MASTER'S PROGRAMME
Geographical Information Sciences
Vrije Universiteit Amsterdam

Report on generic quality
August 21, 2024

Content

1. Introduction

This advisory report contains findings, considerations and judgements about the master's programme Geographical Information Sciences (GIS) of Vrije Universiteit Amsterdam (VU). The Accreditation Organisation of the Netherlands and Flanders (NVAO) bases its accreditation decision on this report.

1.1 Panel

The panel that performed the assessment of the master's programme Geographical Information Sciences consists of four independent experts, including one student member. The NVAO approved the composition of the panel on 23 April 2024:

- Prof. dr. ir. A. Bregt (chair), Professor Geo- information Science and dean of Education at Wageningen University and chair of NCG;
- Dr. G. Wallentin, Associate professor for Geoinformatics and Ecology (Paris Lodron Universität, Salzburg) and programme director of UNIGIS Salzburg (Austria);
- Drs. D. van Barneveld, coordinating policy advisor at the Ministry of the Interior and Kingdom Relations;
- M. Khan BSc (student member), student MSc Spatial Engineering at Twente University.

The panel was supported by drs. Linda te Marvelde, who acted as secretary.

1.2 Assessment framework

The master's programme Geographical Information Sciences is subject to assessment in accordance with the Assessment Framework for Limited Programme Assessment (NVAO 2018, hereafter: 'the assessment framework').

1.3 Working method

Approximately seven weeks before the site visit, the panel received the documentation, including a self-assessment report and a selection of fifteen master's theses including their assessment forms (see appendix 7.1). These documents formed the basis for the assessment of the generic quality achieved. The panel studied the documents and organised an online panel meeting two weeks prior to the site visit. In this meeting, the panel discussed its initial findings and provisional conclusions regarding the quality achieved on the four standards of the assessment framework. Part of the meeting was a (online) consultation opportunity for students and lecturers who wanted to engage in conversation with the panel. No one took advantage of the opportunity to speak with the panel at this stage. Shortly after the meeting, the panel had an initial, online meeting with the programme management to discuss any initial questions that the panel had.

VU chose to organise an online site visit in accordance with the characteristics of the programme, which is mostly offered online (distance learning). The online site visit took place on May 24, 2024 (see appendix 7.2). During the site visit, the panel spoke with delegations of students and teaching staff, examination board, professional field, alumni, and the management team of the programme. At the end of the visit, the panel drew up findings and recommendations. The panel's chair presented these orally to stakeholders of the programme.

After the visit, the secretary drew up the advisory report. After processing the panel's feedback, the secretary sent the advisory report to the programme for the purpose of fact-checking the text. The secretary has corrected factual inaccuracies identified by the programme in the final version. The executive board of Vrije Universiteit Amsterdam received the final report on August 21, 2024.

The development dialogue will take place at a date yet to be determined. The development report that will be drafted is not part of the application for renewal of accreditation, but will rather discuss development opportunities identified. The programme will publish the report (on its own website) within a year of the NVAO's accreditation decision.

2. Characteristics of the programme

2.1 Administrative data

Name of the programme:	Geographical Information Sciences
Croho:	75040
Level and orientation of the programme:	academic master's programme ('post-initial')
Credits:	60 EC
Specialisations or tracks:	N/A
Location:	Amsterdam
Mode of study:	part time
Language of instruction:	English

2.2 Organisation

The post-initial master's programme Geographical Information Sciences (UNIGIS) is hosted by the School of Business and Economics (SBE). The school is governed by the SBE faculty board, consisting of the dean, the vice dean of education, the vice dean of research, the managing director, and a student assessor. The dean has overall authority. The academic staff is divided into departments. The head of each department is responsible for assigning academic staff's teaching and research duties and has a budget for personnel and other expenses.

SBE offers a broad range of executive (non-funded) education programmes in finance, accounting and management, including UNIGIS. To accommodate the learning and development needs of the international and diverse group of participants, programmes are offered in both Dutch and English. Executive Education (EE) is an integral part of the faculty. It is autonomous and self-sustaining in terms of strategy, operation, control, finances and support. Executive Education is chaired by the associate dean of Executive Education, who is regularly invited to the faculty board. Hierarchically, the associate dean of Executive Education is supervised by the dean of SBE and reports to the faculty board.

The programme director of UNIGIS is responsible for content, organisation and quality assurance as well as for aligning the curriculum with the intended learning outcomes. The programme director is also responsible for the day-to-day operations of the programme, such as coordinating the courses and monitoring the teaching quality within the courses. The programme director is supported by a programme coordinator. The programme director regularly meets with the vice dean of education and submits an annual report and year plan to the SBE faculty board.

3. Summary

The English-taught, part-time, executive Master of Science Geographical Information Sciences, also known as UNIGIS Amsterdam, is offered by the Spatial Information Laboratory (SPINlab), the research and education centre for Geographical Information Sciences (GIS), based within the School of Business and Economics (SBE) of Vrije Universiteit Amsterdam (VU). It is a post-initial academic master's programme that focuses on offering GIS professionals a profound understanding of state-of-the-art GIS concepts, methods and technologies and ability to apply these in a structured and reflective manner to complex societal issues. The programme is designed to help active GIS professionals to gain a deeper, more academic understanding of their profession and to acquire new skills in this highly innovative and changing field. Furthermore, it is meant to help people with different areas of expertise transition to their desired job of GIS professional or integrate the possibilities GIS offers into their existing field of work.

The educational concept of UNIGIS is based on pillars of self-directed learning through well-structured online materials, structured interactions in small groups, close and direct personal contact with lecturers and the programme coordinator, and a study schedule with considerable flexibility to accommodate the students' professional, personal and study commitments.

Standard 1

The ambitions of the MSc Geographical Information Sciences are fitting for an academic master's programme in this field. The aims of the programme have been translated into a coherent set of intended learning outcomes (ILOs) that are properly aligned with the requirements of the academic and professional field. The panel is satisfied that the programme has an Advisory Board as a means to keep the ILOs connected to the requirements of the professional field, but suggests that its role is strengthened and that mutual expectations are better aligned.

Standard 2

The curriculum of UNIGIS reflects the ILOs of the programme. The programme uses several activating and inspiring (online and onsite) teaching methods. The online format helps students all over the world to partake in the programme and the diversity in the classroom creates an environment where students learn from each other as well. Students are provided with good support and guidance.

The teaching staff is well-qualified, both in terms of academic expertise and teaching qualifications. The panel finds the programme is open to feedback and is willing to take measures to improve itself.

Standard 3

UNIGIS has an adequate system of assessment in place. The course assessments consist largely of written assessments. The panel finds that the programme could benefit from more diversity in assessment methods, for instance by adding more oral components. With regards to thesis assessments, the panel finds that the assessment process is adequate, but that the use of thesis assessment forms needs to be improved. The panel expects the examiners to substantiate their grades and to provide written feedback in a systematic way, so that students understand what they have done well and which areas need improvement. The oral feedback that is provided to students, for instance during the thesis defences, needs to also be provided in written form.

Standard 4

The theses and the success of alumni on the job market show that students of the programme realize the intended learning outcomes.

Standard	**Judgement**
1 Intended learning outcomes	Meets the standard
2 Teaching-learning environment	Meets the standard
3 Student assessment	Meets the standard
4 Achieved learning outcomes	Meets the standard
Final conclusion	**Positive**

4. Strong points

The panel identified numerous strengths with the key strengths listed below.

- The panel finds that UNIGIS is a well-established programme that is based on 30 years' experience in delivering higher education Geo-information programmes to working professionals. It is a relevant programme that serves a very specific niche well.

- The panel finds that UNIGIS has a solid and coherent curriculum; it addresses relevant topics in quite a niche field. Students are constantly encouraged to make connections with their own work and experiences; this blend with the work field is very good.

- The panel appreciates the small scale of the programme and personal approach with regards to student guidance they experience. The panel is impressed with the synchronized and asynchronized feedback mechanisms that have been put in place.

5. Recommendations

The programme's documentation included an overview of how it followed up on the recommendations given by the previous accreditation panel (2018). The panel finds that the recommendations have been acted upon by the programme; the panel is satisfied with the measures taken and sees that these have contributed to the improved quality of the programme.

The current panel makes several suggestions in this report to aid with the further development of the programme. These do not detract from the positive assessment of the generic quality of the programme. The panel makes one explicit recommendation, which the programme is expected to follow up on soon.

- **Improvement of use of thesis assessment form: written feedback**

The use of thesis assessment forms needs improvement. The panel expects the examiners to substantiate their grades and provide written feedback in a systematic way, so that students understand what they have done well and which areas need improvement. The oral feedback that is provided to students, for instance during the thesis defence, needs also to be provided in written form.

6. Assessment

6.1 Standard 1: Intended learning outcomes

The intended learning outcomes tie in with the level and orientation of the programme; they are geared to the expectations of the professional field, the discipline, and international requirements.

Findings and considerations

The English-taught, part-time Master of Science Geographical Information Sciences, also known as UNIGIS Amsterdam, is offered by the Spatial Information Laboratory (SPINlab), the research and education centre for Geographical Information Sciences (GIS), based within the School of Business and Economics (SBE) of Vrije Universiteit Amsterdam (VU).

UNIGIS is a post-initial academic master's programme that focuses on offering GIS professionals a profound understanding of state-of-the-art GIS concepts, methods and technologies and ability to apply these in a structured and reflective manner to complex societal issues. Geographical Information Sciences is a relatively young scientific domain. It has effectively integrated aspects from existing disciplines, including geography, geodesy, cartography, photogrammetry, remote sensing and computer science. This integration has resulted in a new domain that focuses on the collection, storage, analysis, communication, distribution and use of geospatial information with the aim of supporting scientific, commercial or civic processes. UNIGIS wants to make students aware of the separate building blocks that, when working well together, make for a successful GIS application. At the same time, the programme emphasizes the integrative capability of GIS that allows it to integrate and synthesize information from many sources and to support communication and collaboration between institutions, disciplines and cultures by providing geospatial concepts and maps as the common language.

The programme is aimed at educating students for the most relevant positions in the field of GIS, from data analysts to spatial planning facilitators and GIS managers. It is designed to help active GIS professionals to gain a deeper, more academic understanding of their profession and to acquire new skills in this highly innovative and changing field. Furthermore, it is meant to help people with different areas of expertise transition to their desired job of GIS professional or integrate the possibilities GIS offers into their existing field of work. The panel finds that UNIGIS is a well-established programme that is based on 30 years' experience in delivering higher education Geoinformatics programmes to working professionals. It is a relevant programme that serves a very specific niche well.

Intended learning outcomes

The ambitions of the programme have been translated into a set of Intended Learning Outcomes (ILOs) (see Appendix A). The ILOs are made specific to the five main SBE master learning goals and subsequent six learning objectives for UNIGIS. The goals and objectives reflect the (fairly abstract) AACSB format for business schools. The programme informed the panel that both the SBE and AACSB formats are not restricting with regards to developing or implementing new developments in the programme, as these are mainly introduced at course level.

The panel has established that the alignment of the abstract goals that are formulated at 'school level' to specific learning outcomes for UNIGIS are detailed in the programme's assessment plan. The panel deems the ILOs to be in line with the aims of the programme, including its level and orientation, which is reflected in the structuring of the ILOs according to the Dublin descriptors. The panel does find that, in the future, the programme might have to revisit the current ILOs due to the emergence of AI and its particular influence on the GIS domain, since developments such as Geo AI and machine learning are upcoming and (already) have a great influence on the GIS domain. The panel therefore suggests that it in due time, it would be beneficial to the programme to rethink the ILOs in this particular context of AI.

Embedding in SBE

The panel discussed UNIGIS' embedding in a business school and the consequences thereof with the programme management. The positioning of UNIGIS in SBE has historical origins. At its conception it was linked to Earth Sciences, and after a reorganisation the programme was moved to Spatial Economics at SBE. The programme informed the panel that they are content to be part of SBE, since it is a faculty that invests in lifelong learning, has several post-graduate programmes that UNIGIS can connect with, and a firm ambition to develop more interdisciplinary programmes. This creates synergies between the post-graduate programmes that UNIGIS benefits from. Nevertheless, content-wise the panel questions whether the GIS programme fully benefits from its setting, for instance by offering electives on geo-marketing or otherwise. The panel learned through discussions that most students are not attracted to business or economic elements, but rather are interested in bringing positive change to the world, e.g. with regards to climate, energy, mobility and housing. When it comes to developing a coherent programme, the panel understands that UNIGIS has to make sure that it takes the students' positions and ambitions into account. Nevertheless, the panel suggests that the programme could make better use of the options and possibilities that its position in SBE offers, as this is a unique homebase for a UNIGIS programme.

The programme is looking to strengthen ties with the Faculty of Sciences, which the panel finds a logical step. The panel was pleased to hear that the current vacancy for programme coordinator will ideally be filled by someone who is based at the Faculty of Science as this would strengthen ties between both faculties organically.

Professional field

UNIGIS' students are working in the GIS field and naturally bring their professional experience to the programme. This enables the programme to keep up-to-date with current developments. In addition, the panel is positive that the programme has installed an Advisory Board with members from science, business and governmental institutions to evaluate whether the programme is in line with what is needed in the professional field. Some members are alumni of UNIGIS. Meetings of the Board were revitalized last year, and so far, there have been three meetings. The panel had an opportunity to speak with members of the Board who informed the panel that they view the Board as a linking pin between the programme and their own networks. The programme's hope for its collaboration with the Board is for it to help in connecting to industry (strategic alliances), but also to get feedback on content of the curriculum and reflections on what kind of knowledge and skills are necessary in the field. After discussion with the Advisory Board, the panel is left with the impression that the expectations of the Board and the programme management are not yet fully aligned, or alternatively that the task of the Advisory Board is not yet clear enough for the members as they

mostly reflected on what the programme currently contributes to their networks, rather than what their expertise and networks contribute to the programme. Most importantly, the Advisory Board should be concerned with the development of UNIGIS, for instance in terms of the impact of AI on the programme, renewal of the curriculum, etc. The panel therefore suggests that the role of the Advisory Board is strengthened and that mutual expectations are better aligned.

Conclusion

Meets the standard.

The ambitions of the MSc Geographical Information Sciences are fitting for an academic master's programme in this field. The aims of the programme have been translated into a coherent set of intended learning outcomes (ILOs) that are properly aligned with the requirements of the academic and professional field. The panel is satisfied that the programme has an Advisory Board as a means to keep the ILOs connected to the requirements of the professional field, but suggests that its role is strengthened and that mutual expectations are better aligned.

6.2 Standard 2: Teaching-learning environment

The curriculum, the teaching-learning environment and the quality of the teaching staff enable the incoming students to achieve the intended learning outcomes.

Findings and considerations

UNIGIS (60 EC) is a part-time programme that takes three years to complete. The student population is diverse; they mostly have work experience. Demographics approximate to about 50% internationals (vs 50% Dutch), and about 30% female students, with age ranging from 23 to 50 years old. Students are either already active in the field of GIS or want to transition into this field, and have backgrounds in technical fields, journalism, water management, or military. The programme is fairly small; there are 18 graduates in the period 2019-2023. The drop-out numbers are relatively high, which the programme and students attribute to the strain students may experience in balancing work-life-studies, but also to the level of support students receive from their employers. The programme management seeks to increase student numbers quite organically and aims to attract (and keep) 30 new students per year. Lately, the student numbers have been on the rise (31 in 2023).

Applications to the programme are evaluated by programme management on three parameters: level of academic skills, level of academic English and level of GIS skills. All students are assessed by these standards. The International Office of VU assesses international diplomas and advises on the admissibility of these students. The programme communicates a preference for an MA or MSc degree from an accredited research university as entry requirement, although an academic BA or BSc from a research university can be sufficient. The panel noted that a limited number of students already possess a master's degree before entering the programme, although the numbers (lately) seem to increase somewhat. In addition, some admitted students are confronted with a steep learning curve, for instance those who have had no or limited experience with academic research in their initial degree programme, which is not uncommon for students with a non-European initial degree. The panel was satisfied, however, that UNIGIS offers applicants two premaster's courses to address deficiencies: a course Academic Knowledge and Skills, and Introduction to GIS. If a candidate fails the premaster, it cannot be retaken.

Curriculum

The panel has reviewed the curriculum and finds that it enables students to achieve the ILOs. The three years of the MSc programme represent three major stages or levels in developing academic thinking and understanding of the field. Year 1 offers a foundation in the core building blocks of GIS, discussing the principles, methods, and considerations in (spatial) data collection, storage, processing/modelling and analysis and communication. Course assignments will often involve a same case or dataset for all students since the focus is on gaining a deeper understanding and skills in application. Year 2 shows how the core building blocks of Year 1 come together in complex systems and designs, with a focus on cases and data from the students' own work, bringing in complexities and challenges of real (professional) life. Elements of Year 1 are brought to a next level and are supported by more advanced methods and techniques. Year 3 is devoted to the MSc thesis following the format and requirements of an (international) academic paper. The panel finds that UNIGIS has a solid and coherent curriculum; it addresses relevant topics in quite a niche field. Students are constantly encouraged to make connections with their own work and experiences; this blend with the work field is very good.

The panel discussed how and when students are working on their academic and research skills in the programme. Initially the panel had some doubts about the placement of academic and research skills in the curriculum (fairly late) and the choices for which skills are addressed. The panel found that students are introduced to the skills needed to leverage GIS technology for a next step. The programme ensures that - in all courses - students are required to adopt an academic approach; academic and research skills are integrated in the courses. A 'line' runs through the programme in, for instance, use and discussion of academic literature, or foundational knowledge in Year 1 courses to Python programming and (advanced) remote sensing in Year 2. The Capstone course at the end of Year 2 is then fully devoted to what it takes to make an academic contribution, training students in delineating a proper topic of research, developing a right research question to an existing debate, grounding this in existing literature, and making a well-informed choice for specific methodology, with discussion of the data issues involved. The panel finds that the Capstone course works really well as a preparation for the thesis. With regards to academic and research skills, the panel suggests that the programme explores whether all current offerings are still necessary (i.e. Java Script) and whether programming and AI (as a geo-informatics tool) could have a place in the first-year offerings in the curriculum, to ensure that student are exposed to these sooner rather than later.

It is important for every programme to keep the curriculum up-to-date. A general observation that the panel wants to share, is that it has the impression that currently, the programme mostly relies on personal-driven innovation (bottom-up). The panel advocates a more systematic approach to innovation. Going forward, it will be important to foster an innovative attitude and to perhaps formalise processes that support innovation and the upkeep of the curriculum.

Thesis

The programme director of UNIGIS is also the thesis coordinator who manages the thesis process. If possible, students are encouraged to choose a topic that can be of added value to both the academic debate and their daily work practice. The thesis coordinator then matches a student with a supervisor that has experience in the domain and methodology a student desires to explore. The aim is always to ensure that students can research a topic close to their field of interest and to find a supervisor who can optimally support them during the thesis process. The thesis process is highly

structured and subject to a strict timeline. Specifically, two weeks after the start of the thesis period students are expected to submit a research proposal. Two weeks before the deadline, they are advised to submit a final draft. In between, it is up to the student and supervisor to coordinate how to exactly shape the supervision process (within the requirements). The panel discussed whether the strict timeline would benefit the process and most importantly, the students. But experiences with this structured process are thus far positive as most students manage to submit their final thesis before the deadline. During the site visit, it became apparent that the strict timelines were indeed appreciated by all stakeholders.

Educational concept

The programme is aimed at facilitating professionals working in different time zones around the world. It has a 'blended intense' format of (predominantly asynchronous) online teaching and a one-week, on-campus workshop to conclude each year, in which all students work together in group projects. For instance, in workshop Year 1 the students work on a flood modelling exercise, in teams with different national and professional backgrounds. The week is concluded by an event at which Year 3 thesis students present their work. Additionally, there are talks and presentations from invited speakers. All alumni and partners from the professional field are invited to participate and share their own experiences in these lectures. This event is hybrid, to allow participation by international alumni from abroad.

The educational concept of UNIGIS is based on pillars of self-directed learning through well-structured online materials, structured interactions in small groups, close and direct personal contact with lecturers and the programme coordinator, and a study schedule with considerable flexibility to accommodate the students' professional, personal and study commitments. The Canvas environment where learning materials are offered is geared to support student collaboration. In principle, each course has the same structure of six modules, spread out over ten weeks, with five mandatory assignments. The first week is an introduction week, with a live online session to introduce topics and discuss learning goals. At the end of week three, five, seven and nine, a deadline for an assignment is set. Two of these assignments are formative (no grade, just feedback), and help prepare for the two summative (i.e., graded) assignments, that both count for 50% of the final grade. This ensures a full learning loop. In the two weeks that lead to each assignment, the lecturer organizes online office hours where students can ask questions. A fifth reflection assignment is made in the final week and a live online lecture is given on the outlook of the programme. The panel noted that the entire programme has been streamlined quite a bit in the last few years, which is quite a significant change. Between online contact moments, students are encouraged to use the discussion board on Canvas to ask questions, share interesting findings and keep in touch for collaboration purposes. Furthermore, every week the lecturer posts an announcement on Canvas to give a recommendation on how to best study for that week. This structure with strict deadlines, an open discussion board and announcements by the lecturer are set up to help the students with staying on track and to prevent study delays. Assignment submissions are checked by the programme coordinator and students are contacted personally if they miss a deadline. This also serves as a first step in our tutoring system for students running into personal or professional challenges that interfere with their study progress. Students appreciate the small scale of the programme and personal approach with regards to student guidance they experience. Students and lecturers appreciate the streamlining of the study process and the panel anticipates that it might contribute to a reduction of drop-out numbers. Furthermore, the panel is impressed

with the synchronized and asynchronized feedback mechanisms that have been put in place and that students are content with. The next steps, according to the panel, are 1) to agree on AI as a tool to learn with and to deal with, and 2) how to implement AI in the curriculum as a geo-informatics tool to make it future-proof.

Language of instruction

The choice for English as the language of instruction allows the programme to offer a specialized master's for a select group of professionals, large enough to be viable. It also matches the dominant use of English in the professional and academic field of GIS, in publications, instruction materials, and concepts. An English-taught programme can more easily connect to sources and latest developments, and better prepare graduates for self-study and continued learning after graduation. Finally, the use of English by an international and diverse student body further improves the learning process as students encounter people from diverse backgrounds and learn to operate in an international context. The command of English of the staff is well appreciated in evaluations and matches the required C1 proficiency in language of instruction, stipulated in the VU quality handbook. The panel finds that the choice for English as the language of instruction is fully justified considering the objectives of the programme and the international scope of GIS as an academic discipline.

Staff

The panel has noted that the lecturers are highly qualified to teach in UNIGIS. The programme is mostly taught by staff members from SBE SPINlab. All staff members are specialists in their discipline and are qualified to supervise and evaluate students in their specific courses on the programme. The teaching staff is a small and tight-knit community of GIS experts that are both academics and active professionals in the field of GIS. All have (at least) their University Teaching Qualification (UTQ). UNIGIS also invites selected experts from other academic or professional organizations to share their expertise in the programme. There are strategic collaborations with Netherlands eScience Center and Geo-ICT.

Each course in the programme is coordinated by a course coordinator who has overall responsibility for the content, assessment and administration of a course. Course coordinators may teach courses completely on their own or decide to co-teach with other teachers or guest lecturers/speakers, while still maintaining overall responsibility for the course. The programme director designates the course coordinators (predominantly SBE educators and occasionally specialists from outside SBE) and approves the teachers and/or guest speakers/lecturers who may co-teach a course with a course coordinator.

Conclusion

Meets the standard.

The curriculum of UNIGIS reflects the ILOs of the programme. The programme uses several activating and inspiring (online and onsite) teaching methods. The online format helps students all over the world to partake in the programme and the diversity in the classroom creates an environment where students learn from each other as well. Students are provided with good support and guidance.

The teaching staff is well-qualified, both in terms of academic expertise and teaching qualifications. The panel finds the programme is open to feedback and is willing to take measures to improve itself.

6.3 Standard 3: Student assessment

The programme has an adequate system of student assessment in place.

Findings and considerations

The panel finds that the programme complies with the assessment policy and procedures of SBE, which align with the university's overarching assessment policy. SBE's assessment policy describes the roles and responsibilities of all stakeholders of the assessment process based on the quality assurance cycle of the faculty. UNIGIS, in turn, has drawn up an assessment plan, describing its assessment, the forms of testing and the way the programme ensures that students attain the learning objectives. Each course creates an assessment file that contains a test blueprint, the exam, the resit exam and/or assignment(s), a model answer plus scoring guide or assessment criteria and forms, the results and a test and item analysis including a scoring overview, the results of the course evaluation and a short reflection report by the examiner.

Course assessments

Course coordinators are, in principle, free to tailor the different elements for examination to the requirements of their course in close coordination with the programme director. Every course coordinator appoints a co-reader with content knowledge to cross-check the contents of the assignments. All assignments in the online phase of the programme are individual assignments. Students are made aware of the rules for assessment via the course manual of every course. Examples of old exams, or sample questions, are available to students on the Canvas page of each course. Students have the right to inspect their graded exam and / or assignment and compare the grading to a model answer.

The panel understands that UNIGIS, in part due to its online format, relies quite heavily on written assessments, which is particularly prone to the use of AI. UNIGIS has held roundtable meetings with students and staff to discuss their views on using AI, from a both legal, ethical and practical perspective. Based on those discussions, an initial document was drafted in which is written what the programme explicitly allows or finds unethical in the use of AI. For instance, while a GeoDatabases module might encourage the use for generating and testing SQL code, it is held as unethical to use ChatGPT in improving the formulation of an essay. Also, the Examination Board has recently included regulations on the use of AI in its Rules and Regulations, stating that plagiarism can also entail "presenting work produced with the aid of artificial intelligence (AI) as one's own". Considering the rapid developments in AI, the panel finds that the programme could benefit from diversifying assessments. For instance, by adding an oral component to the written exercises in course assessments. The online format does not prohibit oral examination.

Thesis assessment

The thesis coordinator matches a student with a supervisor that has experience in the domain and methodology a student desires to explore for their thesis. The aim is always to ensure that students can research a topic close to their field of interest and to find a supervisor who can optimally support them in the thesis process. Second assessors are also assigned by the thesis coordinator.

The supervisor and second reader initially only review the final draft of the thesis to check whether the level is sufficient for a master thesis, this is not a guarantee of passing. After a closed defence, the supervisor or second reader can give students a provisional grade. This means that the supervisor and second reader can ask students to change things and make improvements to obtain a specific grade. This could be to bring it up to a standard to pass, but also because with some simple alterations the grade could be higher. The thesis is then defended both in a public thesis presentation and in a closed thesis defence session.

The public thesis presentation is graded. Students are given 20 minutes to present their research, followed by 10 minutes for questions. The session is recorded. Students may invite family/friends, colleagues, both physically and online. All thesis students have to be present at this date. The closed defence is scheduled individually. For this defence, three parties are in attendance: 1) the supervisor, 2) the second reader and 3) someone from the UNIGIS programme management. These sessions are also recorded. After the closed defence, deliberation takes place in which the supervisor and second reader determine a final grade, moderated by someone from the programme management. Afterwards, the grade is announced, with possible reparations that might have to be made. The next step is for the supervisor and second reader to sign the thesis assessment form.

The panel concludes that the programme has designed a conscientious thesis (assessment) process. The thesis assessment form contains a very clear rubric and provides ample opportunity for examiners to substantiate their grades and give written feedback to students. However, the panel has noted that a substantial number of the examiners do not use the opportunity to provide justification for their assessment. In addition, the oral feedback provided to students after the defences is not written down anywhere, making the grading untraceable. These findings lead to the panel's main recommendation, which is to ensure that the use of thesis assessment forms is improved. The panel expects the examiners to substantiate their grades and to provide written feedback in a systematic way, so that students understand what they have done well and which areas need improvement. The oral feedback that is provided to students, for instance during the thesis defences, needs to also be provided in written form.

Examination Board Executive Education

The Examination Board Executive Education (EEE) supervises the examination process and carries final responsibility for safeguarding the quality control of assessments and examinations. All accredited non-government-funded programmes are supervised by this one Examination Board, with the aim to further increase uniformity, clarity and authority. EEE systematically investigates whether the process of assessment is carried out according to predefined criteria, which include the reliability and validity. If assessments are not up to standard, the EEE reports to the programme director and the examiner and requires improvement measures. The panel concludes that the EEE carries out its responsibilities and has a good view of issues at hand in the UNIGIS programme specifically. In particular, the panel noted that the EEE recognised the panel's findings concerning the thesis assessments (need for more documentation). The EEE sees itself as a critical friend for the programmes that it is responsible for. Although the panel finds that this approach tends to be constructive, it does find that the EEE could be more directive, for instance with regards to the the follow-up of its rules or findings (re: quality of course/thesis assessments).

Conclusion
Meets the standard.

UNIGIS has an adequate system of assessment in place. The course assessments consist largely of written assessments. The panel finds that the programme could benefit from more diversity in assessment methods, for instance by adding more oral components. With regards to thesis assessments, the panel finds that the assessment process is adequate, but that the use of thesis assessment forms needs to be improved. The panel expects the examiners to substantiate their grades and to provide written feedback in a systematic way, so that students understand what they have done well and which areas need improvement. The oral feedback that is provided to students, for instance during the thesis defences, needs to be provided in written form.

6.4 Standard 4: Achieved learning outcomes

The programme demonstrates that the intended learning outcomes are achieved.

Findings and considerations
To assess whether GIS fulfils its ambitions, the panel studied a selection of 15 theses written. The panel found that the theses meet the final objectives of the programme and achieve the intended learning outcomes of the programme. The panel is pleased with the high quality of the work it reviewed; the quality is overall in line with the expectations from the field. The theses cover a large variety of topics relevant in domain of geo-information science; the panel remarks that the broadness of topics is a real asset and positive point. The structure of the theses is in line with science conventions. Overall, the panel is impressed by the work that was put into the theses by the students.

The panel made a few remarks for the programme's consideration. The panel mentioned that some of the thesis titles do not quite cover the contents. Also, some of the research designs were a bit unsatisfactory or poorly explained. The panel mentioned that conclusions and discussions are in general a bit lacklustre and the panel expected more recommendations for follow-up. And lastly, the panel suggested that supporting materials can be added more in appendices. All in all, however, the panel has no doubt about the general academic quality and level of the theses it reviewed.

A general observation from the panel is that the manuscript-based format of theses can be quite demanding for students that are not top-performing or who have no interest in continuing an academic career. Some of the theses that the panel reviewed are quite far away from being publishable in a journal. The panel states that it would be an expectation of a PhD level to 1) address a research gap and 2) to write in a style and structure that has the quality for publication. Considering the student profile (professionals) and overall objectives of the programme, the panel questions whether the aim of producing high level publishable papers as theses is fitting and whether the possibility for "traditional" theses would be an option as well.

Alumni
Students who want to change their career either achieve a promotion or find a new job in the field of GIS after completing the programme. For example, students may move from a domain specific department of their organization to the GIS department, or students find a job from their original

training as GIS expert in the construction field. Alumni that the panel spoke with confirmed that most students use their UNIGIS degree to further their professional careers rather than pursue an academic career.

UNIGIS offers (online) activities with lecturers, researchers, students and alumni which promote networking, such as seminars for alumni. The last few years, a range of efforts has been made to involve alumni and the professional world in the programme. There was always a large informal involvement, as faculty have professional obligations or have been sourced from the professional world. Also, students provide direct links to the companies and bodies of government they work for. However, with the fast-changing field of GIS, the need for more formalized policy regarding involving alumni and the professional field is apparent. The first step was to (re)install the Advisory Board (see Standard 1). In addition, the programme wants to create a more formal alumni network, which the panel wholeheartedly supports as it finds that the programme could benefit from a stronger alumni network and involvement of graduates to aid its further development.

Conclusion

Meets the standard.

The theses and the success of alumni on the job market show that students of the programme realize the intended learning outcomes.

7. Appendices

7.1 Documents studied

The panel studied a wide selection of documents relating to the programme's profile and intended learning outcomes, its teaching-learning environment, assessment and end level. These included:

- Self-assessment report (including a student chapter)
- Theses of fifteen graduates (student numbers available on request)
- Intended Learning Outcomes
- Programme 2023 – 2024
- Study guide 2023 – 2024
- Assessment plan 2023 – 2024
- Thesis Manual and thesis assessment form 2023 – 2024
- Teaching and Examination regulations 2023 – 2024
- Rules and Guidelines regarding examinations SBE EE 2023 - 2024
- Overview of academic staff including quality
- List of all graduates in 2021, 2022 & 2023
- Intake, drop out and success rates
- AACSB Memorandum
- Decision trees pre-master
- Use of Generative AI in the UNIGIS master

7.2 Site visit programme

May 24, 2024 (online)

09.00 – 09.45	Welcome to the panel and meeting with faculty board and programme management
09.45 – 10.05	Break and internal meeting panel
10.05 – 10.45	Meeting with students and recent alumni
10.45 – 11.05	Break and internal meeting panel
11.05 – 11.45	Meeting with faculty
11.45 – 13.15	Lunch and internal meeting panel
13.15 – 13.45	Examination board Executive Education
13.45 – 14.00	Break and internal meeting panel
14.00 – 14.30	Meeting with alumni and members of the work field advisory committee
14.30 – 15.30	Internal meeting panel
15.30 – 16.00	Optional meeting with faculty board and programme management
16.00 – 16.45	Internal meeting panel
16.45 – 17.15	Feedback session