Report regarding periodical evaluation of master's degree programme as foundation for re-accreditation

<Industrial Asset Management /Industriell teknologi og driftsledelse >

<120 ECTS credits>

<TekNat>

<10.06.2022>

Attached

Dean's assessment, advice and action plan.

Introduction

National authorities requires the University of Stavanger to control study programmes in accordance with the provisions of the Universities and University colleges Act, regulations on quality assurance in higher education and vocational education (the study quality regulations) and regulations on supervision of the quality of higher education (study supervision regulations)

The study supervision regulations section 4.1.3 states "the institution must have systemic arrangements to control that all study programmes satisifies the regulations for quality assurance and quality development in higher education and vocational education sections 3.1-3.4 and section 2 in the study supervision regulations." A notice to the section says "this includes that the institution must have satisfactory routines and practices for accreditation of study programmes and revisions of the accreditation. With revision of accreditation it is meant a review of whether the study programme still satisfies the current requirements for accreditation, and whether it has satisfactory results."

In the study quality regulations, there is a new requirement regarding periodical evaluations. Section 2.1.2 states: "the institutions must complete periodical evaluations of their study programmes. Representatives from industry and/or society, students and external experts who are relevant for the study programme, must contribute in these evaluations"

At the University of Stavanger, a revision of the accreditation of the programmes in accordance with the study supervision regulations section 4.3.3 is based on a periodical evaluation of the study programme in accordance with the study quality regulations section 2.1.2. The dean appoints an expert evaluation committee. The committee prepares a report where they give an account for how the study programme meets the accreditation criteria in the regulations, and any additional requirements set by the university. The report must also pinpoint areas where further development is desirable. Reference is made to the guidelines for periodic evaluation and re-accreditation at the University of Stavanger decided by the Education Committee xxxx.

This template is developed by the director of academic affairs as a help for the committee and the faculties work. Contents of the document:
1. Composition and mandate of the evaluation committee
2. Overview of documentation to be made available for the committee to do its work
3. General overview of the study programme
4. The assessments from the committee regarding the accreditation criteria
5. The overall assessment from the committee
6. The dean's assessment, advice and action plan

The report, together with the dean's advice is sent to the director of academic affairs for further handling.

Composition and mandate of the evaluation committee

The committees' composition:
- 2 academic staff from the programmes' academic environment
- 2 external academic staff from equivalent or similar subject area
- 1 external representative from industry
- 2 students
- 1 representative from the administrative staff

Mandate of the Committee

- Assess whether the requirements in the study supervision regulations are satisfactory met, and if any, where they do not meet the criteria
- Assess whether the study programme has satisfactory implementation and completion capacity and documented results.
- Give assessments and recommendations that can be helpful for the further development of the study programme.

Committee members:

- 2 Academic staff members
    - Jayantha Prasanna Liyanage, Professor, UiS (*Leader of the committee*)
    - Jawad Raza, Assoc prof. II, UiS (and Morled Apply AS)
- 2 External academic staff members from other relevent disciplines
    - Ville Ojanen, Professor, Industrial engineering and Technology management, Lappeenranta-Lahti University of Technology, Finland
    - Jan Frick, Professor, Business school, UiS
- 1 External industrial representative
    - Charlotte Bårdsen Torvestad, Aker BP
- 2 Students
    - Magnus Erstad, Leader LIAM, Student association of the Study program
    - Amin Elmenshawy, represent International students of the Study program
- 1 Internal administrative representative
    - Guzman Cruz Rodriguez, IMBM, UiS

2 Overview of documentation to be made available for the committee to do its work

Programme description
- Matrix showing how the study programme is structured
- Course descriptions for all courses, with reading lists
- Template for diploma and diploma supplement
- Title of all bachelor-/master theses submitted by students who have graduated in the past three years.
- Timetables for all three cohorts for the academic year 19/20
- Overview of the scope of the academic year of 1500-1800 hours, divided between self-study, organised learning activities, exams and exam preparations.
- All publications registered in Cristin from the academic environment from 2015-2019
- Any other publications relevant for the study programme from the academic environment 2015-2019
- Overview of the academic environment 31.12.2019 (table)
- CV of everyone included in the academic environment.
- Student exchange agreements quality checked by the academic environment

- Agreements for supervised professional training
- Overview of existing arragements for collaborations with places for supervised professional training.
- Following student- and results data NB we are waiting for på UiS Innsikt:

Data	Source
Number of admission places	**Decision of the board**
Applications and admissions	**Tableau - STAR**
Admission quality	**Tableau - STAR**
Number of starting students	**Tableau - STAR**
Number of students	**Tableau - STAR**
Througput of students	**Tableau - STAR**
Drop-out rate 2015-2018	**Tableau - STAR**
Qualifications and student exchange 2016-2019	**Tableau - STAR**
Students leaving for exchange	**Tableau - STAR**
Passed ECTS credits	**Tableau - STAR**
Internal mobility	**Tableau - STAR**
Evaluation data	**Studiebarometeret, internal data**
Exam data, time frame 2016-2019 Grading scale Fail-rate Passed/registered	**DBH**

3 General overview of the study programme

Name, qualification and start date
Norwegian name of programme: Industriell teknologi og driftsledelse
English name of programme: Industrial asset management
Qualification (degree and title) the programme leads to   Master i teknologi/sivilingeniør

Type of study (check box)	
X	Campus based study programme
	Session based study programme
	Distributed provision of education at other institution (name institution)
	Online based study programme
	Online based programme with physical sessions
	Joint degree

Study programme is offered as (check box)	
X	Full time study
	Part time study

4 The committees' assessments regarding the accreditation criteria

The study programme must be assessed according to current accreditation criteria given in NOKUT's regulations for study supervisions and the department's regulations regarding study quality[1].

Requirements for the study programme

4.1   Information about the study programme must be correct, show the contents, structure and progression of the programme, and the possibilities for student exchange. STF §2-1(2)

By information it is meant what appears from the study plan and associated information about the study programme.

Committees assessments:

General information about the study program is very well written to give students a broad insight on what to expect. The content, structure, and progression are all well-structured and balanced. Overall plan of the program in different semesters, as well as the contents of basic, core, and elective courses (+thesis) are clearly presented. More detailed information about specific course contents is available online. Possibilities for student exchanges are well described, with many good exchange opportunities with Australia, Finland, Germany, Italy, The Netherlands, Sweden, and United States. The study program indicates its broader career prospects. Over the years it has been experienced as a very relevant modern engineering study path with increasing employment opportunities.

Apparently, there is a good correspondence between information about the study program, the steady number of applicants during last few years (ex. 532, 496, 546, and 522 respectively in 2018-2021 period for 25 study places, with 7,52; 7,4; 9,84; and 10,16 applicants per study place available with 1st priority), and the responses from graduating students (ex. Study program has been among the top-3 in the National study barometer since 2015, with the top 1st place in 2019 and 2020 in the category of Mechanical and electrical-electronic engineering).

Committees recommendations:

The study program fulfils item 4.1.

Following recommendations are made for further considerations;

- Avoid mis-match of information in official documents and web-page. For instance, in the document 'Exchange institutions.doc', the list is slightly different from webpage information (For example, German universities Aachen and Berlin are not mentioned). Also, update information available with latest changes in Exchange universities. For example, the current official name of LUT is Lappeenranta-Lahti University of Technology. Tampere University of Technology has also become Tampere University (TUNI).

- Consider the possibility of emphasising what kind of industrial careers that students can be qualified for.

---

[1] In this section, regulatory texts are marked in bold and comments in ordinary font (mostly taken from the notes to the regulations and NOKUT's guidance). The assessments and any recommendations are entered in text boxes.

- Consider the possibility of adding some Alumni stories from graduated students about their careers and career options.

4.2   The learning outcomes for the study programme must be described in accordance with the National Qualifications Framework for Lifelong Learning, and the study offer must have an adequate name. STF §2-2(1)

Learning outcomes must be described as what a candidate must have achieved upon completion of education. The learning outcomes for study programmes with professional requirements, for example programmes with national curriculum regulations must comply with both the professional requirements as well as the national qualifications framework for lifelong learning (NKR).

Committees assessments:

The study program has a suitable and representative name that has a growing recognition both in national and international academic environments as well as professional organizations. However, the name in Norwegian does not precisely indicate that the program is related to 'assets' and asset management.

The learning outcomes of the Study program are relevant and well-described through the categories of knowledge, skills, and general competencies. Current learning outcomes not only serve the purpose of students' understanding but also have been described with their abilities of analysis, use, and application of the achieved knowledge and skills in mind. There is also an overall match between the learning objectives and the program content (course portfolio). However, the learning outcomes in both English and Norwegian languages need to be consistent. It seems that the description of Learning outcomes at individual course level follow different practices. In general, it is ideal to ensure some consistency of learning outcomes descriptions across all courses in a Study program.

From a qualification perspective, career prospects are well written that gives a good impression of how professionally broad and relevant this master programme actually is.

Committees recommendations:

The study program fulfils item 4.2.

Following recommendations are made for further considerations;

- Consider the possibility of making the name of the study program in Norwegian language more representative w.r.t. assets, and asset management. A suggestion is; 'Industrielle anlegg og driftsledelse' / 'Industriell assets og driftsledelse'. Alternatively, the English name 'Industrial asset management' can be used as it is also in Norwegian information pages.

- Ensure consistency of learning outcomes both in English and Norwegian languages at Study program level.

- Ensure a consistent practice to describe Learning outcomes across all courses.

4.3 The study programme must be academically updated and clearly be relevant for further studies and/or working life. STF §2-2 (2)

The requirement to keep the study programme current and up-to-date means that it is up to date within the development of knowledge in both academia and professional-, working life and/or society in general. Relevance and current knowledge within professional-, working- and/or social life are ensured through schemes for interaction with working- and/or social life adapted to the contents and level of the study programme. It is assumed that the institution has assessed the foundation for recruitment based on the expected demand/needs and combined capacity associated the same or similar study programmes at their own or other institutions.

Committees assessments:

The program is inter-disciplinary, has a well-established university-industry interaction, and covers carefully selected different engineering aspects which gives the students many opportunities in industry. The courses are time-relevant, content is up-to-date, and they cover needs and day to day challenges of both the society and industry. Working methods, course activities, and expectations by academic staff, correlates directly to the work life of an engineer and gradually prepares the students for the real working life in private and public sector organizations.

The career prospects described give a good impression about the relevance of this master program for further studies as well as challenging jobs. Over many years, there has been a consistent interest among many companies to involve students in Master thesis work, and the continuous interaction with industry has made it relatively easier for students to get job opportunities both before and after graduation. The industrial network of the Academic environment, for instance CIAM industry network, has been used actively for both Master thesis projects and applied-research oriented PhD projects.

The consistent higher number of applicants to the study program as mentioned in 4.1 above, the number of internal yearly applications made by students to change-over to this Study program from other programs (approx. 21 change-over applications in 2017-2021 period), the consistent major share of number of master thesis projects proposed and done with industrial companies, etc. also indicate to a large extent that the program has been up-to-date in academic-pragmatic basis and that it has remained attractive for further studies/work-life.

With refence to scores in the national Study-barometer, the program has remained among the top-3 since 2015. It has become the national best in 2019 and 2020 under the category of mechanical and electrical/electronic engineering. The scores in 2021 were also above the national average. This indicates that continuously updating contents of core courses meet the students' expectations and their employability potential quite well. More practical orientation both at individual course level and overall study program level can further strengthen the full potential of the study.

Committees recommendations:

The study program fulfils item 4.3.

Following recommendations are made for further considerations;

- Explore new possibilities for a practice-oriented course or internships for students. Explore possibilities for Study tours.

4.4 The study programmes' total scope of work must be 1500-1800 hours per year for full time students. STF §2-2 (3)

Scope of work is a calculation of how much time the average student would spend completing academic activities required to acquire the learning outcomes. A calculation of this must include self-study, exam preparations and organised learning activities. Which learning activities each programme consists of will vary, but examples can be lectures, seminars, lab-work, guidance/supervision, and supervised professional training. How much self-study is planned for a programme will vary with the nature and profile of the study programme. A balance between self-study and organised learning activities must be assured, which will make it possible for the students to achieve the learning outcomes in standard time.

Committees assessments:

The total scope of work seemingly is in balance within a given semester in terms of organized-learning, self-studies, and exam preparations. The actual proportions may vary based on the type of a course during the 2-year study cycle. For instance, the 5 ECTS courses seemingly have learning activities that can consume much more time and efforts, especially if students work for top-grades

The form of work differs between individual subjects varying from being traditional to giving more opportunities for self-reflections. From an overall point of view, the study program has a good combination of lectures, individual/group work, project work, presentations, lab activities, etc.

The students are given important tools and supervision to perform organised learning activities, and at the same time it also gives a lot of room for self-studies and individual work responsibilities which can be considered as vital to be able to achieve good results in the programme.

Committees recommendations:

The study program fulfils item 4.4.

Following recommendations are made for further considerations;

- Retain the good balance of different learning activities in the Study program in suitable proportions.

- Consider suitable measures towards 5ECTS courses; either limit learning activities correspondingly, or increase them to 10ECTS levels. Any such changes need to be based on an overall analysis of the impact towards program structure and students learning.

4.5 The contents, structure and infrastructure of the study programme must be adapted to the learning outcomes for the study programme. STF §2-2 (4)

The learning outcomes from a programme is achieved through courses. A course is the smallest ECTS-credit giving unit. The contents and structure of the study programme must show how all the courses in the programme, together with the progression from each semester, leads to achieving the learning outcomes for the programme. The study programme must have adequate access to suitable premises, equipment, library services, administrative and technical services, sufficient and suitable IT-resources, web support, suitable learning platform etc. that support the student's learning and learning environment, as well as the academic staff's teaching and research and/or artistic development and academic development work.

Committees assessments:

There is a good match between learning outcomes at Study program level and pre-defined course contents. The overall program structure is clearly defined within a clear and a matching learning boundary indicating the progression from one semester to another. The Individual course descriptions provide course-specific learning objectives, but with varying practices.

The overall study program consists of 20 ECTS Basic Methods that consolidates and continues the mathematical and scientific foundation of bachelor studies. Core subjects constitute of 50 ECTS that provide core platform within Industrial Asset Management and at the same time expands subjects taken at bachelor level. The remaining 50 ECTS consists of 20 ECTS elective subjects and a final master's thesis of 30 ECTS.

The program has good access to a lab, ICT resources, library facility, own study room, and necessary administrative and mentoring resources. The condition monitoring lab is a great value for the students. There is a good use of available online learning platforms and web-based support. It is especially beneficial to have a dedicated study room for students that strengthens collaboration and interaction related to courses and laboratory work.

Many of the courses do not use traditional school-book approach, which is considered positive. This helps covering a whole range of aspects in many interesting and challenging courses. Such courses also consist of compendiums which contain more updated information on theory and practice than traditional literature. Many courses also encourage students to use more online sources and latest practical information available so that learning activities and exams become more time-relevant, unique, and up-to-date.

Committees recommendations:

The study program fulfils item 4.5.

Following recommendations are made for further considerations;

- Consider how to incorporate new industrial directions at individual course levels to improve practical relevance (ex. Green transition, Sustainability, Digital industry, etc.)

- Ensure a consistent practice to describe Learning outcomes across all courses.

- Retain a good balance of both physical and digital activities at individual Course levels.

4.6 **Forms of teaching, -learning, and -assessments must be adapted the learning outcomes for the study programme. Arrangements for students to actively take part in the learning process must be made.**
STF §2-2 (5)

The different forms of teaching and learning must be adapted to the study programmes' contents and structure. It is assumed that the forms of teaching and learning are adapted to a digitalised society.
The forms of teaching and learning must be structured in such a way that the students achieves the learning outcomes described for the programme. The forms of assessment must be suitable for measuring whether the student has achieved the learning outcomes or not.
How the academic environment makes the arrangements for students to take an active part, will depend on the profile of the study programme, and is also related to ensuring and maintaining a good learning environment.

Committees assessments:

The study programme has courses where the forms of teaching, learning, and forms of assessment differs in a suitable and a good manner w.r.t the overall scope, content, and structure. For instance, while some courses have a traditional setup, there are many other courses with lectures, project assignments, group work, obligatory self-learning exercises, presentations, and laboratory work. Also, some courses have written exams on campus while others have project work and home-exams. It can be said that a "blended" approach has been adopted in the Study program. Individual course descriptions provide further information about the teaching and learning activities as well as various evaluation criteria in use. The diversity of learning forms designed in the study program is a key factor to the student's appreciation and motivation.

Active interaction with students takes place both formally and informally facilitating them to take part throughout the study-cycle. This involves formal mechanisms such as early dialogues, final course evaluations, as well as other informal means such as individual/group-based meetings both at study program and course levels. There have been continuous and productive interactions over the years between the main academic staff members and students. The Student organization 'Linjeforening industrial asset management (LIAM)' also plays a key role in this.

The real impact of overall measures taken can clearly be seen in; general character distribution across all courses 2018-2021 (with proportional A-C grades 74,87%, 80,69%, 68,42%, 81,13% respectively), overall exam failure profiles of main courses 2018-2021 (1,21%, 6,99%, 5,83%, 0% respectively), as well as the consistently top-performing results in the Study-barometer since 2015.

However notably the course STA500 Probability and Statistics 2, seemingly shows a relatively higher grade-distribution pattern at D-F level (71,87%, 61,53%, 77,78%, and 65,22% from 2018-2021 respectively) with a reported grade-F distribution of 37,5%, 15,38%, 23,08%, and 43,48% in 2018-2021 respectively. Some specific measures may be needed to improve the situation in terms of teaching, learning, and assessment forms as well as suitable arrangements for students to participate more actively in the learning process. At the same time, such measures can also ensure more practical orientation of the course than making it very theoretical.

Committees recommendations:

The study program fulfils item 4.6.

Following recommendations are made for further considerations;

- Consider specific measures to improve the situation of STA500 in terms of teaching, learning, and assessment forms as well as suitable arrangements for students to participate more actively in the learning process. Consider more practical orientation of the course than making it very theoretical.

- Consider Study visits to enhance practical thinking and orientation.

- Consider how to use experience gained through pandemic period to further develop post-pandemic teaching, learning, and assessment methods.

4.7   The study programme must have a relevant connection to research and/or artistic development work and academic development work. STF §2-2(6)

The academic environment must be able to show an adequate relevant mutual connection between the R&D/artistic development-activity and the study programme, and how the students are introduced to R&D/artistic development during the programme.
The academic environment may secure this connection through use of their own research results, but also by using other research results in the education.

Committees assessments:

The academic environment consists of active researchers who also have strong links to relevant R&D in their own domains. During the period of 2017-2020, a total of about 175 publications have been made both in level-1 and level-2 with a total impact of 170,22 publication points. In 2021, this amounts to approx. 40 publications acquiring 28,3 points. The topical areas of research have a strong relevance and connection to both study program and at individual course levels, that in general cover for instance; asset decisions, risk, economics and cost, maintenance and reliability, condition monitoring and health assessments, human aspects, asset data and data-driven approach, safety and security, digitalization, sustainability, asset performance, asset investments, etc. Academic staff members have also published domain specific books (e.g. Value networks in Manufacturing: Sustainability and performance excellence (2017), Engineering assets and Public infrastructures in the Age of digitalization: Proceedings of the 13th World Congress on Engineering asset management (2020), Risk science: An introduction (2022), Knowledge in risk assessment and management (2018), Making good decisions (2018), etc. with renowned International publishers for example Springer, Routledge, John Wiley & Sons, SPE respectively.

Course descriptions indicate that academic staff utilize their own research as well as international research publications in lectures. Also, many subjects seem to have incorporated current and emerging research trends in learning activities to enhance students' awareness. Academic environment has broad academic and industrial networks that are beneficial towards continuous development of academic contents and activities. There is an active participation in R&D projects and international conferences for instance inclusive of; World Congress on Engineering asset management (WCEAM), European safety and reliability conference (ESREL), IEEE Industrial engineering and Engineering management conference (IEEE-IEEM), etc. The core academic staff organized The 13th World Congress on Engineering asset management in 2018, with active participation and involvement of national and international researchers as well as students.

Students are encouraged to write research articles based on their performance at master thesis levels. In addition, the students are also provided opportunities for development activities through company connections. Some graduated students have been able to continue towards their PhD degrees with a strong focus on applied research.

Committees recommendations:

The study program fulfils item 4.7.

Following recommendations are made for further considerations;

- Consider providing incentives for students to write creative research articles, for instance based on their Master theses projects.

- Continue the use of companies in CIAM as well as other external organizations and networks for new research opportunities and student involvement.

4.8 The programme must have arrangements for internationalisation customised for the level, scope and individuality of the programme. STF §2-2 (7)

The requirement entails that the programme is put in an international context, and that the students in this way is exposed to a diversity of perspectives. Students on different levels in the programme will experience the international dimension differently, it will also vary from subject area to subject area. In this case, the programme is the centre of the internationalisation, and the arrangements can expand across many activities, such as use of international literature, international guest lecturers, foreign exchange students coming to the university, or student's participation at international conferences or workshops, etc.

Committee assessment:

Internationalization of the Study program and the Academic environment occurs in various forms. The study programme is international by nature. It has good international relations, has a good mix of national and international academic staff, has both international and Norwegian students with diverse backgrounds and cultures, and has a socially interactive environment.

The academic staff is active internationally involving in various forms of bi-lateral activities such as staff-exchange, R&D projects, joint publications, PhD thesis examinations, international conferences, international societies, International journals, etc. In addition, international collaboration has also contributed to develop new student-targeted development projects such as 'Educating Graduate Students for Industry 4.0 (EduInd4)', through collaboration of University of Stavanger in Norway, Nazarbayev University in Kazakhstan, and Azerbaijan State Oil and Industry University in Azerbaijan, to foster the development of competencies that will enable the students to be skillful in future industrial jobs.

Moreover, there is a continuous student-exchange with international universities ensuring a good geographical spread. Erasmus agreements have been made with many European universities to facilitate both in-coming and out-going exchange of students, for instance inclusive of Politecnico di Milano (Italy), Delft University of Technology (The Netherlands), Chalmers Technical University College and Luleå University of Technology (Sweden), Lappeenranta-Lahti University of Technology and

Tampere University (Finland) and, Aachen University of Technology and SRH University Berlin (Germany). In addition, there have also been many in-coming exchange students from other Universities, for instance in France and Italy, to take selected courses of the Study program.

Committee recommendations:

The study program fulfils item 4.8.

Following recommendations are made for further considerations;

- Continue and expand international relations.

- Explore measures to improve number of students making use of bi-lateral student exchange.

- Consider measures to help students to attend international conferences and exhibitions

4.9 **Programmes leading to a degree must have arrangements for international student exchange. Contents of the exchange must be academically relevant.** STF §2-2 (8)

This requirement entails that the institution must ensure that students at all programmes leading to a degree, can be offered a student exchange stay through updated and binding contract, and that the relevance of the exchange-stay is ensured through the programmes' academic environment. The arrangements must be visible and predictable for the students, so that they better the students' possibilities and motivation for student exchange in the programme. There should also be made pre-approved course-lists with descriptions (student-exchange packages) as far as possible.

Committee assessment:

Possibilities for international student exchanges are well described ensuring a good geographical spread. Through formal bi-lateral agreements, the programme has made good arrangements for many interesting exchange opportunities with academically relevant universities in Europe and overseas covering Australia, Finland, Germany, Italy, The Netherlands, Sweden, and United States. Erasmus agreements have been made with many European universities to facilitate both in-coming and out-going exchange of students, for instance inclusive of Politecnico di Milano (Italy), Delft University of Technology (The Netherlands), Chalmers Technical University College and Luleå University of Technology (Sweden), Lappeenranta-Lahti University of Technology and Tampere University (Finland) and, Aachen University of Technology and SRH University Berlin (Germany).

The study program and the department have specific routines for international student exchange. There is a continuous student support and mentoring on student mobility matters. The courses are quality checked and approved by the department to avoid overlap and to ensure relevance.

Prior to Covid pandemic, there had been some steady interests among students on exchange opportunities. With the introduction of student-mobility within the Study program, there were 2 students in 2018, 4 students in 2019, and 2 students in 2021 utilizing exchange-study positions in The Netherlands and Italy. Some specific measures are needed in the post-pandemic period to enhance

Committee recommendations:

The study program fulfils item 4.9.

Following recommendations are made for further considerations;

- Continue and strengthen international student exchange opportunities with partner universities in the Study program.

- Explore measures to motivate students to make use of out-going exchange opportunities available.

- Consider measures to promote the Study program among international partner universities to improve in-coming exchange.

4.10   For programmes with supervised professional training, there must be a contract between the institution and place of professional training. STF §2-2 (9)

Contracts with the places of professional training must be in place. The agreements must ensure and regulate the academic completion of the supervised professional training. The contract makes it possible to ensure the quality of the supervised professional training, and to be sure it is of the same quality as the parts of the programme happening at the institution itself.

Committee assessment:

Not applicable

Committee recommendations:

Not applicable.

For master's degrees

4.11   The master's degree programme must be defined and limited and have a sufficient academic scope. SKF §3-2(1)

The limitations of the master's degree programme must be clear through the descriptions of courses, disciplines, and knowledge areas the programme entails. The profile and possible specialisations of the programme must be described in such a way that the scope of the programme is clear.

Committee assessment:

The program has a properly defined profile in the field of Industrial assets covering industrial plants and facilities, engineering systems, and public infrastructure. The academic scope is sufficiently defined and is inter-disciplinary in nature with a focus on both offshore and land-based industries. The program profile is relevant for many sectors inclusive of; energy (both oil & gas and renewables), manufacturing and production, process, maritime, civil infrastructure, etc.

The master program provides a broad education within industrial management covering the most important and relevant aspects for engineering, operating, and managing an asset. Relevant courses have been carefully selected and focus of each discipline area has been limited to cover the most essential themes relevant for industry and operating assets. The central knowledge areas defined within the program has been adequately prioritized and limited to; statistics & probability, asset economics, decisions and performance, reliability and maintenance, asset condition monitoring, safety and risk, project management, energy and energy technologies, life extension.

In addition, many interesting student-mobility opportunities are available in the 3rd semester.

Committee recommendations:

The master degree program fulfils item 4.11.

Following recommendations are made for further considerations;

- Consider measures to improve pragmatic orientation. This can be beneficial for many students who get admission to the Study program without industrial experience.

- Explore the possibilities for a specific Practice-oriented course in the 3rd semester (Ref. recommendations by TekNat faculty).

- Explore ways to integrate modern industrial trends such as sustainability, digitalization, renewable energy, etc., into Course curriculum/projects.

4.12 **Other evaluation topics decided by UiS**

Committee assessment:

Not applicable

Committee recommendations:

Not applicable

Requirements for the academic environment

4.13   **The academic environment associated with the programme must have a size comparable with the amount of students and the programme's individuality, it has to be stable over time when it comes to competency, and its composition must cover the subjects and courses that form the programme.** STF §2-3 (1)

The academic environment associated with the programme, includes people who directly and regularly contributes to the development, organising, and execution of the programme.
An important assumption for quality in the programme is that the students meet an academic environment which is big and stable enough, and that has competencies within all subjects and courses taught. Expected learning outcomes for the students and the contents of the programme and relevance, should be guiding for the composition of the academic environment. The academic environment is responsible for building a holistic study offering with good coherence, progression and academic diversity.

Committee assessment: The Item 4.13 is replaced by the Item 4.20   See Item 4.20 for details.
Committee recommendations: The study program fulfils item 4.13.   See Item 4.20 for details.

4.14   **Academic environment associated with the programme must have relevant educational academic competency.** STF §2-3 (2)

Educational academic competency means University level pedagogy and didactics. Educational academic competency also includes competency to make use of digital technology to promote learning. National regulations for educational basic competencies have minimum requirements for scientific/academic staff, in line with these, UiS has decided it will require 150-200 hours work to develop the desired level of basic competency as a minimum to meet the requirement for educational academic competency.

Committee assessment: The academic environment associated with the programme has relevant educational academic competency. Main professors associated with the program have long years of experience in university level pedagogy and didactics (some with more than 20 years of individual experience), where at least 2 have also indicated completion of formal Uniped courses in addition. Of the 4 Assoc. professors, 2 have completed basic pedagogic courses, and 1 will take this course in 2022. Also digital competencies are in practical use in almost all courses at different levels at the moment. Digital competencies at various levels have been developed considerably during the Covid-19 period. The administration is taking measures to enhance educational academic competency of the academic staff on continuous basis.
Committee recommendations:

The academic environment fulfils item 4.14, based on years of experience and basic educational academic competency.

Following recommendations are made for further considerations;

- Continue with further development of digital competencies as suitable.

4.15 The programme must have a clear academic management with defined responsibility for quality assurance and development of the programme. STF §2-3 (3)

The requirement is that the academic management must consist of staff in teaching and research positions and have the formal responsibility for the programme being completed in line with the programme description and that the programme description is developed. The person/people with the academic responsibility must have the competency to drive the quality assurance and –development of the programme.

Committee assessment:

The management responsibilities in the program are clear and is formally held by an academic staff member of the core group who also has continuous teaching and supervision tasks, and research activities. The quality assurance, development, and improvements have been structured in a good manner. This has contributed to add some new courses, and more importantly to update existing courses with new learning contents, relevant student projects, and practical case studies. Since the core group of the academic environment has close bonds with both the industrial and research networks, the study program has become a good example in achieving continuous improvement through systematic quality control and development over time delivering excellent results.

The formal quality assurance of individual courses and overall study program occurs on semester-by-semester and yearly basis, in line with the newly introduced Quality system of UiS.

Committee recommendations:

The academic environment fulfils item 4.15.

4.16 At least 50% of the work-years associated with the programme must be done by employees whose main employer is UiS. Of these, there needs to be employees with minimum associate professor-level in the central parts of the programme. In addition, there are the following requirements for the academic environment's competency-level: For programmes on master's degree level, 50% of the academic environment associated with the programme must be employees of at least associate-professor level competency, where at least 10% with professor level competency STF §2-3 (4)

The academic environment associated with the programme, includes people who directly and regularly contributes to the development, organising, and execution of the programme. To have UiS as their main employer, their position must be at least 50% at the university.
It is therefore only the academic environment associated with the programme (in the form of work years), that falls under this point. Positions from 0,1 work years is included in the calculation.

Committee assessment:

The academic environment of the Study program consists of 4 full Professors, 1 adjunct Professor, 4 Assoc. professors, and 1 adjunct Assoc. professor. This represents a total of 8,4 work years. From the total of 10 members, 8 members of the Academic staff have UiS as the main employer with 40% at Full professor qualifications and 40% at Assoc. professor qualifications. A new recruitment of an adjunct Assoc. Prof. was made to the core academic group in 2022 with strong industrial experience in Industrial asset management. Overall, the academic environment fulfills employment basis, competency level requirements, and retains a good balance of research and practice that apparently has contributed to the growing recognition of the Study program and its courses among students and industry.

Committee recommendations:

The academic environment fulfils item 4.16.

Following recommendations are made for further considerations;

- A contingency plan based on internal risk assessments could be helpful to ensure the continuity.

4.17　**The academic environment associated with the programme must do continuous research and/or artistic development work and academic development work and must show documented results at satisfactory quality level and scope for the programmes' contents and level.** STF §2-3 (5)

The academic environment must be able to show to results of such quality and scope, that it is satisfactory for the programmes' individuality, contents, and level.
A scope in relation to the programmes' level entails that it requires more research activity in relation to a master programme, than for a bachelor programme. NOKUT will on the other hand, during
their supervision, require that the activity in an academic environment that has programmes within Ph.D. level must keep "high international quality" at all programme-levels.

Committee assessment:

The academic staff of the program has shown good activity in research-based publications, incl. books, international peer-reviewed papers, book chapters, and conference papers. The academic environment collaborates in projects and publications with a number of known institutions and maintains a good international quality. Moreover, there is also a good level of participation in other academic and research development activities such as, academic program revisions, external academic recruitments, external PhD examinations, external research project advise and revisions, etc.

During the period of 2017-2020, a total of about 175 publications have been made both in level-1 and level-2 with a total impact of 170,22 publication points. In 2021, this amounts to approx. 40 publications acquiring 28,3 points. The topical areas of research are very relevant necessary academic development both at study program and individual course levels, that for instance include; asset decisions, risk, economics and cost, maintenance and reliability, condition monitoring and health assessments, human aspects, asset data and data-driven approach, safety and security, digitalization, sustainability, asset performance, asset investments, etc. Academic staff members have also

published domain specific books (e.g. Value networks in Manufacturing: Sustainability and performance excellence (2017), Engineering assets and Public infrastructures in the Age of digitalization: Proceedings of the 13th World Congress on Engineering asset management (2020), Risk science: An introduction (2022), Knowledge in risk assessment and management (2018), Making good decisions (2018) with renowned International publishers of Springer, Routledge, John Wiley & Sons, SPE respectively, that seemingly also contribute to further develop respective courses.

Course descriptions indicate that academic staff utilize their own research continuously towards gradual course development efforts. Also, the academic environment has broad academic and industrial networks that are beneficial towards continuous development of academic contents and activities. There is an active participation in R&D projects and international conferences for instance inclusive of; World Congress on Engineering asset management (WCEAM), European safety and reliability conference (ESREL), IEEE Industrial engineering and Engineering management conference (IEEE-IEEM), etc. The core academic staff organized The 13th World Congress on Engineering asset management in 2018, with active participation and involvement of national and international researchers as well as students.

Committee recommendations:

The academic environment fulfils item 4.17.

4.18   **The academic environment associated with programmes leading to a degree, must actively participate in national and international cooperation's and networks that are relevant for the programme.** STF §2-3 (6)

Cooperation and networks must be relevant for the programme and give the academic environment experiences that can be used in the programme, and that can contribute to the quality of education. This can for example be research cooperation, participation at international conferences, cooperation about education/teaching quality etc. These networks that the academic environment actively participates in, are the ones that are being assessed. It should also be assessed how the cooperation contributes to the quality in the environments' research and development-activity.

Committee assessment:

The academic environment collaborates in projects and publications with a number of known institutions and maintains a good international quality. Their activity levels clearly indicate the continuous participation in national and international cooperation and networks. The academic environment has been quite active towards the development of research and academic projects collaboratively. This includes for example; EU project on Sustainable value creation in manufacturing network (SustainValue), activities in Norwegian offshore wind cluster NORCOWE, activities towards a national R&D Center for Petroleum Production Facilities (CPPF), student-targeted development projects such as 'Educating Graduate Students for Industry 4.0 (EduInd4)', active participation in European Consortium of Innovative Universities (ECIU), etc.

Academic staff members regularly attend international conferences as indicated by the publication records, and have also contributed to organizing conferences (e.g. World Congress on Engineering Asset Management, National Safety Conference, European Safety and Reliability Conference, etc.). Academic staff are also active in international organizations (e.g. International Society for Engineering

Asset Management (ISEAM), European Safety and Reliability Association (ESRA), etc.), journal editorial boards (e.g. International Journal of Strategic Engineering Asset Management (IJSEAM), Reliability Engineering and Systems Safety, etc.) etc. in the relevant fields of the Study program. Research publications also clearly indicate continuous research cooperation with many external research partners.

The academic environment has established a strong industrial cooperation over the years. The Cluster of Industrial Asset Management (CIAM) is a great example of such collaborative measure between UiS and the industry. Such collaboration brings positive synergies both for the students, the academic environment and the industrial partners. The industrial network has been used actively for both Master thesis projects and applied-research oriented PhD projects.

Moreover, there is also a good level of participation in other academic and research development activities of national and international cooperative partners, for instance in terms of, academic program revisions, external academic recruitments, external PhD examinations, external research project advise and revisions, etc.

Committee recommendations:

The academic environment fulfils item 4.18.

Following recommendations are made for further considerations;

- Consider measures to promote the study programme in relevant networks and to become even more attractive to improve recruitments.

- Consider measures to be the leading contact point for recruiters for companies in the region.

4.19   **For programmes with mandatory supervised professional training, the academic environment associated with the programme must have relevant and updated knowledge from the professional training-field. The institution must ensure that the supervised professional training-advisors has the relevant competency and experience from the professional training field.** STF §2-3 (7)

With "supervised professional training-advisors" it is meant people who takes care of and advises the students during their time in supervised professional training.
With "relevant competency" in the second sentence, it is related to relevant academic knowledge and advising competency.
In programmes where supervised professional training is an integrated part, it is assumed that the institution and the academic environment themselves makes sure there is systematic contact with the professional training field, so that the programmes and the academic environments own professional training experience is updated and following the development of the field. It is important for the quality of the programme that there is a continuous academic interaction between competency people in the professional training field and central competency people with their main employment at the institutions. The academic environment at the institution must have their own knowledge of professional training, to be able to cooperate with the field and integrate / build bridges between theory and practice in the education.

For master's degrees

4.20 **The master's degree programme must have a wide and stable academic environment consisting of a sufficient number of employees with high academic competencies within education, research, or artistic development and academic development work within the study programme. The academic environment must cover subjects and courses the programme consists of. The employees in the academic environment must have the relevant competencies.** SKF §3-2 (2)

Point 4.20 replaces point 4.13 above.

The academic environment associated the study programme includes the people who directly and regularly contributes to the development, structure and completion of the study programme.

The academic environment must be broad and be composed of employees with the relevant competencies within education, research or artistic development and academic development work in all parts of the study programme. It is not sufficient for the competence to be relevant for the programme, the academic environment must have a high level of competence covering the entire academic subject area. The academic environment shall, among other things, consist of people with first-position competence and top-competency such as associate professors, lecturers and professors. The requirement entails strengthening and tightening, while at the same time opening for more flexibility in the composition of the professional environment.

Committee assessment:

The academic environment of the Study program consists of 4 full Professors, 1 adjunct Professor, 4 Assoc. professors, and 1 adjunct Assoc. professor. A new recruitment of an adjunct Assoc. Prof. was made to the core academic group in 2022 with strong industrial experience in Industrial asset management. Overall, the academic environment is wide and stable, has high-level competencies in the area, and has a good balance of research and practice that apparently has contributed to the growing recognition of the Study program and its courses among students and industry.

The academic environment associated with the program has a sufficient size compared to the number of students admitted to the program over the last years with an yearly target of 25 students; 15 national and 10 international. The staff is highly competent in their respective fields and the overall environment has been stable. The core group covers a number of main courses in the program up to 30 ECTS in the first 2 semesters, making it beneficial for students in terms of establishing a good interaction with the core academic staff and getting connected to main courses systematically. The actual scale of the contact environment is relatively bigger when both academic and industrial networks are also taken into consideration.

W.r.t the results achieved so far, the academic environment has demonstrated excellent responsibilities in developing and offering an inter-disciplinary and holistic study program with good coherence, progression, academic diversity, and industrial relevance.

Committee recommendations:

The academic environment fulfils item 4.20.

Following recommendations are made for further considerations;

- Consider suitable measures to recruit more female students and academic staff members to the Study program.

4.21 **The academic environment must be able to show documented results of a high standard and results from cooperation's with other academic environments nationally and internationally. The assessments of the institution must be documented so that NOKUT can use them in their work.** SKF §3-2(3)

The academic environment must be able to show documented results of a high standard. What can be considered a high standard must be assessed from what is considered a high standard of the subject area nationally and internationally.

What must be documented is therefore not just the results the academic environment brings from their own institution, but also results from R&D/artistic development work-collaboration's with other academic environments both nationally and internationally. There is a requirement of higher research activity related to a master's degree programme than to a bachelor's degree programme. NOKUT will also during their supervisions require that the activity in an academic environment running programmes at Ph.D.-level platform must maintain a "high international quality" in all study levels.

Committee assessment:

As indicated, for instance under Items 4,7; 4,8; 4,9; 4,17; and 4,18; the academic environment has demonstrated that a wide international and national collaboration has actively been used over the years to deliver high standard results. There is a good platform to collaborate with external partners and company networks.

Results of high international quality can clearly be seen in terms of; involvement in national and EU project initiating activities, lead roles in such collaborative research projects, editorial and review activities in renowned international journals, lead roles and organization of international and national conferences, publication of books and book chapters/papers, review and advisory roles of research projects, PhD examinations, active involvement in professional societies, etc.

Committee recommendations:

The academic environment fulfils item 4.21.

5 Committee's overall assessment

The assessment process clearly confirms that the Items 4.1 – 4.21 are adequately being fulfilled by the Study program, the Masters degree, and the Academic environment.

The Committee makes following recommendations and suggestions for consideration as a part of continuous improvement, but none of these recommendations or suggestions is pre-conditional for re-accreditation and continuity of the Master program in Industrial asset management.

Study program:

- Avoid mis-match of information in official documents and web-page. For instance, in the document 'Exchange institutions.doc', the list is slightly different from webpage information (For example, German universities Aachen and Berlin are not mentioned). Also, update information available with latest changes in Exchange universities. For example, the current official name of LUT is Lappeenranta-Lahti University of Technology. Tampere University of Technology has also become Tampere University (TUNI).

- Consider the possibility of making the name of the study program in Norwegian language more representative w.r.t. assets, and asset management. A suggestion is; 'Industrielle anlegg og driftsledelse' / 'Industriell assets og driftsledelse'. Alternatively, the English name 'Industrial asset management' can be also used as it is in Norwegian information pages.

- Ensure consistency of learning outcomes both in English and Norwegian languages at Study program level.

- Consider measures to promote the study program in relevant networks and to become even more attractive to improve recruitments. This can strengthen in becoming the leading contact point for recruiters and companies in the region.

Courses:

- Ensure a consistent practice to describe Learning outcomes across all courses.

- Consider suitable measures towards 5ECTS courses; either limit learning activities correspondingly, or increase them to 10ECTS levels. Any such changes need to be based on an overall analysis of the impact towards program structure and students learning.

- Consider specific measures to improve the situation of STA500 in terms of teaching, learning, and assessment forms as well as suitable arrangements for students to participate more actively in the learning process. Consider more practical orientation of the course than making it very theoretical.

- Consider measures to improve students' pragmatic orientation. This can be beneficial for many students who get admission to the Study program without industrial experience. Some measures can include; Study tours, practice-oriented course or internships for students, involving industrial experts for guest lectures, etc.

- Explore ways to integrate modern industrial trends such as sustainability, digitalization, renewable energy, etc., into Course curriculum/student projects to improve their practical relevance even more. This can also help improving students' practical thinking and orientation, market attractiveness, etc.

- Consider how to use experience gained through pandemic period to further develop new post-pandemic teaching, learning, and assessment methods. Continue to take measures for further development of digital competencies as suitable.

Academic environment:

- Consider suitable measures to recruit more female students and academic staff members to the Study program.

- Consider involving industrial experts for guest/inspirational lectures.

- Retain the ongoing collaboration with industry. Continue the use of companies in CIAM as well as other external organizations and networks for new research opportunities and student involvement.

- Continue and strengthen international relations. This can generate even more positive effects on academic development, R&D, and Staff/Student exchange.

- With the gradually growing activity level in any Study program, a contingency plan based on internal risk assessments could be helpful to ensure continuity of academic and research work.

Students:

- Continue and strengthen international student exchange opportunities with partner universities in the Study program.

- Explore measures to motivate more students to make use of the available out-going exchange opportunities. Unique measures seem to be needing for national and international students due to their different study situations. At the same time, consider measures to promote the Study program among international partner universities to improve in-coming exchange.

- Consider making students more aware of different industrial career options that they can be qualified for. This can also include adding some Alumni stories from graduated students about their careers and industrial career options.

- Consider measures to help students to attend international conferences and exhibitions. This can also be supported by providing incentives for students to write creative research articles, for instance based on their Master theses projects.

Conclusion:

The committee hereby conclude that the Masters study program Industrial asset management meets the accreditation criteria in the regulations and the additional requirements set by the university. Hence, re-accreditation of this Master study program is hereby unanimously recommended.

On behalf of the IAM Study program evaluation committee 2022,

Prof. Jayantha P Liyanage, PhD

Leader of the Committee, 10th June 2022, UiS.

6 The dean's assessment, advice and action plan

This is where the dean gives their assessment and advice before the report is sent to the director of academic affairs for further processing. Also state the different committees processing.

If all accreditation criteria are deemed met:
- The programme's accreditation is recommended to continue.

If not all assessed criteria are deemed met, yet the necessary changes to be made to meet the criteria can be done within a reasonable time:
- The programme's accreditation is recommended to continue with an action plan to satisfy the criteria.

If not all assessed criteria are deemed met and necessary changes to satisfy the criteria cannot be done within a reasonable timeline:
- Recommendation to temporarily stop the admissions while necessary development work is done for the programme to satisfy the criteria, or

- Recommendation and plan for phasing out and closure

o This report has been handled in the programme committee <date> o
The deans assessment and advice:
Prioritised actions for further development

UiS, <Date>

<Deans name>

Dean
<Faculty Name>

This document is approved in Public 360 by the dean itself