

Assessment report
Limited Programme Assessment

Master Forensic Science

University of Amsterdam

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1. Executive summary

In this executive summary, the panel presents the main considerations which have led to the assessment of the quality of the programme Master Forensic Science of University of Amsterdam. The programme was assessed according to the NVAO Assessment Framework.

The panel observed that programme management has taken up the recommendations made in the previous assessment in 2011. Among others, steps have been taken to delineate the forensic science domain more clearly, to allow students to study both their bachelor discipline and the interdisciplinary field of forensic science, to form a research group in this domain and to intensify the relations with the professional field.

The panel supports the definition of the forensic science field, as described by programme management in the domain-specific framework. The panel considers the objectives of the programme to be valid for an academic master programme in this domain. The intended learning outcomes of the programme meet these objectives and adequately reflect disciplinary and interdisciplinary knowledge and understanding, disciplinary and interdisciplinary research skills and academic and professional skills. The learning outcomes of the programme correspond to the master requirements. The panel supports the intention of programme management to add the data science and digital forensics fields to the programme, at the same time recommending not to substitute any of the subjects already being part of the programme. The commonalities and differences between this programme and other programmes in the Netherlands and abroad have been laid out appropriately, offering a view on the distinguishing nature of this programme. The panel is positive about the relations programme management and lecturers maintain with the forensic science research community and the professional field. These relations allow programme management to align the programme with trends in forensic research and in the professional practice.

The admission requirements and procedures of the programme are appropriate. Because of the limited career perspectives for graduates, the panel supports the programme management policy to put a cap on the number of incoming students. The panel also agrees with the programme management goal to attract more computer science students, as computer science is becoming more important for forensic science.

The curriculum meets the intended learning outcomes. The panel is content with the curriculum, having noted that knowledge and understanding of the constituent parts of the forensic science field as well as research skills, professional attitudes and professional skills are appropriately addressed. The panel recommends however to strengthen the practical work in the curriculum, as practical, hands-on skills are regarded by the panel to be very important for students in the forensic science field. The panel feels programme management could try and increase the practical work both in the first year and the second year of the curriculum. The curriculum is satisfactorily coherent.

Being positive about the programme teaching philosophy, the panel specially welcomes the fostering of the active participation of students and the formation of groups in which students learn to work in an interdisciplinary way. The study methods are quite diverse and instrumental in promoting the learning processes. The study load and study guidance in the programme are appropriate, leaving some room to make it more challenging. The panel is positive about the round table meetings with students, allowing them to express their views. As to the laboratories for the programme, the panel advises to try and find opportunities in the outside world for students to participate in practical work.

The number of lecturers participating in the programme is quite sufficient. The panel regards them to be well-known researchers in their fields of expertise, being able to introduce recent research outcomes in their courses. The panel observed a number of lecturers to be working at external centres and institutions. The panel recommends programme management to monitor the involvement of these lecturers in the programme, as this may strengthen the programme own character. To be deduced from the proportion of course coordinators with University Teaching Qualification certificates, the educational capabilities of the lecturers are satisfactory. The panel is positive about the guest lecturers in the programme, addressing specialist topics.

The examination and assessment rules of the programme meet the University of Amsterdam and Faculty of Science policy statements in this respect. In the panel's view, the Board of Examiners adequately monitors the examination and assessment processes and outcomes. As programme management adopted an elaborate set of measures to that effect, in the opinion of the panel valid examinations and reliable assessments are ensured.

The examination methods are in line with the course goals and course contents. Having the courses assessed by multiple examinations allows to judge students' performances on different dimensions, relevant for the courses.

The panel regards the processes of supervision and assessment for the *Research Projects* to be adequate. The panel suggests however to require supervisors to complete the written comments on the assessment forms for students to learn explicitly about the supervisor's feedback. Although the written report of the *Research Project* should be in the format of a scientific journal article, the panel noticed only few reports actually did. Therefore, the panel recommends to introduce more strict criteria for the *Research Project* to enforce these projects to be written in this format.

The panel finds the examinations of the courses to be satisfactory in breadth and depth and to reflect the courses learning goals.

For most of the *Research Projects*, the panel agrees with the grades given by the programme examiners. In 20 % of the cases, the panel found the grades given to be somewhat too high. A number of the projects were regarded by the panel to be very interesting and to be very good. One of the projects was assessed by the panel to be unsatisfactory. Since all other projects were satisfactory at least, the panel considers this to be an outlier, being not representative of the general quality and level of the *Research Projects*.

The graduates of the programme nearly all find positions either within or outside of the forensic science field. Although programme management maintains relations with the professional field through the Advisory Board, the panel recommends to strengthen the relations with the professional field further. This may increase the opportunities of graduates to be employed in the forensic science field.

The panel assesses the programme Master Forensic Science of University of Amsterdam to be satisfactory and recommends NVAO to grant re-accreditation to this programme.

Rotterdam, 20 April 2017

Prof. dr. P. de Knijff
(panel chair)

Drs. W. Vercouteren RC
(secretary)

2. Assessment process

Certiked VBI received a request to conduct a limited programme assessment for the re-accreditation of the degree programme Master Forensic Science. This request was submitted by University of Amsterdam.

Certiked requested the approval by NVAO of the proposed panel of experts to conduct this assessment. NVAO have given their approval. The panel composition was as follows (for more detailed information please refer to Annex 4: Composition of the assessment panel).

- Prof dr. P. de Knijff, full professor in Population and Evolutionary Genetics, Leiden University Medical Center (panel chair);
- G. MacKinnon BA MSc MRSB MCSFS MCIfA FRAI (Cert FA-1), forensic anthropologist and archaeologist and company director, Alecto Forensic Services (panel member);
- Dr. A. Biedermann, associate professor in Forensic Science, University of Lausanne (panel member);
- R.C.A. Wink MA, student Master Dutch Language and Culture, Leiden University (student member).

On behalf of Certiked, drs. W. Vercooteren RC was responsible for the process coordination and for the drafting of the panel report. All panel members and the secretary signed a statement of independence and confidentiality.

The panel conducted this assessment on the basis of the standards of the NVAO Assessment Framework of 19 December 2014 (Staatscourant nr. 36791).

The following procedure was adopted. The panel members studied the documents presented beforehand by programme management, including a number of final products or theses of the students (please refer to Annex 2 and 3: Documents studied and Final products reviewed). With respect to the selection and study of the theses, the panel proceeded in line with the NVAO Guidelines for the assessment of final projects during external assessments of 18 February 2015.

Prior to the date of the site visit date, the panel chair and the panel secretary met to discuss the assessment procedures. Before the site visit date, all panel members sent in their preliminary findings, a number of questions to be put to the programme representatives on the day of the site visit and the findings about the theses, they had studied. The panel secretary summarised this information and drafted a list of questions, which served as a starting point for the discussions with the programme representatives during the site visit.

On 13 March 2017, the panel had a meeting to discuss the preliminary findings concerning the quality of the programme. During this preliminary meeting, the findings of the panel members were discussed, including these pertaining to the theses.

On 14 March 2017, the panel conducted the site visit on the Faculty of Science of University of Amsterdam campus. The site visit schedule was in accordance with the schedule drafted beforehand (please refer to Annex 1: Site visit schedule). Programme management communicated the open office hours to the students and staff of the programme. No persons called on the panel.

In the closed session at the end of the site visit, the panel members considered the findings, weighed the considerations and drew conclusions regarding the quality of the programme. At the end of the site visit, the panel chair presented the findings to programme management in broad outline.

A draft version of this report was finalised by the secretary, having taken into account the information presented as well as the findings and considerations of the panel. The draft report was sent to the panel members, who studied the draft report and made a number of changes. Thereupon, the secretary edited the final report. This report was presented to programme management to be corrected for factual inaccuracies. After having been corrected for these inaccuracies, the report was sent to the institution's Board to accompany their request for re-accreditation of this programme.

3. Overview of the programme

3.1 Basic information about the programme

Administrative information about the programme

Name programme in Croho: M Forensic Science
Orientation, level programme: Academic Master
Grade: MSc
Number of credits: 120.0 EC
Specialisations: N.A.
Location: Amsterdam
Mode of study: full time
Registration in Croho: 60338

Administrative information about the institution

Name of institution: University of Amsterdam
Status of institution: Government-funded university
Institution's quality assurance: Approved

Quantitative data about the programme

Percentage of students who completed the programme in three years (n+1)

Cohort	2011	2012	2013
Percentage of students	71 %	67 %	89 %

Percentage of lecturers with the following qualifications

Qualification	Master	PhD	UTQ*
Percentage of lecturers	100 %	70 %	57 %

*proportion of course coordinators, having obtained the University Teaching Qualification certificate

The students-to-staff ratio is 15.5 to 1.

The number of contact hours is 14.4 hours per week in the first year, 9.8 hours per week in the cursory part of the second year and 2.9 hours per week in the *Literature Thesis* and *Research Project*.

3.2 Main facts about the institution

The degree programme Master Forensic Science is a programme of the Faculty of Science of University of Amsterdam. University of Amsterdam was founded in 1632. About 30,000 students are enrolled in the programmes of the University and about 5,000 staff are employed by the University. University of Amsterdam is one of the leading research universities in Europe with about 10,000 academic publications by University staff every year.

According to its website, University of Amsterdam aspires to be a broad, research-intensive academic institution, rooted in the history of the city of Amsterdam, an internationally oriented which can compete with leading in the Netherlands and around the world. University of Amsterdam provides academic training in all areas of science and scholarship, and welcomes students and staff, from all backgrounds, cultures and faiths, who wish to devote their talents to the development and transfer of academic knowledge as a rich cultural resource and foundation for sustainable progress.

University of Amsterdam adopted as core values innovation, determination and engagement. In its own words, the University wants to be innovative and take up a position in the vanguard of fundamental research and its applications. For determination, University students and staff are encouraged to carve out their own paths and thus to set new trends. Engagement for the University means to use acquired knowledge and insights to play an ongoing, prominent and visible role in the social debate.

The University of Amsterdam has seven Faculties, being the Faculties of Economics and Business, Humanities, Law, Medicine, Science, Social and Behavioural Sciences and Dentistry.

3.3 Intended learning outcomes

The intended learning outcomes of the programme are as follows.

- Graduates will know and understand the forensic process in detail, including the players and their roles, the statistical foundation for the interpretation of evidence, the judicial context and the quality requirements within the process.
- Graduates will have gained an overview of the most common traces and knowledge of the classical forensic expert areas, the scientific principles of the main techniques used in those areas and the appropriate methods used for the analysis of the data gathered by such techniques.
- Graduates will have gained state-of-the-art knowledge of the scientific developments within their bachelor's discipline and are able to integrate those within the forensic science to make innovative contributions to these areas.
- Graduates will be able to apply their forensic knowledge to a basic forensic case including the application of the Bayesian paradigm for the interpretation of evidence.
- Graduates are able to identify relevant forensic issues, to formulate appropriate research questions, develop an experimental set-up and to design a project plan to answer their question and implement that plan under supervision.
- Graduates are able to work autonomously and with others in multidisciplinary and multicultural teams and are able to apply their problem solving abilities in unfamiliar environments within multidisciplinary contexts related to the field of forensic science.
- Graduates are able to review situations critically and in a systematic way and are able to draw inferences on the basis of incomplete information, and they are aware of the limitations of these inferences.

- Graduates will have knowledge of and insight into the role of forensic science in society and awareness of the standards required for scientific research in order to function adequately and autonomously in their future professions and reflect on societal problems.
- Graduates will be able to communicate findings and conclusions with solid argumentation both orally and with written reports to expert and non-expert audiences in the legal context.
- Graduates are aware of their knowledge and competencies and are able to independently acquire knowledge and skills in unknown situations, they have the ability to reflect upon their contribution and future professional development.

3.4 Outline of the curriculum

In the table below, the programme curriculum is presented.

Courses	Credits
Statistics for Forensic Science	6.0 EC
Criminalistics and Analytical Chemistry	6.0 EC
Research and Innovation in Forensic Science	6.0 EC
Reasoning and Formal Modelling for Forensic Science	6.0 EC
Complex Crime Scenes	6.0 EC
Forensic Statistics and DNA Evidence	6.0 EC
Elective* or specialisation course**	6.0 EC
Chain of Evidence	6.0 EC
Criminal Law and Expert Evidence	6.0 EC
Policy, Ethics and Media	6.0 EC
First year	60.0 EC
Specialisation course**	6.0 EC
Elective* or specialisation course**	6.0 EC
Specialisation course**	6.0 EC
Professional Development (spread over two years)	1.0 EC
Literature Thesis	5.0 EC
Research Project	36.0 EC
Second year	60.0 EC
Total credits of the programme	120.0 EC

*Electives offered are Physical and Forensic Anthropology, Cybercrime and Cybersecurity, Project Gerede Twijfel (in Dutch), Observer Based Techniques. Students are to select 6.0 EC to 12.0 EC electives.

**Specialisation courses are courses in line with the bachelor discipline of the students. Students are to take the study load of 12.0 EC to 18.0 EC of these courses, to be selected from pre-approved lists.

4. Overview of assessments

Standard	Assessment
Standard 1. Intended learning outcomes	Satisfactory
Standard 2: Teaching-learning environment	Satisfactory
Standard 3: Assessment	Satisfactory
Standard 4: Achieved learning outcomes	Satisfactory
Programme	Satisfactory

5. Findings, considerations and assessments per standard

5.1 Standard 1: Intended learning outcomes

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

Findings

Forensic science may be said to be the application of scientific principles and techniques to study and to determine criminal, civil and regulation issues for the purposes of justice. The field of forensic science is interdisciplinary, including disciplines as diverse as biology, chemistry, mathematics, computer science, humanities, social sciences, psychology and law. Programme management drafted the domain-specific framework for the field of forensic science in order to delineate this field.

From a survey among alumni, programme management deduced the graduates of the programme to take on three distinct roles, being those of researcher, expert and advisor or coordinator. Identifying these roles has been instrumental in arriving at the objectives and the intended learning outcomes of the programme. Programme management's explicit intention is to train students to obtain positions in the forensic science field. Graduates may, however, find positions in other fields, but it is not the purpose of the programme to specifically educate them for these positions.

The objectives of the Master Forensic Science programme of University of Amsterdam are to educate students to acquire broad forensic knowledge and understanding, to have a solid basis in their bachelor discipline within the forensic science field, to address forensic problems, to conduct research in their bachelor discipline and to contribute to research in the forensic science field.

From these objectives, programme management derived the programme intended learning outcomes. These include knowledge and understanding of the forensic science field and of the bachelor discipline within this field, abilities to apply this knowledge and understanding to forensic cases, research skills, capacities to work in multidisciplinary and multicultural teams, critical judgement, professional skills, societal awareness, communication skills and learning abilities.

Programme management intends to include the data science and digital forensics fields in the programme objectives and intended learning outcomes, since this field is becoming more and more important for the forensic science study and practice.

In an overview, programme management presented the relations between the intended learning outcomes and the Dublin-descriptors, being a measure for the master level of the programme. From this table, it may be deduced the intended learning outcomes meet all of the Dublin-descriptors.

Programme management made a comparison between this programme and the programmes of other institutions in the Netherlands and abroad. From this comparison, it may be deduced this programme shares important traits with programmes in Sweden, Switzerland and the United Kingdom at the same time distinguishing itself in the pronounced interdisciplinary characteristics.

Programme management maintains relations with both the forensic science research community and the forensic science professional field. The Co van Ledden Hulsebosch Center was founded in 2013 to promote forensic science research. Programme management collaborates closely with this centre and lecturers in the programme are researchers in this centre. For the programme, an Advisory Board with representatives of the professional field, has been installed. The Board meets with programme management, advising them on trends in the professional practice.

Considerations

The panel appreciates the domain-specific framework programme management drafted to describe and delineate the forensic science field and agrees with the definition of this field, as described by programme management. The objectives of the programme are considered by the panel to be valid for an academic master programme in this domain.

The intended learning outcomes of the programme meet the programme objectives and adequately reflect disciplinary and interdisciplinary knowledge and understanding, disciplinary and interdisciplinary research skills and academic and professional skills. The panel ascertained the learning outcomes of the programme to comply with the Dublin descriptors for master programmes and, therefore, to meet the master requirements.

The panel supports the intention of programme management to add the data science and digital forensics fields to the programme objectives and learning outcomes, as these fields represent indeed important trends in forensic science. At the same time, the panel recommends to add these fields to the subjects already studied in the programme and not to substitute any of these subjects. The panel feels there to be sufficient room in the programme to include the new subjects.

The comparison with other programmes in the Netherlands and abroad has been conducted adequately by programme management. The commonalities and differences between this programme and other programmes have been laid out appropriately, offering a satisfactory view on the distinguishing nature of this programme.

The panel is positive about the relations programme management and lecturers maintain with the forensic science research community as well as with the professional field. The panel feels these relations allow programme management to align the intended learning outcomes and the curriculum of the programme with current trends in forensic research and in the professional practice (please refer to standard 4 for additional considerations on the part of the panel in this respect).

Assessment of this standard

These considerations have led the assessment panel to assess standard 1, *Intended learning outcomes* to be satisfactory.

5.2 Standard 2: Teaching-learning environment

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

Findings

The programme Master Forensic Science is part of the Institute for Interdisciplinary Studies of University of Amsterdam. This institute is the centre for interdisciplinary education within the university, having acquired expertise on specific aspects of this type of education. The programme is managed by the programme director and the programme coordinator, working together with the study advisor. The Education Committee of the programme, being composed of both lecturers and students, advises programme management on quality issues regarding the programme. Programme management organises written surveys and round table discussions with students to obtain their views on the programme quality. The examinations and assessments in the programme are monitored by the Board of Examiners.

Every year, between 60 and 90 applications are received by programme management. About 60 % of these applications are rejected and the number of students actually being admitted to the programme amounts to 30 students per year on average. The proportion of students coming from abroad is 35 %. Students have various backgrounds, over 50 % of them having studied biology or biomedical sciences, about 12 % of them having backgrounds in chemistry and another 12 % having studied computer science. Programme management intends to attract more students with the latter background.

The entry requirements for the programme are to have completed a bachelor programme in Science. All applicants to go through the admission procedures, irrespective of the previous education or background. Applicants fill out the admission form and submit their motivation letter, curriculum vitae, bachelor degree certificate, grade list, abstract of their bachelor thesis and a reference letter. Every one of the applicants is invited for an intake interview. Having studied the applicant's documentation and having interviewed the applicants, the programme director decides on admission, using a standardised set of criteria. The purpose of the admission procedures is to select students best prepared for the programme. The number of positions for graduates in the forensic science field in the Netherlands is limited. Admitting more students would be inconsistent with their career prospects.

Programme management presented a table in which the relations between the intended learning outcomes and the curriculum components were specified. From this table, it can be deduced that all of the intended learning outcomes are addressed in the curriculum. The curriculum of the programme has a total study load of 120 EC, is a full-time programme and takes two consecutive years. Throughout the curriculum, six so-called teaching-learning tracks may be found, these being forensic processes, traces and analysis, interpretation of evidence, research, professional attitudes and professional skills. All of the courses in the curriculum address one or more of these tracks, ensuring students to meet the required knowledge and skills. The first year introduces students to the theoretical and scientific foundations of forensic science, acquainting them with, among others, principles of criminalistics reasoning, interpretation of evidence by means of statistical methods and hypothesis formulation and validation. With the exception of one course, all of the courses in the first year are mandatory. The courses *Chain of Evidence* and *Policy, Ethics and Media* are integrative courses, addressing complex interdisciplinary cases. In the second year of the programme, students extend and deepen the knowledge and understanding of their bachelor field, taking 12 EC to 18 EC in specialisation courses in this domain.

In addition, students write the *Literature Thesis* (5 EC) and do the *Research Project* (36 EC). These are both individual assignments, the first being meant to address a specific topic through the study of academic literature and to prepare for the *Research Project* and the second being meant to do theoretical and practical forensic science research and to write the report on the research and the results, based upon the requirements of a journal article. Whereas the first year is primarily theoretical, practical work and exercises are introduced in the second year. Students are advised to attend the regularly organised extra-curricular *Frontiers of Forensic Science* conferences, where they may meet fellow students, researchers and professional field representatives.

The teaching philosophy in the programme constitutes of a number of educational principles. Teaching is in small groups and meant to promote the active participation of students. Students learn both individually and in groups, these groups being purposely composed of students with different backgrounds. This way, students learn to work in multidisciplinary settings, to complete interdisciplinary group assignments and to present their findings to diverse audiences. The study methods are, among others, lectures, workshops, presentations, practical classes, excursions, moot courts and mock crime scenes. As the laboratories for practical work are not in place, programme management is considering to have laboratories constructed.

The study load of the programme may be regarded to be appropriate, leaving some room to add items. To discuss their study planning and career perspectives and to ask for assistance in case of personal problems, students may turn to the programme study advisor. A number of meetings are scheduled throughout the programme to inform students about their study plan and the selection of electives. The study advisor monitors the study progress of every one of the students. Students are asked by programme management about their opinions on the programme and separate courses in written surveys and round table meetings.

The staff in the programme consists of 22 lecturers with a total of a little over 1.4 full-time equivalents. The resulting student-to-staff ratio is 15.5. The number of contact hours is 14.4 hours per week in the first year and 9.8 hours per week in the cursory part of the second year. The proportion of lecturers with a PhD is about 70 %. Most of the lecturers are active researchers in their field of expertise and a number of them participate in the Co van Ledden Hulsebosch Center for forensic research. The proportion of course coordinators having obtained the University Teaching Qualification certificate is 57 %. These course coordinators monitor the coherence within the courses. Guest lecturers with various backgrounds present specific topics in the courses. The students, with whom the panel met, expressed experiencing the lecturers to be quite easily approachable.

Considerations

The panel studied the admission requirements and the admission procedures of the programme and consider these to be appropriate. The panel supports the programme management policy to limit the number of incoming students, in view of the limited number of positions for graduates on the labour market. The panel, also, is positive about programme management's intention to attract more computer science students, as the importance of computer science for the forensic science field is growing.

The panel established the curriculum to meet the intended learning outcomes. The panel is content with the curriculum. Knowledge and understanding of the constituent parts of the forensic science field are appropriately addressed in the curriculum. Research skills, professional attitudes and professional skills are covered as well. The panel recommends however to strengthen the practical work in the curriculum, as practical, hands-on skills are regarded by the panel to be very important for students in the forensic science field. The panel feels programme management could try and increase the practical work both in the first year and the second year of the curriculum. The curriculum is satisfactorily coherent, as exemplified by the teaching-learning tracks and by the built-up from the theoretical and research foundations in the first year to the specialisation courses in the second year. The course coordinators ensure the coherence within the courses.

Being generally positive about the teaching philosophy of the programme, the panel especially welcomes the fostering of the active participation of students in learning processes and the multidisciplinary groups. In these groups students learn to work interdisciplinary, meeting with fellow students from different backgrounds. The study methods adopted are quite diverse and are instrumental in promoting the learning processes of the students.

The study load and the study guidance in the programme are appropriate, leaving some room to make it more challenging. The panel is positive about the round table meetings with students, allowing them to express their views. In addition, the panel noted programme management to have designed transparent processes to implement improvements. As to the laboratories for the programme, the panel recommends to try and find opportunities in the outside world for students to participate in practical work and to gain practical experience.

The number of lecturers participating in the programme is quite sufficient. Having studied the curricula vitae of the lecturers, the panel regards them to be well-known researchers in their fields of expertise, being able to introduce recent research outcomes in their courses. The panel observed a number of lecturers to be working at external centres and institutions. The panel recommends programme management to monitor these lecturers' involvement in the programme, as this may strengthen the programme own character. To be deduced from the proportion of course coordinators with University Teaching Qualification certificates, the educational capabilities of the lecturers are satisfactory. The panel is positive about the guest lecturers in the programme, addressing specialist topics.

Assessment of this standard

These considerations have led the assessment panel to assess standard 2, *Teaching-learning environment* to be satisfactory.

5.3 Standard 3: Assessment

The programme has an adequate assessment system in place.

Findings

For the programme, an assessment plan has been drafted, specifying the rules for the examinations and assessments in the programme. This assessment plan conforms to both the University of Amsterdam Assessment Policy Framework and the Faculty of Science Testing Framework.

The Board of Examiners for this programme has the responsibilities to monitor the examinations and assessments processes and outcomes. The Board meets regularly.

Each of the courses is assessed by means of multiple examinations. The final grade for these courses is the weighted average of the constituent examinations. These examination methods adopted are, among others, written examinations, written and practical assignments individually or in groups, presentations, essays and moot court reports and defences. The selection of examination methods is being monitored by the Board of Examiners.

The examination and assessment rules for the programme, as drafted by programme management and monitored by the Board of Examiners, include a number of specific measures. Each of the examinations is prepared by one of the examiners and is presented to an colleague for peer-review. Examiners are required to present the test matrix to demonstrate the correspondence between examination items and the course learning goals. They should also present the answer model in case of written examinations and a grading form in case of assignments. All written reports are checked for plagiarism. The Board of Examiners checks whether examiners conform to these procedures. In addition, the Board inspects the grade distribution of examinations and may take additional measures in case of abnormal distributions. A member of the Board chairs the *Research Project* defence meetings. This allows the Board to calibrate the grades for these projects.

For the *Research Project*, a protocol has been drafted, in which the procedures regarding this project have been laid down. The *Research Project* concerns individual research. Students starting the project have to submit their research proposal to their supervisor and the independent, second examiner. During the process, students meet with their supervisor to obtain feedback on their progress. Halfway through the project, students are to submit a progress report to the supervisor and the examiner. At the end of the process, students submit their written report and defend the project before the supervisor, the examiner and a member of the Board of Examiners. Students are required to present the written report in the format of a scientific journal article. The grade for the *Research Project* consists of the grades for the research proposal (10 %), experimental work (40 %), report (30 %) and presentation and defence (20 %). For the assessments, scoring models with relevant criteria are used.

Considerations

The panel observed the examination and assessment rules of the programme to meet the University of Amsterdam and the Faculty of Science policy statements in this respect. The panel considers this to provide a solid basis for these rules. In the panel's view, the Board of Examiners adequately monitors the examination and assessment processes and outcomes.

The panel is of the opinion programme management ensures valid examinations and reliable assessments, having adopted an elaborate set of measures to that effect.

The panel approves of the examination methods. They are in line with the course goals and the course contents. Having the courses assessed by multiple examinations allows to judge students' performances on different dimensions, relevant for the courses.

The panel regards the processes of supervision and assessment for the *Research Projects* to be adequate. During the project, students are guided by their supervisor. The assessment by at least three examiners, using scoring models leads to reliable assessments. The panel suggests to require supervisors to complete the written comments on the assessment forms for students to learn explicitly about the supervisor's feedback.

Although the written report of the *Research Project* should be in the format of a scientific journal article, the panel noticed only few reports actually did. Therefore, the panel recommends to introduce more strict criteria for the *Research Project* to enforce these projects to be written in this format.

Assessment of this standard

The considerations have led the assessment panel to assess standard 3, *Assessment* to be satisfactory.

5.4 Standard 4: Achieved learning outcomes

The programme demonstrates that the intended learning outcomes are achieved.

Findings

The panel studied the examinations of a number of courses in the programme.

In the *Research Projects* at completion of the programme, six of the intended learning outcomes of the programme are addressed and the students are to demonstrate in these projects to master these learning outcomes. The average grade of these projects in the years 2012 - 2016 was a little over 7.8. The panel reviewed a total of fifteen *Research Projects*.

Graduates of the programme may be employed as researchers, experts or advisors in the forensic science field, but may also find employment outside of this field. The results of a survey among alumni conducted by programme management show about 26 % of the alumni being employed in academia as researcher, another 25 % of them having found positions as advisors or experts in the forensic science field and 22 % of the alumni working outside of the forensic science field. The remainder either have other positions or have not listed their current position. The proportion of alumni being unemployed is 3 %, which is very low. Positions alumni with biology or biomedical backgrounds may find outside of the forensic science field are in hospitals, in the chemical industry or with pharmaceutical companies. The students, with whom the panel met, expressed being well informed about their career perspectives.

Considerations

Having studied the examinations of a number of courses, the panel concludes these examinations to be satisfactory in breadth and depth and to reflect the learning goals of the courses.

Having reviewed fifteen *Research Projects*, the panel agrees in 80 % of the cases with the grades given by the programme examiners. In 20 % of the cases, the panel found the grades given to be somewhat too high. A number of the projects were regarded by the panel to be very interesting and to be very good. One of the projects was assessed by the panel to be unsatisfactory. As all of the other projects were satisfactory at least, the panel considers this to be an outlier, being not representative of the general quality and level of the *Research Projects*.

The graduates of the programme nearly all find positions either within or outside of the forensic science field. As has been said when discussing standard 1, programme management maintains relations with the professional field in the form of the programme Advisory Board. Although this is the case, the panel recommends to strengthen the relations with the professional field further, thereby raising the chances of students to find positions in the forensic science field.

Assessment of this standard

The considerations have led the assessment panel to assess standard 4, *Achieved learning outcomes* to be satisfactory.

6. Recommendations

In this report, a number of recommendations have been listed. For the sake of clarity, these are brought together below. The recommendations are the following.

- To include the data science and digital forensics fields in the programme, adding these fields to the subjects already studied and not replacing any of these subjects.
- To strengthen the practical work in the curriculum, as practical, hands-on skills are very important for students in the forensic science field, and to try and increase the practical work both in the first year and the second year of the curriculum.
- To try and find opportunities in the outside world for students to participate in practical work and to gain practical experience in the forensic science field.
- To monitor the involvement in the programme of lecturers who may primarily be employed at other centres and institutes, as this may strengthen the programme own character.
- To require supervisors to complete the written comments on the assessment forms for students to learn explicitly about the supervisor's feedback.
- To introduce more strict criteria for the *Research Project* to enforce these projects to be written in a scientific journal article format, as is the intention of programme management.
- To strengthen the relationships with the professional field in order to secure more positions for graduates of the programme.

Annex 1: Site visit schedule

The site visit took place at the Faculty of Science campus in Amsterdam on 14 March 2017.

08.30 h. – 09.30 h.	Arrival and preparatory meeting panel (closed session)
09.30 h. – 10.00 h.	Dean and programme management Prof. dr. P. van Tienderen (dean Faculty of Science), prof. dr. J. de Boer (vice-dean education, Faculty of Science), drs. L. Wenting (director Institute for Interdisciplinary Studies), prof. dr. J. Bergstra (interim programme director), dr. A. Haker (programme director 2010 – 2016)
10.00 h. – 11.00 h.	Programme management and core lecturers Prof. dr. J. Bergstra (interim programme director), dr. A. Haker (programme director 2010 – 2016), dr. Y. Hartman (programme coordinator), drs. M. Hoogstraten (study advisor), prof. dr. A. Kloosterman (course coordinator, lecturer, examiner), prof. dr. M. Aalders (course coordinator, examiner)
11.15 h. – 12.00 h.	Board of Examiners Dr. H. Breeuwer (member Board of Examiners), dr. B. van Es (member Board of Examiners), dr. P. Verschure (chair Board of Examiners), dr. R.M. Williams (external member Board of Examiners)
12.00 h. – 13.00 h.	Lunch panel (closed session), open office hours 12.00 h. – 12.30 h.
13.00 h. – 14.00 h.	Lecturers and thesis examiners Dr. M. Blom (course coordinator, lecturer, examiner), prof. dr. T. de Cock Buning (course coordinator, lecturer, examiner), prof. dr. M. Sjerps (course coordinator, lecturer, examiner), dr. I. O’Sullivan (course coordinator, lecturer, examiner), dr. K. Vriend (course coordinator, lecturer, examiner), dr. R. Winkels (course coordinator, lecturer, examiner)
14.00 h. – 14.45 h.	Students, including Education Committee members and alumni A. Akbani MSc (alumnus cohort 2014), H. Boomsma MSc (alumnus cohort 2013), F. Bittner (student cohort 2016), L. Graaf MSc (alumnus cohort 2013), M. Hoegee (student cohort 2015), R. Vorstenbosch (student cohort 2014), R. Wieten MSc (alumnus cohort 2012)
15.00 h. – 15.45 h.	Representatives of professional field (names without titles) M. Fissette (senior consultant, KPMG, University of Twente), W. Remijn (forensic consultant, Court Rotterdam, Court The Hague), J. de Koeijer (senior forensic scientist interdisciplinary investigations, Netherlands Forensic Institute), C. de Poot (lector, Amsterdam University of Applied Sciences), J. van de Sommen (forensic investigator, Eindhoven Police)
15.45 h. – 17.30 h.	Deliberations panel (closed session)
17.30 h. – 17.45 h.	Main findings presented by panel chair to programme management and others

Annex 2: Documents studied

The panel studied the following documents, presented by programme management prior to the site visit.

- Master in Forensic Science Self-Evaluation Report
- Domain-specific framework
- Learning outcomes
- Members of boards and committees
- Summary meeting Advisory Board
- Teaching and Examination Regulations
- Teaching philosophy
- Overview curriculum
- Course descriptions
- Overview teaching staff
- Overview guest lecturers and topics
- Overview Frontiers of Forensic Science
- Seeing the big picture – Further integration curriculum, 2013 – 2014
- Research Project protocol
- Assessment plan
- Course evaluation
- Course file review by Board of Examiners
- Round table meeting minutes
- Overview Literature Thesis topics
- Overview Research Project topics
- Alumni survey, 2016
- More in-depth teaching
- Considerations on a forensic lab
- Data science and digital forensics

In addition, the panel members were given access to the programme electronic learning system.

On the day of the site visit, programme management presented the following documents.

- Course material of selected courses
- Examinations of selected courses
- Contact hours and self-study hours breakdown
- Information brochure for prospective students
- Research Project protocol
- Education Committee minutes
- Board of Examiners annual reports

Annex 3: Final products reviewed

The final products or Research Projects of the following fifteen students have been selected for review by the panel.

- 10435050
- 10185119
- 10853081
- 10222766
- 6068375
- 10416544
- 10000082
- 10653449
- 10632808
- 10634568
- 10631666
- 10287426
- 10008756
- 10587179
- 10634592

Annex 4: Composition of the assessment panel

The assessment panel had the following composition.

- Prof dr. P. de Knijff, full professor in Population and Evolutionary Genetics, Leiden University Medical Center (panel chair);
- G. MacKinnon BA MSc MRSB MCSFS MCIfA FRAI (Cert FA-1), forensic anthropologist and archaeologist and company director, Alecto Forensic Services (panel member);
- Dr. A. Biedermann, associate professor in Forensic Science, University of Lausanne (panel member);
- R.C.A. Wink MA, student Master Dutch Language and Culture, Leiden University (student member).

Prof dr. P. de Knijff (panel chair)

Mr de Knijff is full professor in Population and Evolutionary Genetics at Leiden University Medical Center. His current research is aimed at the development and use of polymorphic markers on the human Y chromosome and fundamental population genetic and evolutionary genetics. He has been involved in numerous national and international population genetic, evolutionary genetic and forensics genetic studies. These studies have resulted in over 200 authored and co-authored articles, published in international peer reviewed journals and in contributions to over twenty books.

G. MacKinnon BA MSc MRSB MCSFS MCIfA FRAI (Cert FA-1) (panel member)

Mrs MacKinnon is a forensic anthropologist and archaeologist at Alecto Forensic Services and the company director of Alecto Forensic Services. Previously, she was a lecturer in Forensic Anthropology and Archaeology at the Centre for Anatomy and Human Identification of University of Dundee and a forensic anthropologist and archaeologist at LGC Forensics. She participated in numerous international and United Kingdom forensic cases. Mrs MacKinnon published widely and spoke at many conferences in her field of expertise.

Dr A. Biedermann (panel member)

Mr Biedermann is an associate professor in Forensic Science at University of Lausanne in Switzerland. He took his doctorate in forensic science from the University of Lausanne. He did post-doctoral research at institutions in a number of countries. His research and teaching activities concentrate on graphical modelling for evidential reasoning and decision-making in forensic science. His work is multidisciplinary and involves forensic science, law and various topics in probability and decision theory. Mr Biedermann published widely in his field of expertise.

R.C.A. Wink MA (student member)

Mr Wink was until recently a student in the programme Master Dutch Language and Culture of Leiden University. He completed the Research Master History at this university and was a student member in the programme committee of the latter programme. He was, among others, employed as an account manager and a professional researcher. Mr Wink participated as a student member in panels for the accreditation of degree programmes in higher education in the Netherlands.