also applied to the MSc Logic. In 2018, the EB decided this additional list of rules was superfluous (most rules were already part of the OER or the RRvE) and potentially confusing (in particular the regulations on thesis assessment created a conflict with the MSc Logic policy formalised in the RRvE). Since September 2019, the Assessment Plan for GSI masters is therefore no longer operative for the MSc Logic. All articles in the GSI document that were not already covered in other regulations have been added to the RRvE document in 2019.

an abnormal profile (e.g., a success rate lower than 40% or a mean grade above 8.5) or have been reported to the programme director by the OC, the academic mentors or the students themselves as diverging from the norm. In addition to these regular checks, the EB can carry out spot checks and, if required, intervene. To facilitate these checks, since 2019, lecturers post their exams on DataNose where they are accessible to members of the EB.

Transparency means that students understand how they are being assessed and what the evaluations they receive are based on. To guarantee transparency, following UvA regulations, the MSc Logic requires that the assessment method to be used for a curriculum component has to be announced by the start of that component; and that students have the right to inspect their marked work and to discuss the assessment criteria with the lecturers until 20 days after the grades have been announced. The latter measure further guarantees **accountability**, that is, examiners should be able to justify the evaluations they give towards the students and the programme. Fairness, transparency and accountability are further guaranteed by the four-eyes principle, which is largely adopted within the MSc Logic: Master's theses are assessed by a committee consisting of at least three members and the large majority of our courses has one or more TAs, which guarantees that each assessment is viewed and approved by at least two people. Exceptions to the four-eyes principle are advanced research seminars where nobody besides the lecturer has enough expertise to peer-review the examinations.

Finally, we summarise the measures adopted by the EB to guarantee the **validity** of the exams and the **reliability** of their evaluations: (a) The EB encourages "peer validation" of exams before the examination takes place. In particular, lecturers are encouraged to ask their TAs to test the exam and identify potential problems well before the actual examination takes place. (b) The chair of the EB checks the grade statistics of all courses. In the case of outliers he talks to the examiner in question. There have been three such cases in 2018/2019. (c) The EB also hears about potential problems through (i) the programme director, (ii) the OC, and (iii) the academic mentors. The chair of the EB is in close contact with the programme director, the chair of the OC, and also meets with the academic mentors twice a year. (d) The EB asks all examiners to make their exams available to the EB through DataNose. If needed, these exams can then be checked by the EB without consultation with the examiner, though in practice potential problems (and possible solutions) are usually discussed with the examiner directly.

Chapter 4

Achieved Learning Outcomes

In this section, we document the fact that our graduates achieve the intended learning outcomes specified in Section 1.2. The main indicators for success that we cite are the quality of the Master's theses (Section 4.2) and our graduates' placement record (Section 4.3). But equally importantly, our students and graduates themselves are satisfied with the education received. We substantiate this claim in Appendix L, where we reproduce (a) a recent survey amongst graduates that gives our programme a grade of 8.88 (on a scale from 1 to 10); (b) the first report of the Professional Advisory Board of the MSc Logic composed by MoL alumni who describe the programme as "thriving"; and (c) the results of the Dutch National Student Enquête (NSE) for the years 2013-2018 according to which more than 90% of the MSc Logic students are *very satisfied* with the content of the programme (92% in 2018).

4.1 Level Achieved

MSc Logic graduates achieve the learning outcomes of the programme as specified in Section 1.2 and the OER (cf. Appendix F). The following table graphically represents which part of the curriculum contributes to which outcome. Details on which individual courses cater for which type of knowledge or skill are given in Appendix E.

Component	Learning Outcomes
Obligatory courses	
Foundational	K1, S3, IM
Track specific	K1, K2
Electives	K1, K2, S1, S2, S3, S4, S5, IM
Research training	
Projects	IR, K2, S1, S2, S3, S4, S5, IM
Thesis	IR, K2, S1, S2, S3, S5, IM
Seminars	IM

Table 4.1: Achieved learning outcomes per component

4.2 Master's Theses and Student Publications

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 term papers written for advanced courses, have also lead to publications. Appendix K lists a selection of the publications which resulted from research produced by MoL students in the years 2014 to 2018. This list 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. For instance, in the last years MSc Logic students published their results in journals such as *Annals of Pure and Applied Logic*, *Australasian Journal of Philosophy*, *Erkenntnis*, *Journal of Logic and Computation*, *Journal of Semantics*, *Linguistics and Philosophy*, *Mathematical Logic Quarterly*, *Mathematical Structures in Computer Science*, *Physical Review A*, *Social Choice and Welfare*, *Studia Logica*, *Synthese*, *Theory and Applications of Categories*, and presented their work at selective conferences such as AAAI, AAMAS, ACL, CLS, CRYPTO, EACSL, INLG, SALT, SemDial and TARK. Beside demonstrating the *interdisciplinarity* of the programme the publication record of the MSc Logic students also bears witness to the fact that they are used to work in *collaborative teams*: most publications based on research projects or advanced courses are joint work of two or more students.

Another indicator of excellence is the fact that several MSc Logic students have won **prizes and awards** for their work. Students from our programme won *thesis prizes* in 2015 (UvA Thesis Prize for the best Master's thesis written at the University of Amsterdam); in 2016 (Ngi-NGN Master's thesis Information prize from the Koninklijke Hollandsche Maatschappij der Wetenschappen (KHMW) for the best Master's thesis in Informatics & Computer Science in the Netherlands); and in 2017 and 2019 (both AILA Thesis Award for the best Master's thesis in Logic by an Italian student). Publications co-authored by our students further won the Best Paper Award at the ESSLLI Student Session in 2016 (based on a term paper for a MoL course), and in 2018 (based on a MoL project); the Best Student Paper Prize at Cognitive Modeling and Computational Linguistics in 2015 (based on course work) and at Computability in Europe (CiE) in 2017 (based on thesis work); the Best Paper Award at SIGNLL Conference on Computational Natural Language Learning (CoNLL) in 2016 (based on thesis work); and, finally, the Best Paper Prize at the EMNLP Workshop: Analyzing and Interpreting Neural Networks for NLP in 2018 (based on a project work). Furthermore, three of our students won the prestigious NWO PhDs in the Humanities grants to fund their PhD positions for research proposals developed during their time as MSc Logic students (two in 2017 and one in 2018, respectively). Other noteworthy achievements include one MSc Logic student being selected in 2017 during their first MoL year to take part in the selective Infosys InStep summer internship programme in Bangalore, India; and another student being selected in 2018 during their second MoL year to write their thesis at the Institute of Advanced Studies of the UvA.

4.3 Job Market Performance

MSc Logic graduates enjoy excellent opportunities on the job market. Table 4.2 gives an overview of graduate destinations for students who graduated in the last six years. Over 90% of our graduates, including those who opt for a career outside of academia, easily find a job at graduate level after graduation. The majority of them receive their job offer before or directly after graduation.[1]

Year	*N*	PhD	ICT	Management	Teaching	Other	Unknown
12/13	24	20	1	1	1	1	–
13/14	25	19	2	2	1	1	–
14/15	31	20	3	3	2	3	–
15/16	31	18	4	4	2	–	3
16/17	36	18	5	4	2	3	4
17/18	34	16	7	3	2	3	3

Table 4.2: Graduate destinations

In Table 4.2, *ICT* includes software engineering and a variety of related jobs in the ICT industry (analyst, data-scientist, machine learning researcher) but also students who founded their own startup in a software-related area. *Management* refers to management and consulting jobs at companies or in the public sector. *Teaching* includes teaching positions at universities (UvA, University of Indonesia, Jahangirnagar University in Bangladesh) or high-schools. Other jobs include researcher (at TNO), artist, writer, administrator, quality assurance coordinator, and more; this column also covers graduates who entered a second Master's programme.

Around **60%** of the graduates covered by Table 4.2 (111 out of 181 graduates) have entered a PhD programme.[2] Focusing on the last two cohorts, of the 34 graduates who entered a PhD programme, 10 (**29%**) did so at a *Dutch* institution—ILLC (6 students), CWI (2), VU-AI (1) and TU Delft-QuTech (1). Seven students (**20%**) joined PhD programmes in the *United States* at NYU (Philosophy), Stanford (Philosophy), Santa Cruz (Linguistics), Amherst (Linguistics), Berkeley (Mathematics), John Hopkins (Cognitive Science), and Irvine (Philosophy). The remaining 14 students (**41%**) joined a *European* programme in Philosophy (e.g., Köln, Stockholm, Jagiellonian University in Krakov), Computer Science (e.g., UCL, Warwick, Toulouse, TU Dresden, Zurich), Linguistics (ZAS Berlin, Pompeu Fabra Barcelona), Mathematics (Bern, Technical University of Denmark), AI (Dalle Molle Institute for AI), or interdisciplinary (e.g., SnT Luxemburg). In terms of disciplines, most students do their PhD in a logic-related topic in a Computer Science department (11 students; 32%), followed by Philosophy (8 students; 23%), AI (5 students; 15%), Linguistics (4 students; 12%), Mathematics (3 students; 9%), and Cognitive Science or other interdisciplinary programmes (3 students; 9%).

[1] The trend for the 2018/19 graduates is similar, 21 (78%) out of the 27 students who graduated in the past academic year already have found a job—most of them had an offer before graduation. This includes PhD positions (16 students, 59%), jobs in industry and in the public sector, but also startups (own business). Three students continued or started a second Master's programme; only three students are still searching (data collected in October 2019, most students graduated in the summer of 2019).

[2] These numbers do not include students who are offered a PhD position after completing the first year of the programme and join a PhD programme before graduation. We had two such cases in the last two years.

Part II

Chapter 5

Student Chapter

This section has been written by MoL students. It is an evaluation of the program based on the responses of, then current, Master of Logic students during a program meeting on May 15, 2019. The Master of Logic was evaluated across two dimensions: academic and social. The academic dimension was evaluated according to four standards: Intended Learning Outcomes, Teaching Learning Environment, Assessment and Testing, and Achieved Learning Outcomes. Each of the mentioned standards were discussed in terms of strengths and weaknesses and then given an overall grade (according to the Dutch grading scale) for that given standard. The social dimension was evaluated in terms of strengths and weaknesses and also given an overall grade. Each standard was discussed until the students reached a consensus, and an agreed-upon evaluation was recorded.

Intended Learning Outcomes. The first standard we evaluated was *Intended Learning Outcomes*. It was communicated to the students that this standard refers to how well the program's academic level, orientation, and international competitiveness is communicated to incoming Master students prior to starting the program. Students expressed that the Master of Logic's international status is clear, for its distinguished reputation is known to most applicants. When applying, it is explicit that the program intends to be a preparatory step towards a PhD program. The students acknowledge and appreciate the fact that the program's freedom regarding course selection, track selection, and opportunity for research projects, provides a way for students to individualize the Master in order to be best prepared for their desired PhD program. The students expressed that they wished there was more information about the cutting-edge research at the ILLC prior to their enrolment. The researchers at the ILLC are some of the top in their fields, and it was suggested that this should be emphasized to incoming students. **Overall grade: 9/10**.

Teaching-Learning Environment. The second standard within the academic dimension is *Teaching-Learning Environment*. This refers to how well the program helps achieve the intended learning outcomes mentioned above. For example, it covers issues such as the extent to which the program values diversity (in coursework, topics, lecturers, teaching styles), and whether or not the lecturers have sufficient expertise in the field. The students concluded that the Master of Logic performs extremely well on this standard, primarily because of the size of the program. Each class size if often quite small (usually under 20/15 students with the exception of courses shared with the AI Master), and as a result, lectures have an informal atmosphere. Students agree that this is beneficial and encourages active participation with the lecturer and the material. Furthermore, lecturers are willing to adapt and try a different learning style

that best fits the students' needs. The size of the program also allows the opportunity for students to work on research projects with top researchers in the field, an opportunity they believe should be more clearly advertised during the application process. Lastly, because the program accepts a limited number of applicants, each incoming student is assigned an academic mentor (a researcher at the ILLC) with whom they meet with upon starting, and throughout, the program. This allows the student to have the opportunity to seek advice and plan for the future under the guidance of a researcher at the institute. The availability of an academic mentor was greatly appreciated by the students, especially when starting the program, for it provides individual guidance from an expert in the student's preferred field. It was mentioned that classes shared with the Master AI students are larger than MoL courses. This was seen as something that could be improved, however, the students recognize that the MoL is working to remedy this issue. Students also suggested something that could be improved is the physical space of the study areas for the MoL students. However, they were reminded that plans are in place to move the ILLC to a new location within the next few years, and thus, this concern will no longer be an issue. **Overall grade: 9/10.**

Assessment & Testing. The third standard of the academic dimension is *Assessment and Testing*. This standard was understood as how well the program's assessment requirements are transparent and reliable. It was agreed that the courses within the Master of Logic clearly indicate the requirements of their assessment, independent of the level of difficulty of a course. In general, students appreciate the fact that in most courses their final grade does not rely exclusively on the exam grade and that assignments throughout the course are fair in content as well as overall grade weight. It is also appreciated that at the beginning of a course, it is clearly indicated what one must do in order to perform well. The main concern for Assessment and Testing is the variation of assessment among courses. For example, math-focused courses often conclude with an exam, whereas philosophy courses rely heavily on an end-of-course paper. Though this variation exists, the students understand that this is a consequence of the MoL being an interdisciplinary program, and agree that each track tests differently. **Overall grade: 8/10.**

Achieved Learning Outcomes. The last standard used to evaluate the academic dimension of the Master of Logic was *Achieved Learning Outcomes*. This standard refers to how successful the program is in preparing its students post-Master of Logic. As mentioned in the Intended Learning Outcomes, the program explicitly communicates that it intends to prepare its students for a PhD. It is agreed among the student that in this respect, the program scores extremely high. This high score is the result of various opportunities available to students throughout the program. The MoL encourages its students to participate in academia by hosting various seminars, workshops, and advertising conferences in the different tracks. Specifically, the students value the multiple opportunities to present their work in front of an audience as a course requirement. This is seen as a beneficial practice before defending their thesis at the end of the program, and in preparation to post-MoL work/study. Another opportunity available throughout the program is research projects, either individual or cooperative. Research projects allow students to work with experts in their fields, be exposed to the research process before a PhD, and produce papers that can be used as writing samples for PhD applications. The students appreciate the fact that research projects allow them to explore a particular interest in more depth, and begin preparing them for postgraduate research. When applying to PhD programs, students feel they have already taken part in the academic community. The MoL program explicitly states that it intends to prepare its students for a PhD program. While the student

understand this intention, they feel there could be more done for students who do not want to pursue academia. It was brought up that the MoL offers various opportunities for students who do not wish to pursue academia. For example, it is possible to do research projects with a company instead of an ILLC researcher. Students also have the opportunity to get in touch with ILLC alumni who went on to work for various companies, such as Google, instead of pursuing academia. After highlighting the various possibilities for students who do not want to go into academia, it was decided that it would be beneficial to make these opportunities more known to MoL students. **Overall grade: 9/10.**

Social dimension of the MSc Logic. The social dimension of the Master of Logic was evaluated in terms of strengths and weaknesses. It was concluded that the strengths far outnumber, and help reduce, its weaknesses. The primary concern regarding the social life of a Master of Logic student is its near absence. The program is a very demanding and academically challenging, and this often causes students to have to compromise their social life in order to succeed in their academic life. Although this weakness is not to be taken lightly, it was agreed among the students that there are many aspects of the program that alleviate this concern. The program's small size, its international composition, and the fact that it spans over two years are some of the structural components of the program that benefit the students' individual needs. Components which are unique to the Master of Logic and designed to help maintain the balance between academic and social life include the Student Mentor program, the Mental Health Program and extracurricular activities organized by committees within the Master. The Student Mentor program assigns incoming MoL students to second-year students who act as mentors for the incoming class. Student Mentors organize outings, such as drinks at a local pub, so that the incoming class gets a chance to meet the second-year students and vice versa. The Mental Health program is a sub-committee of the Opleidingscommissie of the Master of Logic. It is responsible for providing students with information about taking care of their well being throughout their study, and dispurses a Mental Health Survey at the end of every academic year, as well as an annual hike through the forest in the spring. Another unique opportunity in the MoL is for students to participate in the Cool Logic Seminar. It is a student run seminar where MoL and PhD students give presentations on their current work. The seminar occurs on Fridays and is intended to be an informal setting, allowing the students a chance to improve their presentation skills while bonding with fellow students. The students suggested that extracurricular events could be improved by hosting more events outside of Science Park. Ex Falso, an extracurricular committee responsible for hosting events for the ILLC, intends to address this concern in the upcoming academic year 2019/2020. **Overall grade: 9/10.**

Part III: Appendices

Appendix A

Developments since Previous Accreditation

In this appendix we summarise the most important developments since the previous accreditation, which was carried out in June 2013.

A.1 Specific Committee Recommendations

In 2013 the panel evaluating the MSc Logic concluded the summary of their findings as follows:

> The programme has a strong research orientation, and the majority of the graduates obtain Ph.D.-positions at renowned universities. This is another reason for the panel to assess this programme as one of the best, if not the best programme on logic in the world.

The main recommendations for improvements contained in their report were:

(1) **BKO:** The panel advises the programme management to increase the number of BKO certified lecturers

(2) **Examinations of courses:** The panel advises the board of examiners to study, more systematically, the examinations of the courses in order to be able to assess the examinations' quality more thoroughly, to catch early warning signals wherever necessary

(3) **Thesis assessment:** The examinations of the courses meet the learning objectives of the courses and are of very good quality. The panel regards the master's thesis process and assessment to be sound and to lead to a fair assessment of the theses. Still, the panel recommends the programme management to specify the assessment criteria for the master's thesis more clearly and to communicate these more explicitly to the students.

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

(1) **BKO:** The percentage of BKO certified lecturers has increased from 22% in 2013 to 69% (74% of the lecturers, 72% of the supervisors and 81% of the core staff members) in 2019, cf. Section 2.4.

(2) **Examinations of courses:** Since 2018/19, the Examinations Board collects information about pass percentage and average grades for all MSc Logic courses and further investigates those which deviate from the norm (a passing rate of less than 40% and an average grade higher than 8.5). Furthermore, although in day-to-day practice, the responsibility of examinations is largely delegated to the individual examiners, the Board has the right to carry out spot checks and it can, if required, intervene. To facilitate these checks since 2018 examiners are required to upload their written exams in DataNose where the EB can inspect them.

(3) **Thesis assessment:** The assessment criteria for the master's thesis were revised and made more precise in 2017 (approved on 18 December 2017) and has been operative since June 2018. Minor adjustments were further made by the Examinations Board on 21 November 2018. To guarantee transparency, the assessment guidelines are available for students on the MSc Logic website at the address:

https://msclogic.illc.uva.nl/current-students/graduation/assessment/

A.2 Changes in the Programme

The objectives of the programme, its general structure as well as its overall strategy have not changed in recent years. However, various details have. In addition to the changes discussed above we mention here four further developments:

Obligatory Courses. There have been a number of changes in the compulsory components of the programme in part introduced as reaction to students' evaluations. Since 2014/15, the course Kant, Logic & Cognition is no longer an obligatory component of the Logic and Philosophy track. Since 2015/16, the course Information Theory is an obligatory component of the Logic & Computation track, replacing Recursion Theory. The courses Kant, Logic & Cognition and Recursion Theory are still part of our electives. Since 2017/2018, Mathematical Proof Methods for Logic is a compulsory component of the MSc Logic replacing Basic Logic. Finally, since 2017/18, the MasterMath course Set Theory is an obligatory component of the Logic & Mathematics track and the deficiency course Axiomatic Set Theory is no longer part of our curriculum.

Elective Courses. Over the years, we have discontinued many elective courses and started many 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. This policy and the many recent hires at ILLC resulted in the introduction of multiple new themes including latest developments such as Quantum Information, Inquisitive Logic, Deep Learning (applied to NLP) and Cognitive and Computational Semantics, as well as more traditional topics such as Philosophy of Mathematics, Causality, Topology and Category Theory. Furthermore, with the goal to enlarge our offerings in Theoretical Computer Science and Theoretical Linguistics, we extended the curriculum by including selected advanced courses in these areas offered by other programmes at the UvA and the VU. The total number of courses in the MSc Logic grew from 48 in 2013/14 to 64 in 2019/20.

Graduation Trajectory and Life after the MSc Logic. With the goal of offering more guidance to students in their final year, in 2017 we introduced (i) a graduation trajectory

aimed at helping students in their thesis writing period; and (ii) a number of new initiatives to help students orientate in their "life after MoL", including participation in the Thesis Fair of GSI, information meetings on PhD applications, and, since September 2019, a system of non-academic mentorship. Possibly also thanks to these measures, we managed to slightly increase the success rates of the programme. Since the previous accreditation the percentage of students graduating within 2 years has increased from 39% to 42% and that of students graduating within 3 years has increased from 61% to 69% (compare Table 2.1, in Section 2.2.4 with Table 2.2, at page 20 of the self-assessment report produced for the previous accreditation).

Digitisation. With the goal of reducing the workload of the support staff of the MSc Logic, in 2017/18, we have digitised various procedures including student applications, approval of research projects, submission of thesis projects and assessment of Master's theses. These procedures are now handled in DataNose (`https://datanose.nl`), a web-based system from the Faculty of Science, which further provides students with a personal schedule, a complete grade list and access to various electronic forms. Since September 2018, lecturers also rely on the digital learning system Canvas (`https://canvas.uva.nl`) to share course material and to facilitate interaction with students in a course-specific context.

Appendix B

Reference Framework

The MSc Logic is an interdisciplinary programme educating students in the research area of Logic, Language and Information. The overall goal in this area is to understand how humans and machines alike accomplish the tasks of representing, communicating, manipulating and reasoning with information. For this area, no widely accepted reference framework exists. To nevertheless provide a point of reference, in this appendix we first present a slightly modified version of the brief outline of the field which was produced for the previous accreditation and then present a number of Master's programmes from around the world that each cover a significant part of this area.

B.1 Logic, Language and Information

Traditionally defined as the study of truth and reasoning, logic has throughout the centuries been associated with different disciplines. Its origins 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. Since Aristotle, logic has played a central role in many parts of philosophy, and particularly in the study of natural language, thought and knowledge.

In the (late) 19th century, logical reasoning started being studied in mathematical terms and logic found 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), as well as in the shaping of modern linguistic theory, being nowadays the tool of choice to study natural language meanings and their composition. Logic has maintained its position at the foundational core of computer science to this day.

It is this blend of a philosophical tradition, mathematical rigour and modern technical and theoretical applications that makes logic a uniquely interdisciplinary field, combining the humanities and the exact sciences in both methodology and motivation. Besides its intense contacts with analytical philosophy, theoretical and computational linguistics, mathematics, 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, philosophy of language, philosophy of mathematics 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, more generally, formal methods.

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 of 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 of 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) and, each two years, the North American Summer School in Logic, Language and Information (NASSLLI) attract participants (most of them PhD students) from all over the world, and there is a smaller but equally successful initiative of a similar kind in 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.

B.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.

B.2.1 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/), co-organized by five Catalan universities: Universitat de Barcelona, Universitat Autònoma de Barcelona, Universitat Pompeu Fabra, Universitat Rovira i Virgili and Universitat de Girona:

> "The Cognitive Science and Language (CCiL) program is a postgraduate interdisciplinary program focused on language and cognition as approached from three different disciplines: Psychology, Linguistics and Philosophy. Its goal is to educate researchers in the field of Language and Cognition Studies with an interdisciplinary orientation, providing the scientific formation and the methodological tools necessary to carry out high level research in a specific subtopic."

B.2.2 Bristol: Logic and Philosophy of Mathematics

The University of Bristol offers a one-year MA in Logic and Philosophy of Mathematics. The website (https://www.bristol.ac.uk/study/postgraduate/2020/arts/ma-logic-philosophy-maths/) describes the programme as follows:

> "The Department of Philosophy has exceptional research strength in the fields of logic and the philosophy of mathematics, and very strong links with the School of Mathematics [...]. Our MA draws on these strengths and is open to students with first degrees in philosophy (subject to a suitable background in logic) or mathematics. It consists of six taught units, examined by essay, and a 15,000-word dissertation."

B.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 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 curriculum includes core courses in logic and formal approaches to philosophy of science, and advanced optional courses in logic, philosophy of mathematics, foundations of physics, logical methods in linguistics, philosophy of language, metaphysics, and formal models in social sciences. Students can choose a focus according to their own fields of interests. In general, the program is research oriented, aiming to prepare students for a PhD program."

B.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 (https://www.cmu.edu/dietrich/philosophy/graduate/masters/lcm/index.html):

> "[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 specialise 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.

B.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."

B.2.6 Gothenburg: Logic

In 2017, the Department of Philosophy, Linguistics, Theory of Science of the University of Gothenburg launched a new MA programme in Logic (https://flov.gu.se/english/education/masters-second-cycle/mil). The website advertises the programme to prospective students as follows:

> "Do you see yourself thriving in an environment that fuses profound philosophical insights and striking mathematical methodology? Logic has developed beyond the

> traditional definition as the study of formal aspects of valid reasoning to be more widely applicable not only in the neighbouring disciplines of philosophy, mathematics, linguistics, and computer science, but also in industry and engineering. As a student of the programme, you will get a thorough education in the core topics in logic and will have the opportunity to explore applications in diverse areas including natural language processing, database design, and artificial intelligence."

Very close in spirit to our programme, the Gothenburg MA in Logic is however younger and, at least so far, much smaller in terms of student numbers.

B.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 (https://www.manchester.ac.uk/study/masters/courses/list/09110/msc-pure-mathematics-and-mathematical-logic/). 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."

B.2.8 Munich: Logic and Philosophy of Science

Since 2012 the Munich Center for Mathematical Philosophy (MCMP) at Ludwig Maximilian University offers a 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 [...] We offer world-class instruction and supervision in logic and computational philosophy, formal epistemology and decision theory, philosophical logic and philosophy of logic, general philosophy of science, philosophy of physics, philosophy of special sciences, and core analytic philosophy."

One of the current lecturers in this programme is MSc Logic graduate Ivano Ciardelli.

B.2.9 Paris: Logic and Philosophy of Science / Mathematical Logic and Foundation of Computer Science

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 (https://www.ihpst.cnrs.fr/enseignement/master-lophisc), which is offered by Paris 1–Sorbonne:

> "Its objective is to provide a fundamental education of high standards that is both balanced and open, in the areas of philosophy of science and of logic. It also offers training in the history of science and social studies of science, as well as other contemporary dimensions of science, such as cognitive approaches." [*our translation*]

Another very relevant programme is the Master's in Mathematical Logic and Foundations of Computer Science (LMFI) (http://master.math.univ-paris-diderot.fr/en/annee/m2-lmfi/) organised by Paris 7–Diderot and the CNRS:

> "LMFI is [...] dedicated to mathematical logic and its applications to computer science. It trains high-level logicians and prepares them to later obtain a PhD, have an academic career, teach or work in research and development."

Other relevant programmes are the Parisian Master of Research in Computer Science (MPRI) (http://dptinfo.ens-paris-saclay.fr/mpri-m1.php) and the new Master in Cognitive Science (https://cogmaster.ens.psl.eu/en) jointly offered by University Paris Descartes, École des Hautes Études en Sciences Sociales and École Normale Supérieure. The latter programme offers interdisciplinary training in Linguistics, Philosophy, Cognitive Social Science, Psychology, Neuroscience, Modeling and Cognitive Engineering. One of the lecturers of this new Master's programme is MSc Logic graduate Salvador Mascarenhas.

B.2.10 Sofia: Logic and Algorithms

The Logic and Algorithms MSc programme offered by Sofia University is aimed at graduates of Bachelor's programmes in Mathematics and Computer Science. Their website (https://store.fmi.uni-sofia.bg/fmi/logic/en-logic.html) describes the programme as follows:

> "During the curriculum, the students will have the opportunity to learn about the current trends in mathematical logic. The program provides a solid theoretical background indispensable for solving non-trivial algorithmic problems in the field of Mathematics as well as in the field of Computer Science."

B.2.11 St. Andrews: Logic and Metaphysics

The MLitt in Logic and Metaphysics at the University of St Andrews offers students a specialist education in various topics within both Logic and Metaphysics. The website (https://www.st-andrews.ac.uk/subjects/archive/2019-2020/postgraduate/logic-metaphysics-mlitt/) describes the curriculum as follows:

> "[The programme] focuses on topics within metaphysics and logic. You can take classes covering logic and advanced logic, formal approaches to natural languages and contemporary and historical debates in metaphysics."

B.2.12 Trento: Cognitive Science

The Center for Mind/Brain Sciences (CIMeC) at the University of Trento offers a Master's course in Cognitive Science (https://international.unitn.it/mcs). The curriculum is described as follows:

> "Students choose between two tracks: Cognitive Neuroscience (CN); Language and Multimodal Interaction (LMI). [...] The curriculum includes courses focusing on neurophysiological aspects of cognitive processes, the study of human behavior, and human-computer interaction."

B.2.13 Vienna: Logic and Computation

The Department of Informatics of the Technical University of Vienna offers a MSc in Logic and Computation (https://informatics.tuwien.ac.at/master-ue066931). The website describes the content of the programme as follows:

> "Logic and Computation is crucial for today's infrastructure, industry, consumer products, etc. Formal methods in this field build the basis for tackling great challenges, such as storing and processing big amount of data, software verification for fail-safe software in critical environments, fast algorithms to solve computationally hard problems, etc. As a Master student you will learn basic and advanced methods in the field of Logic and Computation. [...] In addition to algorithm analysis and machine learning, you will be intensively involved with optimization and inference methods for knowledge processing, answer-set programming and truth-maintenance systems. In addition, your knowledge in the areas of requirements engineering, software testing or high-performance computing will be expanded to a high level. You complete the given courses with free electives, which allow you to expand and deepen your personal research focus."

Appendix C

Exit Qualifications

On this appendix we reproduce (i) the exit qualifications (or learning outcomes) of the MSc Logic as reported in the OER 2018/19; (ii) the new formulation of these exit qualifications (summer 2019); (iii) a comparison between the two versions; and (iv) an explanation of how the exit qualifications (version OER 2018/19) relate to the so-called Dublin descriptors. How the exit qualifications relate to the curriculum is illustrated in Section 4.1, Table 4.1.

C.1 Exit qualifications (version OER 2018/19)

On the basis of the acquired knowledge, understanding and skills, students that have successfully completed the MSc Logic 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] a *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.

C.2 Exit qualifications (updated version, summer 2019)

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

Interdisciplinary Research

[RI] carry out *research* in the *interdisciplinary* area of Logic, Language and Information making original contributions to the theories and research methods in their field of specialisation;

Foundations and Advanced Knowledge

[A1] explain and apply classical results and proof methods used in mathematical logic; apply proof-theoretic and model-theoretic techniques to prove theorems; explain applications of Logic in Philosophy, Mathematics, Computer Science, and Linguistics;

[A2] critically evaluate, apply and integrate advanced results and theories in their field of specialisation (Philosophy, Mathematics, Computation or Language) based on an awareness of its research traditions and conventions;

Formal Methods

[FM] analyse and model complex structures using *formal methods*, which includes at least one of the following: develop predictive formal models of complex (linguistic) phenomena; study formal properties of mathematical structures; develop formal theories for philosophical issues; develop algorithms, information-theoretic, computational and probabilistic models;

Skills

[B1] formulate *research questions* placed in the correct scientific context and address these in a research plan;

[B2] deliver and defend *presentations* of their own work, both orally and in writing, following the conventions of their field of specialisation; and

[B3] collaborate with others in a *multidisciplinary team*.

Finally, a graduate of the MSc Logic

Intellectual Mobility

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

C.3 Comparison

The new formulation of the exit qualifications highlights the use of formal methods (FM) as an independent learning outcome and reformulates other outcomes making them more precise. More specifically in the new version:

- IR has been reformulated as RI;
- K1 and K2 have been made more specific in A1 and A2;

- S1 has been reformulated in B1;
- S2 has been integrated in RI;
- S3 has been integrated in A2;
- S4 has been reformulated in B2;
- S5 was renamed as B3;
- IM stayed unchanged.

C.4 Adequacy with Respect to Dublin Descriptors

The level of the MSc Logic meets the international requirements for a *Master's programme* as codified in the so-called *Dublin Descriptors*. Below we explain how the MSc Logic conforms to each of the Dublin Descriptors and refer to the relevant learning outcomes where appropriate (using the formulation of the outcomes operative in 2018/19):

- **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. [**IR, K1, K2**]
- **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. [**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. [**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. [**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. [**IR, S1, IM**]

Appendix D

Curriculum

On this appendix we reproduce (i) the overview poster of the MSc Logic 2018/19 displaying all electives in the programme according to the area they belong to and (ii) a high-level diagrammatic overview of the curriculum. The curriculum is further described in Section 2.2.1.

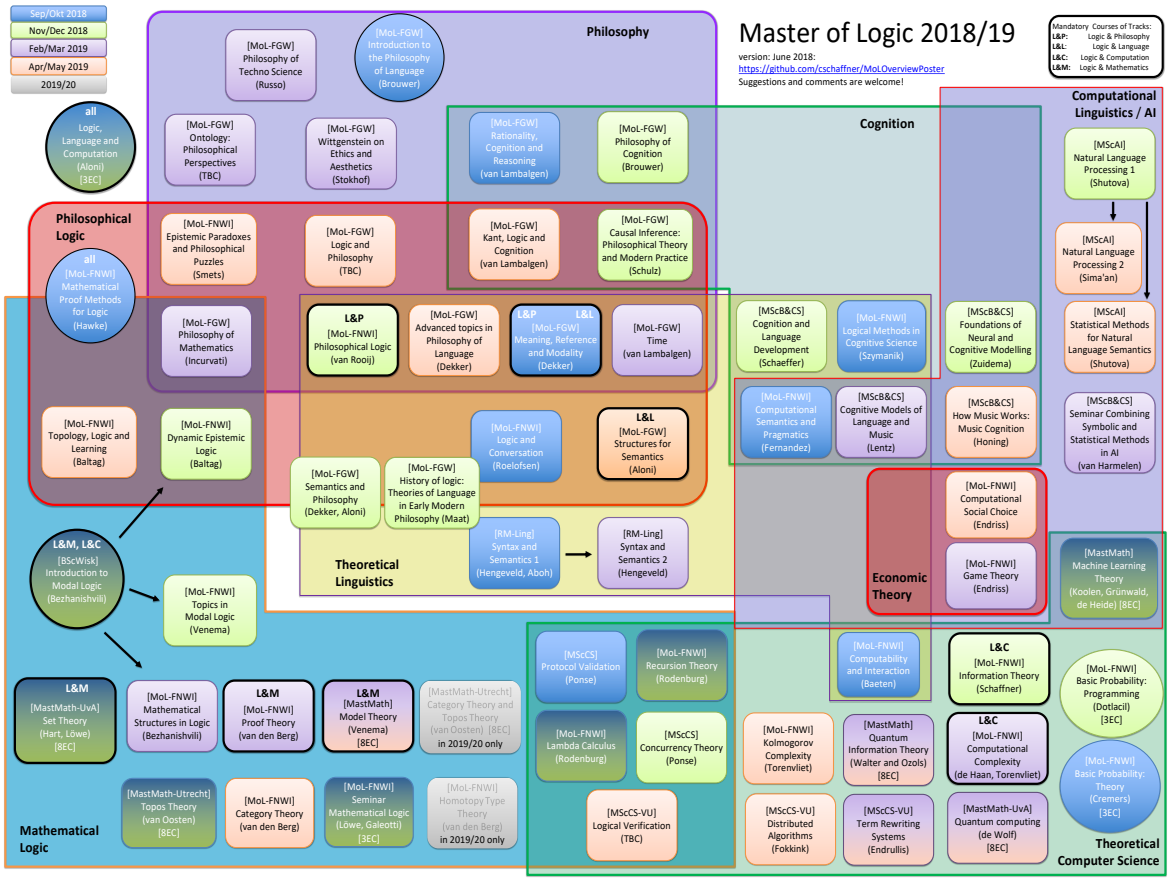

Figure D.1: Overview poster of the MSc Logic 2018/19

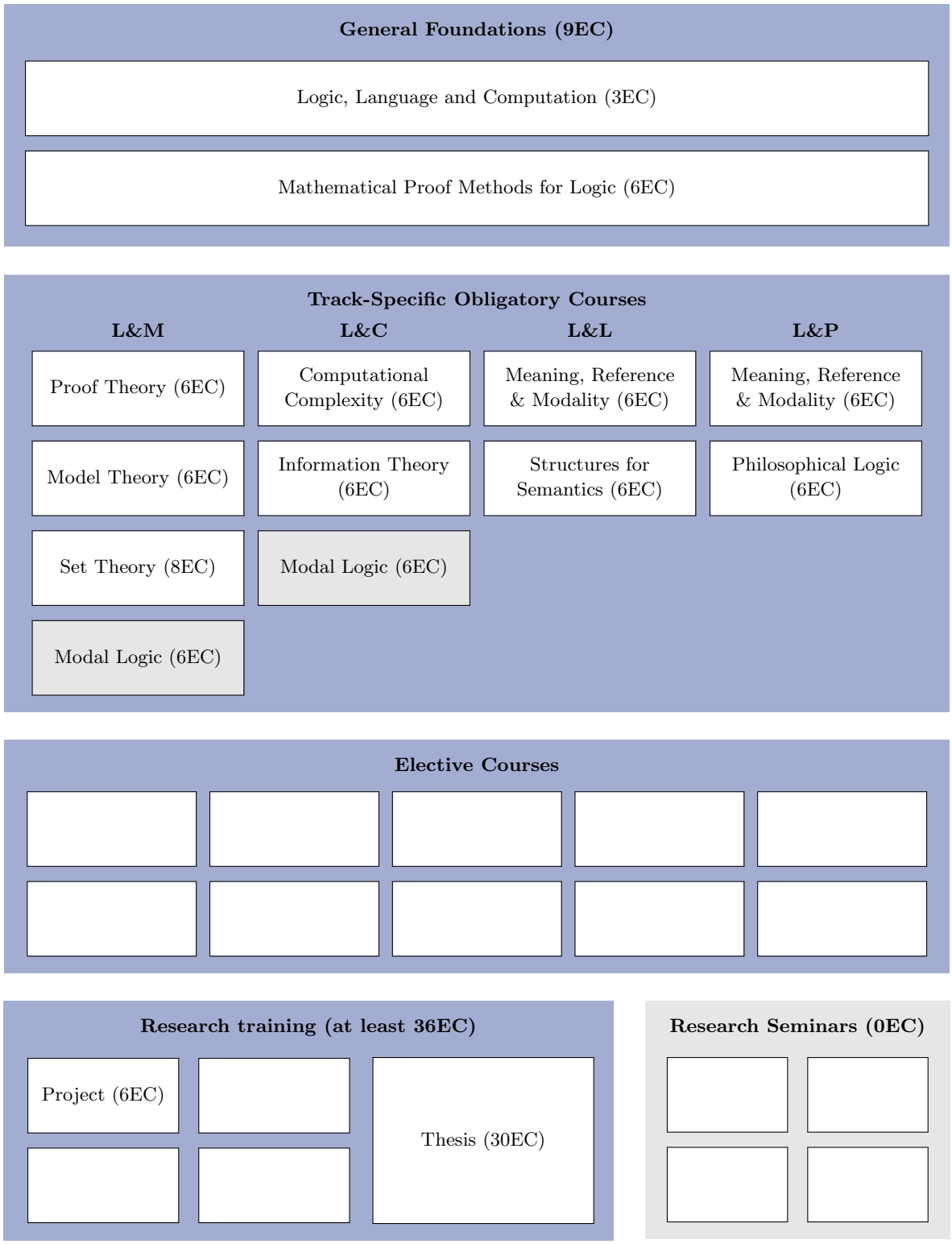

Figure D.2: Diagrammatic overview of the curriculum

Appendix E

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 the thesis. For each component we list the general learning outcomes the component is contributing to (cf. Appendix C 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. Information about the obligatory courses and the research training is copied below. The complete list of individual components, including all electives, is available at the following address:

https://msclogic.illc.uva.nl/Accreditation/Accreditation-2019/courses/course-descriptions/

The reported information is in part based on the UvA's online *Study Guide* (http://studiegids.uva.nl/). We use the academic year of 2018/19 as our point of reference.

E.1 Obligatory Courses: foundational

E.1.1 Logic, Language and Computation

Learning outcomes:	S3, IM	[↦ A1, IM]
Teaching methods:	Lectures; one-to-one research meetings	
Assessment:	Written summaries of guest lectures; reports on research meetings	
Teacher:	Maria Aloni (coordinator)	
Credit points:	3 EC	

Objectives: The course provides an overview of different research lines within the area of Logic, Language and Information. After the course students can summarise and critically evaluate contributions in different fields including mathematics, linguistics, philosophy and computer science transcending the traditional boundaries between these disciplines.

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. 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.

E.1.2 Mathematical Proof Methods for Logic

Learning outcomes:	K1	[↦ A1]
Teaching methods:	Lectures; tutorials	
Assessment:	take-home exams; in-class exam	
Teacher:	Peter Hawke	
Credit points:	6 EC	

Objectives: By the end of the course, students will have: (i) learned the statements and proofs of the basic results of mathematical logic; (ii) mastered the basic proof-theoretic and model-theoretic techniques used in mathematical logic; (iii) developed their abilities to prove theorems through the study of these techniques.

Content: The course is an introduction to the proof methods used in mathematical logic and to how these methods are used in the proofs of the basic results of mathematical logic. Topics to be covered include classical propositional and predicate logic, soundness, completeness, compactness, the Löwenheim-Skolem Theorems and applications thereof.

Study material: Dirk van Dalen, *Logic and Structure* (5th edition) Springer, 2013; as well as course notes.

E.2 Obligatory Courses: track-specific

E.2.1 Computational Complexity (L&C)

Learning outcomes:	K1, K2	[↦ A1, A2, FM]
Teaching methods:	Lectures; tutorials	
Assessment:	Exercises; in-class exam	
Teacher:	Ronald de Haan	
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, diagonalization, Boolean circuits, randomized computation, interactive proofs, cryptography, quantum computing, and circuit lower bounds.

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

E.2.2 Information Theory (L&C)

Learning outcomes:	K2, S5	[↦ A2, FM, B3]
Teaching methods:	Flipped-classroom; self-study; presentation; plenary work session	
Assessment:	(Team) homework; final exam	
Teacher:	Christian Schaffner	
Credit points:	6 EC	

Objectives: At the end of the course students will be able to compute various entropic quantities of discrete random variables; work with the core concepts and theorems for the scenarios of data compression and noisy-channel coding; collaborate (under guidance of teachers) in small groups and present solutions of mathematical problems orally to peers.

Content: Information theory was developed by Claude E. Shannon in the 1950s to investigate the fundamental limits on signal-processing operations such as compressing data and on reliably storing and communicating data. These tasks have turned out to be fundamental for all of computer science. In this course, we quickly review the basics of probability theory and introduce concepts such as (conditional) Shannon entropy, mutual information and entropy diagrams. Then, we prove Shannon's theorems about data compression and channel coding. An interesting connection with graph theory is made in the setting of zero-error information theory. We also cover some aspects of information-theoretic security such as perfectly secure encryption, and draw some connections to machine learning and artificial intelligence.

Study material: Course lecture notes interactively presented on Canvas.

E.2.3 Introduction to Modal Logic (L&C, L&M)

Learning outcomes:	K1	[↦ A1]
Teaching methods:	Lectures; tutorials	
Assessment:	Homework; midterm and final in-class exam	
Teacher:	Nick Bezhanishvili	
Credit points:	6 EC	

Objectives: At the end of the course the students should be able to (a) point out when a modal formula is satisfied/valid on a given Kripke model/frame; (b) compute standard translations of modal formulas and first-order correspondents of Sahlqvist formulas; (c) produce a completeness proof via the canonical model construction for some basic systems of modal logic; (d) derive finite model property of such systems via the method of filtration; (e) argue about decidability of simple systems of modal logic by combining finite axiomatization and the finite model property of these systems; (f) solve basic problems involving more complex modal systems such as PDL.

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 neighbourhood frames.

Study material: Blackburn, de Rijke & Venema. *Modal Logic*. CUP, 2001.

E.2.4 Meaning, Reference and Modality (L&L, L&P)

Learning outcomes:	K1, K2	[↦ A1, A2, FM]
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; context and context change; modality and discourse.

Study material: L.T.F Gamut. *Logic, Language and Meaning* (volume II). The University of Chicago Press, 1991; and a collection of articles.

E.2.5 Model Theory (L&M)

Learning outcomes:	K1, K2	[↦ A1, A2, FM]
Teaching methods:	Lectures; tutorials	
Assessment:	Homework; in-class exam	
Teacher:	Prof. dr. Yde Venema	
Credit points:	8 EC	

Objectives: The main aim of the course is to provide the students with an overview of classical model theory; additionally, the course will give either an introduction to modern model theory (leading up to Morley's Theorem) or treat a special topic (for instance, finite model theory or nonstandard analysis).

Content: In this course we will give a general introduction to the methods and results of classical model theory including games, compactness, the Loewenheim-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 construction, ultraproducts and saturated models.

Study material: W. Hodges. *A Shorter Model Theory.* CUP, 1997.

E.2.6 Philosophical Logic (L&P)

Learning outcomes:	K1, K2	[↦ A1, A2, FM]
Teaching methods:	Lectures; tutorials	
Assessment:	Homework	
Teacher:	Prof. dr. ing. Robert van Rooij	
Credit points:	6 EC	

Objectives: In this course students learn how to build and evaluate logical theories for philosophical issues.

Content: The course discusses the use of logic(s) to tackle philosophical issues, especially ones concerning metaphysics and the philosophy of language. The topics dealt with include (i) vagueness; (ii) truth (the liar paradox); (iii) conditionals and modalities.

Study material: Lecture notes.

E.2.7 Proof Theory (L&M)

Learning outcomes:	K1, K2	[↦ A1, A2, FM]
Teaching methods:	Lectures; tutorials	
Assessment:	Homework; in-class exam	
Teacher:	Dr. Benno van den Berg	
Credit points:	6 EC	

Objectives: At the end of the course the student should: (a) be able to give formal derivations in different proof calculi (Hilbert-style proof calculi, natural deduction and sequent calculus), both for classical and constructive logic; (b) know the main properties of these calculi (such as normalisation and cut elimination) and be able to use these to give mathematical proofs about these proof calculi; (c) understand the difference between constructive and non-constructive arguments and be able to recognise when proofs are constructive or not constructive; (d) be able to write down realizers which make the algorithmic content of constructively valid statements explicit; (e) use Kripke models to give semantic proofs for properties of intuitionistic logic.

Content: Like the empirical sciences, mathematics and logic are concerned with truth. But unlike the empirical sciences, mathematics and logic establish truths by writing down deductions on the blackboard or on a piece a paper. Indeed, within mathematics and logic these proofs are our sole method for obtaining knowledge. But what are these proofs? What properties do they have? Within proof theory we study these questions mathematically. The starting point is that what counts as a valid proof is a purely formal matter: indeed, it depends on the shape of the argument rather than its precise content. For this reason proofs can be studied using proof calculi, that is, formal systems for deriving statements. Within this course we study three types of proof calculi, Hilbert systems, natural deduction and sequent calculus, and establish their main properties. We will not only study proof calculi for pure logic, but also for arithmetic, and we will also be concerned with systems for constructive (or intuitionistic) logic.

Study material: Syllabus.

E.2.8 Set Theory (L&M)

Learning outcomes:	K1, K2	[↦ A1, A2, FM]
Teaching methods:	Lectures; tutorials	
Assessment:	Homework, in-class exam	
Teacher:	Dr. K.P. Hart; Prof. dr. Benedikt Löwe	
Credit points:	8 EC	

Objectives: To provide the students with a basic knowledge of axiomatic, combinatorial, and descriptive set theory. To prepare the students for research in set theory and for using set theory as a tool in mathematical areas such as general topology, algebra and functional analysis.

Content: The course will start with a brief introduction to axiomatic set theory, the model theory of set theory (including simple independence results), and the basic theory of ordinals and cardinals. The second part of the course will be devoted to more advanced topics in set theory. This year, a major focus will be descriptive set theory, the study of definable subsets of the real line and their relation to concepts from topology and measure theory.

Study material: T. Jech. *Set Theory.* The Third Millennium Edition. Springer, 2003.

E.2.9 Structures for Semantics (L&L)

Learning outcomes:	K1, K2	[↦ A1, A2, FM]
Teaching methods:	Lectures, tutorials, individual supervision	
Assessment:	Take home exams; in-class exam; presentations; research project	
Teacher:	Dr. Maria Aloni	
Credit points:	6 EC	

Objectives: Gaining working knowledge of the logical/ 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, generalized 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.

Study material: L.T.F Gamut. *Logic, Language and Meaning* (volume II). The University of Chicago Press, 1991; and a collection of articles.

E.3 Elective Courses

A complete list of the courses offered as electives in 2018/19 is available at:

https://msclogic.illc.uva.nl/Accreditation/Accreditation-2019/courses/course-descriptions/

E.4 Research Training

E.4.1 Research Project

Learning outcomes:	IR, K2, S1, S2, S3, S4, S5, IM	[↦ RI, A2, FM, B1, B2, B3, IM]
Teaching methods:	Various	
Assessment:	Various	
Teacher:	Maria Aloni (coordinator)	
Credit points:	6 EC	

Objectives: To gain experience with conducting independent research.

Content: Every January and June, the MSc Logic offers a small number of *coordinated projects* for students to choose (a full list is available at https://msclogic.illc.uva.nl/current-students/courses/projects/). 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 them. 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 report. 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).

We list the **coordinated projects** offered in 2018/19:

- Advanced Topics in Computational Social Choice

- Computational Approaches to the History and Philosophy of Mathematics.
- Elements of Universal Algebra
- Logic Programming and Learning
- Advanced Topics in Set Theory
- Computer Assisted Homotopy Type Theory in Agda
- Grammatical models for musical harmony
- Introduction to Philosophy of Information
- Reasoning in autism spectrum disorders (ASD)
- Semantic drift in multilingual representations

The following are examples of recent **individual projects**:

- Axiomatization of Origami Geometry
- The role of space in the Transcendental Deduction B of Kant's Critique of pure reason
- Proof Theory for Fuzzy Logic
- Belief in Fiction
- Updating Kolmogorov Complexity
- Quantum cryptography
- Developing a model for gradable adjectives with hyperpriors
- Conditionals and Tense in the Event Calculus
- Semantic factors predicting the learnability of quantifiers
- Logic and measurement-based quantum computation
- Philosophy of nonclassical logic

E.4.2 Thesis

Learning outcomes:	IR, K2, S1, S2, S3, S5, IM	[↦ RI, A2, FM, B1, B2, IM]
Teaching methods:	Individual research supervision	
Assessment:	Written thesis; oral defense	
Teacher:	Maria Aloni (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 more applied nature.

During the whole year a number of events are organised as part of a graduation trajectory with the aim to provide students with information and extra support in their graduation year. The MSc Logic graduation trajectory includes meetings on how to find a supervisor; how to apply for PhD positions; how to write a Master's thesis and a series of events where students present their ongoing thesis projects first, informally, to other students and the programme director, and later to the whole ILLC community. Academic mentors are further available to assist the students with finding a supervisor. The choice of a supervisor, who will usually be a member of the senior scientific staff of the Institute for Logic, Language and Computation (ILLC), requires the approval of the chair of the Examinations Board.

E.4.3 Research Seminars

Each student is expected to regularly attend local research seminars. 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 webpage lists all regular event series that take place at the ILLC: https://www.illc.uva.nl/NewsandEvents/Events/Regular/

Appendix F

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 2018/19. Previous versions of the OER are also available from the website of the MSc Logic at

https://msclogic.illc.uva.nl/current-students/regulations/oer/

F.1 OER, Part A (General)

https://msclogic.illc.uva.nl/Accreditation/Accreditation-2019/TER-A-master-2018-2019-FNWI.pdf

F.2 OER, Part B (MSc Logic)

https://msclogic.illc.uva.nl/Accreditation/Accreditation-2019/ter_part_b_msc_logic_2018-2019.pdf

F.3 Rules and Guidelines of the Examinations Board MSc Logic (RRvE)

https://msclogic.illc.uva.nl/Accreditation/Accreditation-2019/RRvE_MScLogic_2019.pdf

Appendix G

Assessment Policy

G.1 Quality Assurance: institutional actors and their roles

Examinations Board The Examinations Board (EB) is formally responsible for the quality of examinations in the MSc Logic. Every Master's thesis examination is closely monitored by a member of the EB who composes the thesis committee, monitors plagiarism control, collects pre-assessments from committee members, chairs the thesis defense and produces the final assessment report. As for other examinations, in day-to-day practice, this responsibility is largely delegated to the individual examiners. Nevertheless, the EB has the right to carry out spot checks and it can, if required, intervene. To facilitate these checks since 2018/19 examiners are required to upload their written exams in DataNose where the EB can inspect them. Since 2018/19, the EB further collects information about pass percentage and average grades for all MSc Logic courses and further investigates those which deviate from the norm (i.e., a passing rate of less than 40% and an average grade higher than 8.5). The EB further handles cases of suspected plagiarism or fraud and informs the programme director of any further violation of the regulations and the principles of MSc Logic, indicating any need for corrections or improvements. The EB finally advises the director about the contents of the OER and its annual update and produces the updates of the RRvE.

Programme Director The programme director annually updates the regulations in consultation with the EB, and informs the teaching staff about its contents and role. The director can further ask the EB to investigate examinations for which they have received either positive or negative feedback from the OC, the students, the academic mentors or other sources.

Examiners The MSc Logic places the responsibility of the assessment of the student performances as close as possible to the individual examiners, who are appointed at the faculty level. Examiners have full autonomy in the choice of the assessment forms that better match the learning outcomes of their course and are responsible for ensuring that their examinations are carried out in line with the regulations (OER and RRvE) and the principles of the MSc Logic.

Programme Committee, Students and Academic Mentors The **programme committee** (*Opleidingscommissie* (OC)) reports to the programme director how each course is evaluated by students and teaching staff. As these evaluations, by default, address assessment issues, these reports also address the quality of assessment in courses. Besides filling in course evaluations and participating in the regularly organised curriculum evaluations (aka

pizza evaluations, cf. Section 2.5), **students** can provide feedback on assessments directly to the examiners, (the student members of) the OC, their academic mentors and directly to the programme director or the EB. And, finally, the **academic mentors** meet with the programme director twice a year to discuss the progress of their individual students but also general issues including the quality of assessments.

G.2 Assessment of MSc Theses

In this section we refer to the guidelines given to the members of a MSc Logic thesis committee, available at the following address:

https://msclogic.illc.uva.nl/current-students/graduation/assessment/

A first version of this document was approved by the MSc Logic's Board of Examiners on 14 December 2011 and has been operative since August 2012. The original document was revised and made more precise in 2017 (approved on 18 December 2017) and has been operative since June 2018. Minor adjustments were further made by the Examinations Board on 21 November 2018. To guarantee transparency, this document is available for students and supervisors on the MSc Logic website.

Appendix H

Academic Staff

H.1 Staff Listing

In this appendix we provide an overview of the academic staff allocated to the MSc Logic. For each member of the core staff (as defined in Section 2.4) we list their name, their position, the extent of their appointment (number of FTE at the UvA, covering both teaching and research), their teaching qualifications 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] A more comprehensive list including all lecturers (academic year 2018/19) and thesis supervisors (2017/18 and 2018/19) is available at the following address:

https://msclogic.illc.uva.nl/Accreditation/Accreditation-2019/lecturers/

(1) **Name:** Maria Aloni (PhD Amsterdam, 2001)
Position: Associate Professor (UHD)
Appointment: 1.0 FTE
Teaching qualifications: BKO
Expertise: formal semantics and pragmatics; philosophy of language; philosophical logic

(2) **Name:** Alexandru Baltag (PhD Indiana-Bloomington, 1998)
Position: Associate Professor (UHD)
Appointment: 1.0 FTE
Teaching qualifications: BKO
Expertise: modal logic; formal epistemology; logic in computer science; logic and game theory

(3) **Name:** Jos Baeten (PhD Minnesota, 1995)
Position: Full Professor (HGL)
Appointment: 0.1 FTE
Teaching qualifications: none (part-time)
Expertise: theory of computing; model-based engineering; process algebra

(4) **Name:** Benno van der Berg (PhD Utrecht, 2006)
Position: Assistant Professor (UD)
Appointment: 1.0 FTE
Teaching qualifications: BKO

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

Expertise: mathematical logic; proof theory; category theory; foundations of mathematics

(5) **Name:** Franz Berto (PhD Venice, 2004)
Position: Full Professor (HGL)
Appointment: 0.2 FTE
Teaching qualifications: BKO
Expertise: philosophical logic; metaphysics

(6) **Name:** Arianna Betti (PhD Genova, 2000)
Position: Full Professor (HGL)
Appointment: 1.0 FTE
Teaching qualifications: BKO
Expertise: history and philosophy of logic; philosophy of language; metaphysics

(7) **Name:** Nick Bezhanishvili (PhD Amsterdam, 2006)
Position: Assistant Professor (UD)
Appointment: 1.0 FTE
Teaching qualifications: BKO
Expertise: modal logic; algebraic logic; duality theory

(8) **Name:** Elsbeth Brouwer (PhD Amsterdam, 2003)
Position: Instructor (*docent*)
Appointment: 0.8 FTE
Teaching qualifications: BKO
Expertise: philosophy of language; philosophy of mind and cognition; epistemology

(9) **Name:** Paul Dekker (PhD Amsterdam, 1993)
Position: Assistant Professor (UD)
Appointment: 1.0 FTE
Teaching qualifications: BKO
Expertise: philosophy of language; formal semantics and pragmatics

(10) **Name:** Ulle Endriss (PhD London, 2003)
Position: Full Professor (HGL)
Appointment: 1.0 FTE
Teaching qualifications: BKO
Expertise: artificial intelligence; economics and computation; knowledge representation; multiagent systems

(11) **Name:** Raquel Fernández (PhD London, 2006)
Position: Associate Professor (UHD)
Appointment: 1.0 FTE
Teaching qualifications: BKO
Expertise: computational linguistics; semantics and pragmatics; dialogue modelling

(12) **Name:** Wilker Ferreira Aziz (PhD Wolverhampton, 2014)
Position: Assistant Professor (UD)
Appointment: 1.0 FTE
Teaching qualifications: none (in progress)
Expertise: natural language processing; deep learning

(13) **Name:** Ronald de Haan (PhD Vienna, 2016)
Position: Assistant Professor (UD)
Appointment: 1.0 FTE
Teaching qualifications: BKO
Expertise: complexity theory; computational social choice; knowledge representation

(14) **Name:** Henkjan Honing (PhD London, 1991)
Position: Full Professor (HGL)
Appointment: 1.0 FTE
Teaching qualifications: BKO
Expertise: music cognition

(15) **Name:** Luca Incurvati (PhD Cambridge, 2010)
Position: Assistant Professor (UD)
Appointment: 1.0 FTE
Teaching qualifications: BKO
Expertise: philosophy of mathematics; philosophy of logic; philosophical logic; philosophy of language; metaphysics

(16) **Name:** Dick de Jongh (PhD Wisconsin-Madison, 1968)
Position: Professor Emeritus
Appointment: 0.0 FTE
Teaching qualifications: none (emeritus)
Expertise: nonclassical logics; intuitionism; formal learning theory

(17) **Name:** Michiel van Lambalgen (PhD Amsterdam, 1987)
Position: Full Professor (HGL)
Appointment: 1.0 FTE
Teaching qualifications: BKO
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
Teaching qualifications: none (part-time)
Expertise: mathematical logic; set theory; foundations of mathematics

(19) **Name:** Jaap Maat (PhD Amsterdam, 1999)
Position: Assistant Professor (UD)
Appointment: 1.0 FTE
Teaching qualifications: BKO
Expertise: artificial languages; history of logic; history of linguistic ideas; Leibniz's rational grammar

(20) **Name:** Maris Ozols (PhD Waterloo-Canada, 2012)
Position: Assistant Professor (UD)
Appointment: 1.0 FTE
Teaching qualifications: BKO
Expertise: quantum computing; quantum information; quantum algorithms

(21) **Name:** Alban Ponse (PhD Amsterdam, 1992)
Position: Associate Professor (UHD)
Appointment: 1.0 FTE
Teaching qualifications: BKO, Eerstegraads Onderwijsbevoegdheid Wiskunde
Expertise: process algebra; semantics of programming languages

(22) **Name:** Piet Rodenburg (PhD Amsterdam, 1986)
Position: Instructor (*docent*)
Appointment: 1.0 FTE
Teaching qualifications: none
Expertise: universal algebra; term rewriting

(23) **Name:** Floris Roelofsen (PhD Amsterdam, 2008)
Position: Associate Professor (UHD)
Appointment: 1.0 FTE
Teaching qualifications: BKO
Expertise: formal semantics; inquisitive logic

(24) **Name:** Robert van Rooij (PhD Stuttgart, 1997)
Position: Full Professor (HGL)
Appointment: 1.0 FTE
Teaching qualifications: BKO
Expertise: philosophical logic; formal semantics and pragmatics; philosophy of language

(25) **Name:** Federica Russo (PhD Leuven, 2005)
Position: Assistant Professor (UD)
Appointment: 1.0 FTE
Teaching qualifications: BKO, SKO
Expertise: philosophy of science and technology; causality

(26) **Name:** Christian Schaffner (PhD Aarhus, 2007)
Position: Associate Professor (UHD)
Appointment: 1.0 FTE
Teaching qualifications: BKO
Expertise: quantum cryptography; cryptographic protocols; (quantum) information theory

(27) **Name:** Katrin Schulz (PhD Amsterdam, 2007)
Position: Assistant Professor (UD)
Appointment: 1.0 FTE
Teaching qualifications: BKO, SKO
Expertise: formal semantics; philosophical logic; causality

(28) **Name:** Katia Schutova (PhD Cambridge, 2011)
Position: Assistant Professor (UD)
Appointment: 1.0 FTE
Teaching qualifications: BKO
Expertise: computational linguistics; natural language processing; machine learning; metaphor; cognitive science

(29) **Name:** Khalil Sima'an (PhD Utrecht, 1999)
Position: Full Professor (HGL)

Appointment: 1.0 FTE
Teaching qualifications: BKO
Expertise: natural language processing; computational linguistics

(30) **Name:** Sonja Smets (PhD Brussels, 2001)
Position: Full Professor (HGL)
Appointment: 1.0 FTE
Teaching qualifications: BKO
Expertise: philosophical logic; philosophy of science; logical foundations of quantum physics; formal epistemology

(31) **Name:** Martin Stokhof (PhD Amsterdam, 1984)
Position: Professor Emeritus
Appointment: 0.0 FTE
Teaching qualifications: none (emeritus)
Expertise: philosophy of language; formal semantics

(32) **Name:** Jakub Szymanik (PhD Amsterdam, 2009)
Position: Associate Professor (UHD)
Appointment: 1.0 FTE
Teaching qualifications: BKO
Expertise: logic; cognitive science; computational modelling; formal semantics

(33) **Name:** Leen Torenvliet (PhD Amsterdam, 1986)
Position: Associate Professor (UHD)
Appointment: 1.0 FTE
Teaching qualifications: BKO
Expertise: algorithms and complexity theory

(34) **Name:** Yde Venema (PhD Amsterdam, 1992)
Position: Full Professor (HGL)
Appointment: 1.0 FTE
Teaching qualifications: BKO, Eerstegraads Onderwijsbevoegdheid Wiskunde
Expertise: modal logic; algebraic logic

(35) **Name:** Michael Walter (PhD Zurich, 2014)
Position: Assistant Professor (UD)
Appointment: 1.0 FTE
Teaching qualifications: BKO
Expertise: quantum information; mathematical physics

(36) **Name:** Ronald de Wolf (PhD Amsterdam, 2001)
Position: Full Professor (HGL)
Appointment: 0.2 FTE
Teaching qualifications: none (part-time)
Expertise: quantum computing; algorithms and complexity theory

(37) **Name:** Jelle Zuidema (PhD Edinburgh, 2005)
Position: Associate Professor (UHD)
Appointment: 1.0 FTE
Teaching qualifications: BKO
Expertise: natural language processing; language cognition; evolution of language

H.2 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". We calculate here the student-teacher ratio for the academic year 2017/18 because, at the time of writing, the final official data concerning research projects for the year 2018/19 were not yet available. The student-teacher ratio of the MSc Logic in the academic year of 2017/18 has been **11.4 students per FTE** of teaching effort logged. The way we have calculated this figure is documented below. To put this in context, a ratio of around 20 would typically be considered normal in the Netherlands.

Number of students. The number of students enrolled in the MSc Logic in the academic year of 2017/18 has been **98** (to be precise, we use 1 January 2018 as our point of reference). This number includes *Logic Year* 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 2017/18, the MSc Logic has offered regular courses adding up to a total of 294 EC (source: UvA *Study Guide*). This figure excludes the 4 elective courses which were offered at other universities (VU and Utrecht). The number of MSc Logic students taking such courses is of the same order of magnitude as the number of students from other universities 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:

$$\frac{294 \text{ EC}}{6 \text{ EC}} \times 0.1 \text{ FTE} \quad \approx \quad \textbf{4.9 FTE}$$

FTE logged for supervision. In the academic year 2017/18 we awarded a total of 617 EC in student research projects (source: FNWI-ESC database). Roughly half of these were for individual projects and the rest for group projects of 3–12 students per project. Most 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:

$$\frac{617 \text{ EC}}{6 \text{ EC}} \times 0.02 \text{ FTE} \quad \approx \quad \textbf{2.0 FTE}$$

In the academic year of 2017/18, 34 students defended their thesis in the MSc Logic (cf. Appendix J). 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:

$$34 \times 0.05 \text{ FTE} \quad = \quad \textbf{1.7 FTE}$$

Overall number of FTE. We obtain a sum of $4.9 + 2.0 + 1.7 =$ **8.6 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:

$$98 \text{ students} \;/\; 8.6 \text{ FTE} \;\approx\; \textbf{11.4 students per FTE logged}$$

H.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 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.

Appendix I

Programme Officials

In this appendix we list the people occupying the various official positions in the MSc Logic programme by name. We take September 2019 as our point of reference.

I.1 Management & Administration

Programme director: Dr. Maria Aloni.
Programme manager: Drs. Tanja Kassenaar.
Director of the Graduate School of Informatics: Dr. Andy Pimentel.
Programme coordinator (from GSI): Drs. Liza Lambert.

I.2 Examinations Board

Dr. Floris Roelofsen (chair, 2018–2021),
Dr. Paul Dekker (2018–2021),
Dr. Ekaterina Shutova (2018–2021),
Prof. Dr. Yde Venema (2017–2020),
Prof. Dr. Ronald de Wolf (2014–2019),
Dr. Tejaswini Deoskar (external member, 2017–2020).

I.3 Admissions Board

Prof. Dr. Benedikt Löwe (chair),
Dr. Maria Aloni.

I.4 Programme Committee (OC)

Marta Campa (student),
Damiano Fornasiere (student),
Angelica Hill (student),
Simon Vonlanthen (student),
Dr. Nick Bezhanishvili (staff, chair),
Prof. Dr. Ulle Endriss (staff),
Dr. Federica Russo (staff),
Dr. Christian Schaffner (staff),
Pepijn Vrijbergen (student, secretary).

I.5 Academic Mentors

Dr. Maria Aloni,
Dr. Alexandru Baltag,
Dr. Benno van den Berg,
Dr. Nick Bezhanishvili,
Prof. Dr. Ulle Endriss,
Dr. Raquel Fernández,
Dr. Wilker Ferreira Aziz,
Dr. Ronald de Haan (LY),
Dr. Peter Hawke (LY),
Prof. Dr. Dick de Jongh,
Prof. Dr. Benedikt Löwe,
Dr. Floris Roelofsen,
Dr. Julian Schlöder (LY),
Dr. Katrin Schulz,
Dr. Jakub Szymanik,
Prof. Dr. Yde Venema,
Prof. Dr. Ronald de Wolf.

I.6 Student Mentors

Maëlle Havelange,
Daniël Louwrink,
Rachel Maden,
Yoàv Montacute.

I.7 Professional Advisory Board

Thomas Icard, Stanford University,
Annemieke Reijngoud, McKinsey & Company,
Yanjing Wang, Peking University.

I.8 Non-academic Mentors

Heleen Booy (MoL 2013), high-school teacher, Hyperion Lyceum, Amsterdam,
Andreea van Ham (MoL 2014), engagement manager at Oliver Wyman,
Tikitu de Jager (MoL 2005; PhD ILLC 2009), mobile developer with Minddistrict,
Nal Kalchbrenner (MoL 2012), staff research scientist at Google Brain Amsterdam,
Raul Leal (MoL 2007; PhD ILLC 2011), fleet information analyst at bol.com,
Lucy van Oostveen (MoL 2018), Rijks ICT trainee, Dutch Ministry of Economic Affairs,
Annemieke Reijngoud (MoL 2011), engagement Manager at McKinsey & Company.

Appendix J

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 September 2017 and 31 Augustus 2019). For each thesis, we provide the specialisation of the student, the title of the thesis, the name(s) of the supervisor(s), and the date of the defense.

(1) **Student specialisation:** L&P
Thesis: On Logical Nihilism
Supervision: Peter Hawke
Defense: 30-8-2019

(2) **Student specialisation:** L&P
Thesis: Sets and Categories: What Foundational Approaches Tell Us About Mathematical Thought
Supervision: Luca Incurvati
Defense: 30-8-2019

(3) **Student specialisation:** L&P
Thesis: Questioning Philosophy
Supervision: Maria Aloni, Paul Dekker
Defense: 27-8-2019

(4) **Student specialisation:** L&L
Thesis: A Diachronic and Semantic Study of Italian Free Choice
Supervision: Maria Aloni
Defense: 12-7-2019

(5) **Student specialisation:** L&P
Thesis: The Informational View on Technologies in the Scientific Practice
Supervision: Federica Russo
Defense: 10-7-2019

(6) **Student specialisation:** L&P
Thesis: Defending the Classes
Supervision: Luca Incurvati
Defense: 5-7-2019

(7) **Student specialisation:** L&L
Thesis: Varieties of Distributivity: From Mandarin 'Dou' to Plurality, Free Choice and Scalarity
Supervision: Maria Aloni, Alexandre Cremers
Defense: 5-7-2019

(8) **Student specialisation:** L&P
Thesis: Intensional Kleene logics for vagueness
Supervision: Robert van Rooij, Massimiliano Carrara
Defense: 5-7-2019

(9) **Student specialisation:** L&C
Thesis: Non-determinism in Multiparty Session Types within a Curry-Howard system
Supervision: Alban Ponse, Jorge Perez
Defense: 4-7-2019

(10) **Student specialisation:** L&P
Thesis: Gatekeepers in Social Networks: Logic for Communicative Actions
Supervision: Alexandru Baltag
Defense: 4-7-2019

(11) **Student specialisation:** L&P
Thesis: Space and the continuum from Kant to Poincaré
Supervision: Michiel van Lambalgen, Gianluca Grilletti
Defense: 4-7-2019

(12) **Student specialisation:** L&P
Thesis: Dynamic Set Theory
Supervision: Luca Incurvati
Defense: 3-7-2019

(13) **Student specialisation:** L&P
Thesis: Polarization and Echo Chambers: A Logical Analysis of Balance and Triadic Closure in Social Networks
Supervision: Sonja Smets
Defense: 3-7-2019

(14) **Student specialisation:** L&M
Thesis: The van Benthem Characterisation Theorem for Descriptive Models
Supervision: Nick Bezhanishvili
Defense: 2-7-2019

(15) **Student specialisation:** L&M
Thesis: Polyhedral Completeness in Intermediate and Modal Logics
Supervision: Nick Bezhanishvili
Defense: 2-7-2019

(16) **Student specialisation:** L&P
Thesis: Expressive Limitations and the Liars Revenge: a Strict-Tolerant Solution and a Pragmatic Solution For Dialetheism
Supervision: Robert van Rooij
Defense: 1-7-2019

(17) **Student specialisation:** L&L
Thesis: The simplicity/informativeness trade-off in the semantic typology of quantifiers
Supervision: Shane Steinert-Threlkeld
Defense: 26-6-2019

(18) **Student specialisation:** L&P
Thesis: Tennenbaum's Theorem and Non-Classical Arithmetic
Supervision: Luca Incurvati
Defense: 19-6-2019

(19) **Student specialisation:** L&P
Thesis: Neural language models with latent syntax
Supervision: Wilker Ferreira Aziz
Defense: 25-5-2019

(20) **Student specialisation:** L&P
Thesis: Lorentzian Structures on Branching Spacetimes
Supervision: Alexandru Baltag
Defense: 28-2-2019

(21) **Student specialisation:** L&P
Thesis: Strategic Manipulation in Voting under Higher-order Reasoning
Supervision: Ronald de Haan, Fernando Velázquez Quesada
Defense: 7-2-2019

(22) **Student specialisation:** L&P
Thesis: A Right Semimodel Structure on Semisimplicial Sets
Supervision: Benno van den Berg
Defense: 17-12-2018

(23) **Student specialisation:** L&P
Thesis: An Exploration of Closure Ordinals in the Modal Mu-calculus
Supervision: Yde Venema
Defense: 31-10-2018

(24) **Student specialisation:** L&P
Thesis: Generic Models for Topological Evidence Logics
Supervision: Alexandru Baltag, Nick Bezhanishvili
Defense: 20-9-2018

(25) **Student specialisation:** L&P
Thesis: Dynamics for Argument-Belief Systems
Supervision: Sonja Smets, Fernando Velázquez Quesada
Defense: 19-9-2018

(26) **Student specialisation:** L&P
Thesis: Counterfactuals and the Logic of Imaginative Content
Supervision: Katrin Schulz
Defense: 17-9-2018

(27) **Student specialisation:** L&C
Thesis: A Constructive Approach towards Formalizing Relativization Using Combinatory Logic
Supervision: Benno van den Berg, Leen Torenvliet
Defense: 12-9-2018

(28) **Student specialisation:** L&L
Thesis: Conditional Commitments
Supervision: Floris Roelofsen
Defense: 31-8-2018

(29) **Student specialisation:** L&P
Thesis: How do we Develop Ethically Aware AI?
Supervision: Martin Stokhof
Defense: 30-8-2018

(30) **Student specialisation:** L&P
Thesis: Conceptual Relativism and Empirical Science. How to Comprehend the Incomprehensible?
Supervision: Martin Stokhof
Defense: 30-8-2018

(31) **Student specialisation:** L&C
Thesis: Learning to Decide a Formal Language: A Recurrent Neural Network Approach
Supervision: Elia Bruni, German Kruszewski
Defense: 29-8-2018

(32) **Student specialisation:** L&P
Thesis: Real Logic and Logical Tensor Network
Supervision: Jakub Szymanik, Frank van Harmelen
Defense: 28-8-2018

(33) **Student specialisation:** L&L
Thesis: Inquisitive Logical Triviality and Grammar
Supervision: Floris Roelofsen
Defense: 28-8-2018

(34) **Student specialisation:** L&L
Thesis: Coordinating Questions
Supervision: Floris Roelofsen
Defense: 27-8-2018

(35) **Student specialisation:** L&L
Thesis: CRISP: A Semantics for Focus-sensitive Particles in Questions
Supervision: Alexandre Cremers, Jakub Dotlacil
Defense: 27-8-2018

(36) **Student specialisation:** L&M
Thesis: Monotone Modified Realizability
Supervision: Benno van den Berg
Defense: 22-8-2018

(37) **Student specialisation:** L&C
Thesis: Advancing the Use of Sparse Knowledge for Qualitative Models and Simulations
Supervision: Jaap Kamps, Bert Bredeweg
Defense: 20-7-2018

(38) **Student specialisation:** L&P
Thesis: Post-quantum Security of Fiat-Shamir Signatures
Supervision: Christian Schaffner, Christian Majenz
Defense: 13-7-2018

(39) **Student specialisation:** L&M
Thesis: Studies in Minimal Mathematics
Supervision: Dick de Jongh
Defense: 12-7-2018

(40) **Student specialisation:** L&P
Thesis: Logical Functionalism
Supervision: Martin Lipman
Defense: 12-7-2018

(41) **Student specialisation:** L&C
Thesis: Recognizing Logical Entailment: Reasoning with Recursive and Recurrent Neural Networks
Supervision: Jelle Zuidema
Defense: 9-7-2018

(42) **Student specialisation:** L&C
Thesis: Optimality in Stabilizer Testing
Supervision: Michael Walter
Defense: 9-7-2018

(43) **Student specialisation:** L&P
Thesis: A Computational Method for Philosophical Interpretation
Supervision: Arianna Betti, Veruska Carretta Zamborlini
Defense: 6-7-2018

(44) **Student specialisation:** L&P
Thesis: Preventing Manipulation in Aggregating Value-Based Argumentation Frameworks
Supervision: Sonja Smets, Umberto Grandi
Defense: 5-7-2018

(45) **Student specialisation:** L&C
Thesis: Algorithmic Complexity in Textile Patterns
Supervision: Leen Torenvliet
Defense: 4-7-2018

(46) **Student specialisation:** L&C
Thesis: Examining Personality Differences in Chit-Chat Sequence to Sequence Conversational Agents
Supervision: Raquel Fernández
Defense: 3-7-2018

(47) **Student specialisation:** L&P
Thesis: On the Problem of Counterpossibles
Supervision: Franz Berto, Luca Incurvati
Defense: 29-6-2018

(48) **Student specialisation:** L&P
Thesis: Loyalty and Faithfulness of Model Constructions for Constructive Set Theory
Supervision: Benedikt Löwe
Defense: 28-6-2018

(49) **Student specialisation:** L&P
Thesis: Computation with Infinite Programs
Supervision: Benedikt Löwe, Lorenzo Galeotti
Defense: 28-6-2018

(50) **Student specialisation:** L&P
Thesis: Leibniz's Principle and the Problem of Nonindividuality
Supervision: Franz Berto
Defense: 28-6-2018

(51) **Student specialisation:** L&C
Thesis: Quantum Plaintext Non-Malleability
Supervision: Christian Schaffner, Christian Majenz
Defense: 19-6-2018

(52) **Student specialisation:** L&P
Thesis: Probabilistic Stability: dynamics, nonmonotonic logics, and stable revision
Supervision: Alexandru Baltag
Defense: 18-6-2018

(53) **Student specialisation:** L&P
Thesis: Quine and Loglan: the Inluence of Philosophical Ideas on the Creation of a Logical Language
Supervision: Arianna Betti, Jaap Maat
Defense: 18-6-2018

(54) **Student specialisation:** L&P
Thesis: You Don't Believe This Is The Title: Moore's Paradox and its relation to the Surprise Exam Paradox, the Knowability Paradox, the Toxin Problem and Newcomb's Problem
Supervision: Sonja Smets, Fernando Velázquez Quesada
Defense: 11-6-2018

(55) **Student specialisation:** L&M
Thesis: A Gödel-like Translation from Positive Calculus into Strict Implication Logic
Supervision: Nick Bezhanishvili, Frederik Lauridsen
Defense: 22-5-2018

(56) **Student specialisation:** L&C
Thesis: What You Know About People's Matters: Investigating Simpler Notions of Partial Information in the Context of Strategic Manipulation in Voting
Supervision: Ronald de Haan, Jakub Szymanik
Defense: 26-4-2018

(57) **Student specialisation:** L&P
Thesis: Unreliable Gossip
Supervision: Jan van Eijck, Theodora Achourioti
Defense: 12-1-2018

(58) **Student specialisation:** L&P
Thesis: The Paradoxes of Self-Negation
Supervision: Franz Berto, Luca Incurvati
Defense: 27-11-2017

(59) **Student specialisation:** L&C
Thesis: Leaning on Impossible to Parallelize Work for Immutability Guarantees in the Blockchain
Supervision: Christian Schaffner, Marc Stevens
Defense: 28-9-2017

(60) **Student specialisation:** L&P
Thesis: The Perception of Number: Towards a Topological Approach
Supervision: Michiel van Lambalgen
Defense: 27-9-2017

Appendix K

Student Publications

Selected publications based on work produced in 2014

(1) **Andreea Achimescu**, Alexandru Baltag, and Joshua Sack. The probabilistic logic of communication and change. *Journal of Logic and Computation*, exv084, 2016. Based on thesis work (2014).

(2) Alexandru Baltag, **Rachel Boddy**, and Sonja Smets. Group knowledge in interrogative epistemology. In H. van Ditmarsch and G. Sandu (eds.), *Jaakko Hintikka on Knowledge and Game-Theoretical Semantics*, pp. 131–164. Springer, 2018. Based on thesis work (2014).

(3) **Alexander Block** and Benedikt Löwe. A multiplication operation for the hierarchy of norms. *Annals of Pure and Applied Logic*, 169(7): 656–673, 2018. Based on thesis work (2014).

(4) Ivano Ciardelli, Floris Roelofsen, and **Nadine Theiler**. Composing alternatives. *Linguistics and Philosophy*, 40(1): 1–36, 2017. Based on project and thesis work (2014).

(5) **Justin Kruger**, Ulle Endriss, Raquel Fernández, and **Ciyang Qing**. Axiomatic analysis of aggregation methods for collective annotation. *Proceedings of the 2014 international conference on Autonomous Agents and Multi-Agent Systems* (AAMAS-2014), pp. 1185–1192, 2014. Based on project work (2014).

(6) Floris Roelofsen, **Michele Herbstritt**, and Maria Aloni. The *whether puzzle. In K. von Heusinger, M. Zimmermann, and E. Onea (eds.), *Questions in Discourse*, pp. 172–197. Brill, 2019. Based on thesis work (2014).

(7) **Julian Schlöder** and Raquel Fernández. The Role of Polarity in Inferring Acceptance and Rejection in Dialogue. *Proceedings of the 15th Annual Meeting of the Special Interest Group on Discourse and Dialogue* (SIGDIAL), pp. 151-160, 2014. Based on final project for the course *Computational Semantics and Pragmatics* (2014).

(8) **Nadine Theiler**, Floris Roelofsen, and Maria Aloni. A uniform semantics for declarative and interrogative complements. *Journal of Semantics*, 35(3): 409–466, 2018. Based on thesis work (2014).

(9) **Ciyang Qing**, Ulle Endriss, Raquel Fernández, and **Justin Kruger**. Empirical Analysis of Aggregation Methods for Collective Annotation. *Proceedings of COLING 2014*,

the 25th International Conference on Computational Linguistics: Technical Papers, pp. 1533–1542, 2014. **Finalist IBM Best Paper Award**. Based on project work (2014).

(10) **Ciyang Qing** and Michael Franke. Variations on a Bayesian Theme: Comparing Bayesian Models of Referential Reasoning. In H. Zeevat and H.-C. Schmitz (eds.), *Bayesian Natural Language Semantics and Pragmatics*, pp. 201–220. Springer, 2015. Based on thesis work (2014).

Selected publications based on work produced in 2015

(11) Alexandru Baltag, Nina Gierasimczuk, Aybuke Ozgun, Sonja Smets, and **Ana Lucia Vargas Sandoval**. A Dynamic Logic for Learning Theory. *Dynamic Logic. New Trends and Applications (DAli 2017)*, pp. 35–54. Springer, 2017. Based on thesis work (2015).

(12) Nick Bezhanishvili, Silvio Ghilardi, and **Frederik Lauridsen**. One-step Heyting algebras and hypersequent calculi with the bounded proof property. *Journal of Logic and Computation*, 27(7): 2135–2169, 2017. Based on thesis work (2015).

(13) **Laura Biziou-van-Pol**, **Jena Haenen**, **Arianna Novaro**, **Andres Occhipinti Liberman**, and Valerio Capraro. Does telling white lies signal pro-social preferences? *Judgment and Decision Making*, 10(6): 538–548, 2015. Based on final paper for the course *Game Theory* (2015).

(14) **Sirin Botan**, **Arianna Novaro**, and Ulle Endriss. Group Manipulation in Judgment Aggregation. *Proceedings of the 15th International Conference on Autonomous Agents and Multiagent Systems (AAMAS-2016)*, 2016. Based on final paper for the course *Computational Social Choice* (2015).

(15) Valerio Capraro and **Jotte Kuilder**. To know or not to know? Looking at payoffs signals selfish behavior, but it does not actually mean so. *Journal of Behavioral and Experimental Economics*, 65: 79–84, 2016. Based on project work (2015).

(16) **Lorenzo Galeotti**. A Candidate for the Generalised Real Line. In A. Beckmann, L. Bienvenu and N. Jonoska (eds), *Pursuit of the Universal (CiE 2016)*. LNCS, vol 9709. Springer, 2016. **Best Student Paper**. Based on thesis work (2015).

(17) **Hanna van Lee** and Sonja Smets, The Logic of Observation and Belief Revision in Scientific Communities. *Journal for General Philosophy of Science* (2019). https://doi.org/10.1007/s10838-018-9436-x. Based on thesis work (2015).

(18) **Bill Noble** and Raquel Fernández. Semantic Approximation And Its Effect On The Development Of Lexical Conventions. *The Evolution of Language: Proceedings of the 11th International Conference (EVOLANG11)*, 2016. Based on thesis work (2015).

(19) **Bill Noble** and Raquel Fernández. Centre Stage: How Social Network Position Shapes Linguistic Coordination. *Proceedings of the 6th Workshop on Cognitive Modeling and Computational Linguistics*, pp. 29-38, 2015. **Best Student Paper Award**. Based on final project for the course *Computational Semantics and Pragmatics* (2014).

(20) Jaap van Oosten and **Tingxiang Zou**. Classical and relative realizability. *Theory and Applications of Categories*, 31(22): 571–593, 2016. Based on thesis work (2015).

(21) **Iris van de Pol**, Iris van Rooij, and Jakub Szymanik. Parameterized Complexity Results for a Model of Theory of Mind based on Dynamic Epistemic Logic. In R. Ramanujam (ed.), *Proceedings of the 15th Conference on Theoretical Aspects of Rationality and Knowledge (TARK)*, pp. 239–248, 2015. Based on thesis work (2015).

(22) **Jouke Witteveen** and Leen Torenvliet. Fixed-parameter decidability: Extending parameterized complexity analysis. *Mathematical Logic Quarterly*, 62(6): 596–607, 2016. Based on thesis work (2015).

(23) **Fangzhou Zhai**, Jakub Szymanik, and Ivan Titov. Toward a probabilistic mental logic for the syllogistic fragment of natural language. *Proceedings of the 20th Amsterdam Colloquium*, pp. 468–477, 2015. Based on thesis work (2015).

Selected publications based on work produced in 2016

(24) **Laura Aina**, **Natalia Philippova**, **Valentin Vogelmann**, and Raquel Fernández. Referring Expressions and Communicative Success in Task-oriented Dialogues. *Proceedings Workshop on the Semantics and Pragmatics of Dialogue (SEMDIAL-2017, SaarDial)*, pp. 1–9, 2017. Based on final paper for the course *Computational semantics and pragmatics* (2016).

(25) **Christofer Badura** and Francesco Berto. Truth in Fiction, Impossible Worlds, and Belief Revision. *Australasian Journal of Philosophy*, 97(1): 178–193, 2019. Based on thesis work (2016).

(26) Alexandru Baltag and **Andrés Occhipinti**. Evidence logics with relational evidence. *Proceedings of LoRI 2017*, LNCS, vol 10455, pp. 17-32. Springer, 2017. Based on thesis work (2016).

(27) Guram Bezhanishvili, Nick Bezhanishvili, **Thomas Santoli**, and Yde Venema. A strict implication calculus for compact Hausdorff spaces. *Annals of Pure and Applied Logic*, 170(11), article 102714, 2019. Based on thesis work (2016).

(28) Nick Bezhanishvili, **Almudena Colacito**, and Dick de Jongh. A study of subminimal logics of negation and their modal companions. *12th International Tbilisi Symposium on Logic, Language, and Computation (TbiLLC 2017)*, pp. 21–41, 2017. Based on thesis work (2016).

(29) Marta Bílková and **Almudena Colacito**. Proof theory for positive logic with weak negation. *Studia Logica* (2019). https://doi.org/10.1007/s11225-019-09869-y. Based on thesis work (2016).

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Appendix L

Student and Alumni Surveys

In this appendix we reproduce the results (in Dutch) of the Dutch National Student Enquête from 2013-2018 (copied from UvAdata), according to which more than 90% of our students are very satisfied with the content of the programme; the results (again in Dutch) of a recent survey amongst MSc Logic graduates where the programme scores an average of 8.88 (on a scale from 1 to 10) and the first report of the Professional Advisory Board of the MSc Logic, which was installed in September 2018.

L.1 National Student Enquête (MSc Logic)

M Logic

Tijdens de opleiding (Nationale Studenten Enquête)

	Respons	% (zeer) tevreden							
	Respon-denten	Inhoud	Docenten	Toetsing en beoordeling	Uitdagend onderwijs	Studie-faciliteiten	Kwaliteits-zorg	Informatie-voorziening	Studie-begeleiding
2018	29	92%	88%	81%	88%	81%	83%	77%	84%
2017	22	95%	86%	81%	95%	86%	83%	90%	86%
2016	29	92%	85%	82%		78%	50%	78%	71%
2015	42	92%	85%	73%		88%	68%	90%	76%
2014	34	97%	91%	85%		97%	65%	91%	82%
2013	22	90%	81%	68%		100%	57%	95%	81%

L.2 Alumni Survey

https://msclogic.illc.uva.nl/Accreditation/Accreditation-2019/alumni_survey_2018.pdf

L.3 Report Professional Advisory Board

https://msclogic.illc.uva.nl/Accreditation/Accreditation-2019/Report-MoL-Professional-Advisory-Board-2019.pdf

Appendix M

SWOT Analysis MSc Logic

In this last Appendix, we report on a SWOT analysis carried out on 3 November 2019 during a Current Affairs Meeting (CAM) of the ILLC staff. Approximately 20 people actively participated, including MoL lecturers and supervisors, ILLC postdocs and PhD students (some of them MoL alumni), and ILLC support staff. No current MoL students were present.

Strengths	**Weaknesses**
1. Interdisciplinary, flexible curriculum well integrated with research at ILLC 2. Strong, international student community	1. Not widely recognised field, no clear career path 2. Internal cohesion of the curriculum
Opportunities	**Threats**
1. Alumni community 2. Growing interest for foundational research in AI and other emerging fields	1. Hype surrounding AI 2. Inequality among students; work pressure; sustainability

Table M.1: MoL SWOT analysis, November 2019

The interdisciplinary character of the programme, its flexibility and embedding in ILLC research, were identified as the main **strengths** of the MSc Logic by most participants together with our fantastic international community of talented and motivated students who we attract every year thanks to our strong (international) reputation. Interdisciplinarity, research orientation and flexibility however also lead to **weaknesses**. Despite being an established research area, the interdisciplinary field of Logic, Language and Information does not have the status of a widely recognised academic discipline such as Mathematics or Philosophy (we often have to explain the aims and objectives of the programme to outside stakeholders including potential students) and the programme does not prepare for a single, specific profession (which can lead to difficulties particularly for students who opt for a career outside of academia). Furthermore, because of the diversity of topics addressed in our courses (coinciding with the diverse research interests of ILLC lecturers) and its flexibility, our programme can appear to lack in focus and

cohesion since the connection between the different themes is not always explicit. The programme tries to address these weaknesses primarily by providing close individual guidance via the mentoring systems. Academic mentors help students find a coherent, personalised path within our broad, multi-disciplinary curriculum; and the non-academic mentors are available for advice on job opportunities outside of academia.

We see two main **opportunities** for the programme. The first is the community of MoL/ILLC alumni. Since 2018 we have a professional advisory board and, since 2019, a system of non-academic mentorship, both drawing from MoL alumni. Building on the existing ILLC Alumni Network on LinkedIn we plan to further formalise our connections with the alumni community and link them more closely to the ILLC international research networks. We also are investigating the option of creating an alumni fund with the aim of providing financial support to talented prospective students so that we can enable them to study at ILLC. This addresses one of the threats we envisage for our programme, the inequality among our students when it comes to financial (and housing) situation. The second opportunity is to capitalise on the success of emerging neighbouring disciplines such as AI and cognitive science. ILLC has relevant talents among students and staff to contribute to principled approaches to these fields. The recent hype surrounding AI was however also mentioned as one of the **threats** for our programme. Logic as a field is decreasing in popularity with respect to AI. Although we do not experience this trend directly in our programme (our student numbers are increasing), logic programmes around the world have difficulties in attracting students and a number of programmes have stopped since the last accreditation. One core characteristic of the MSc Logic, which contributes to its popularity among potential students, is that it combines foundational philosophical/mathematical themes with more applied AI, linguistic and cognitive components. In the future we plan to further invest in this combination emphasising the potential of logic (broadly conceived) as a methodology for exploring the foundations of these fields. The new hires at ILLC in the area of (logic of) AI and the move of ILLC to a shared building with the UvA Institute of Informatics, planned for 2022, are first relevant steps in this direction. Finally, besides inequality among students in terms of tuition fees (EU vs non EU) and housing (there is a dramatic shortage of student accommodation in Amsterdam and UvA can offer housing only to a subset of our incoming students), increasing work pressure is a further threat for our programme, which involves students, support staff as well as academic staff, particularly lecturers from FGW who have 60% teaching obligations vs the 40% for FNWI lecturers. Among the measures we adopted at the programme level to address this issue we mention here: the OC sub-committee on student Mental Health (cf. Section 2.2.4); automatisation of a number of procedures meant to reduce work load of support staff (cf. Section A.2); and, finally, qualified postdocs of the ILLC have recently started taking over some of the tasks of the lecturers, including academic mentoring of LY students, teaching of introductory courses and thesis supervisions. One last threat which was mentioned during the meeting concerns the sustainability of our programme. Part of the success of the MSc Logic is due to small courses and much individual attention, this might not be sustainable in the long run because of the growing student numbers and the unstable financial situation of Dutch universities.

Appendix N

Glossary

AB	Admissions Board
BKO	Basiskwalificatie Onderwijs (Basic Teaching Qualification)
CWI	Centrum Wiskunde & Informatica
EB	Examinations Board
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)
FSR	Facultaire Studentenraad (Student Council of the Faculty of Science)
ICT	Information and Communication Technologies
ILLC	Institute for Logic, Language and Computation
IvI	Informatics Institute, University of Amsterdam
HGL	Hoogleraar (Full Professor)
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)
LY	Logic Year
MoL	Master of Logic
NSE	Nationale Studenten Enquête (Dutch National Student Enquête)
NVAO	Nederlands-Vlaamse Accreditatieorganisatie
NWO	Nederlandse Organisatie voor Wetenschappelijk Onderzoek
OC	Onderwijscommissie (Educational Committee)
OER	Onderwijs- en Examenregeling (Teaching and Examination Regulations)
TA	Teaching Assistant
UD	Universitair Docent (Assistant Professor)
UHD	Universitair Hoofddocent (Associate Professor)
UvA	Universiteit van Amsterdam (University of Amsterdam)
VU	Vrije Universiteit (Free University), Amsterdam