

Academic bachelor programme
Technology and
Liberal Arts & Sciences
University of Twente

Initial accreditation

10 July 2012

Panel report

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1 Executive summary

The Accreditation Organisation of the Netherlands and Flanders (NVAO) has received a request for an initial accreditation procedure, including programme documents, regarding the proposed academic bachelor programme Technology and Liberal Arts & Sciences of University of Twente. In order to obtain an informed advice about the quality of the proposed programme, the NVAO convened an expert panel. The panel has studied the programme's information file and listed a series of questions which the programme has answered in the run-up to the site visit. During the site visit, the panel met with representatives of the university, programme management and teaching staff. Below, the panel presents the considerations which have led to the assessment.

The panel regards the goal of the programme to educate engineers with a broad perspective as appropriate. These engineers will be educated to be able to address topics from the social sciences as well. The intended learning outcomes of the programme are sound. These not only reflect the competences of the specialist engineering programmes but also the interdisciplinary competences, required for the graduates of this programme. The intended learning outcomes meet the 3TU requirements and, therefore, the Dublin descriptors, indicating the level of the programme is a bachelor's level. The learning outcomes reflect the learning objectives drafted for liberal arts and sciences programmes. The panel considers the codes of conduct the graduates have to comply with as being valuable for their personal development.

The target group of gifted students is the right target group for this programme. The admission procedure is sound, selecting the students who have the abilities to complete the programme. The intended learning outcomes are completely and evenly reflected in the curriculum. The concept of the programme is well elaborated in the curriculum. The courses are appropriate in transferring the disciplinary knowledge which the students need. The theme-related projects provide an interesting structure to implement the interdisciplinary nature of the programme. Still, the projects ought to be elaborated in more detail. The panel recommends to draft the learning objectives of the projects more precisely in order to ensure these to meet the intended learning outcomes. The panel considers the Personal pursuit projects appropriate for the students' personal development. These projects reflect the concept of *Bildung*. As these projects are inherently self-directed, the programme management should ensure the Personal pursuit projects to meet the intended learning outcomes. The panel does not question the willingness and the abilities of the programme management to achieve this. The panel applauds the role of the examination board in approving the plans for these projects. The degree of choice of courses the students have allows them to prepare for the master's programme of their preference. The panel assesses the course material to be appropriate but encourages the programme management to make certain that the choice of texts is aligned with the learning objectives.

The members of the staff core team are all very motivated and enthusiastic teachers. The cohesion of the team is strong. The disciplinary knowledge of the teachers is up to standard. Their didactical abilities meet the requirements of this small-scale, intensive programme. The panel feels the teachers will be able to effectively transfer knowledge and skills.

The didactical concept of project-led education is well-suited for this programme. Teams of 4 to 8 students have to handle ill-defined situations which they have to redefine into a set of

problems for which they conduct research and design solutions. The student-to-staff ratio of 16:1 is appropriate for this small-scale programme. The number of contact hours is adequate as well. The study guidance as represented in the mentoring system is good. The building and the material facilities of the programme enable the staff and students to organize the learning processes effectively.

The panel regards the programme to be very ambitious for the presently available staff, especially in time consuming elements such as the personal pursuit and mentoring. The panel would advise the programme management to adjust the programme to the resources available. The panel has observed awareness on the part of the programme management and the teachers to adjust the plans if the real situation would prove to differ in important aspects from the projections. The panel, therefore, is confident the programme management will be able to execute the programme along the lines now drawn.

The examination board of the programme is an important safeguard for the quality of the assessments as well as for the level of the graduates of the programme. The assessment forms conform to the learning objectives of the courses and the projects, are well elaborated and are appropriate to assess the individual contribution of students in the case of group projects. The panel is positive about the intention of the programme to have the examinations and the assessments reviewed by a second teacher. The panel would, nevertheless, advise the programme management to work out these plans in more detail. The assessment of the Graduation project by two assessors and by means of a report as well as an oral defence is adequate. When this project is a group project, the assessment procedure enables the assessors to identify and rightly assess the individual performance of each of the students. The panel is confident the graduates of the programme will have the capacities to be admitted to a number of demanding master's programmes and will, therefore, be able to pursue their career to become the engineers with the broad perspective the programme management wants to educate. The choices for courses the students can make enable them to prepare for a number of interesting master's programmes. The panel understands that the programme management advises the students to pursue further studies in a challenging master's or graduate programme and not to enter the labour market upon completion of this bachelor's programme.

The guarantee by the University of Twente that students will be able to complete the programme is appropriate. The budget the programme management has drawn up is realistic. The funding by the Faculties and the University of Twente constitutes important financial safeguards, giving the programme ample opportunity to develop and execute the programme in the way the programme management has envisaged. The panel regards the financial basis of the programme to be sound.

The panel acknowledges the intention of the programme to be registered in the Croho domain Sectoroverstijgend, subonderdeel Onderwijs/Landbouw en natuurlijke omgeving/Natuur/Techniek/Gezondheid and the motivation supplied in the information dossier. In view of the multi- and interdisciplinary nature of the programme, which has been established also during the initial review, the panel accepts the programme's intention and advises the NVAO that the programme be registered in the Croho domain mentioned above.

In response to the question put to the panel by the NVAO whether the addition 'Technology' to the name of the programme is appropriate, given that all other University Colleges in the Netherlands are called 'Liberal Arts and Sciences', the panel regards the name Technology

and Liberal Arts & Sciences a good representation of the distinctive nature of the programme within the field of Liberal Arts and Sciences programmes in the Netherlands. It advises against a shortening of the name to 'Liberal Arts & Sciences'.

Given these considerations, the panel advises the NVAO to take a positive decision with regard to the quality of proposed academic bachelor programme Technology and Liberal Arts & Sciences of the University College of University of Twente.

The Hague, 10 July 2012

On behalf of the Initial Accreditation panel convened to assess the quality of proposed academic bachelor programme Technology and Liberal Arts & Sciences of University of Twente,

Prof.dr. J.C.M. van Eijndhoven
(chair)

drs. W.J.J.C. Vercouteren RC
(secretary)

2 Introduction

2.1 The procedure

NVAO has received a request for an initial accreditation procedure including programme documents regarding the proposed academic bachelor programme Technology and Liberal Arts & Sciences. The request was submitted by the University of Twente.

An initial accreditation procedure is required when a recognised institution wants to offer a programme and award a recognised bachelor's or master's degree. To a certain extent, an initial accreditation procedure differs from the accreditation procedure for programmes already being offered. Initial accreditation is in fact an *ex ante* assessment of a programme. A programme becomes subject to the normal accreditation procedures once the initial accreditation has been granted.

NVAO has convened a panel of experts. The panel consisted of:

- Prof. dr. Josee van Eindhoven (The Netherlands), chair, retired Professor of Sustainability Management, Erasmus University Rotterdam;
- Prof. dr. Mark Somerville (United States of America), member, Professor of Electrical Engineering and Physics, Olin College, Boston, USA;
- Dr. Cis van den Bogaert (Belgium), member, physicist and Head of the Department of Education, University of Antwerp;
- Drs. Marjolijn Vermeulen (The Netherlands), member, Policy Advisor in Institutional development, Erasmus University Rotterdam;
- Esther van Duin MSc (The Netherlands), student member, graduated from the research master programme Brain and Cognitive Sciences-Neuroscience of the University of Amsterdam, currently working at the Nationale Denktank.

On behalf of the NVAO, dr. Th. de Bruijn was responsible for the process-coordination. The panel's report was drafted by drs. W.J.J.C. Vercouteren RC, external secretary.

The composition of the panel reflects the expertise which NVAO deemed necessary. (please refer to Annex 1: Composition of the panel). All the panel members have signed a statement of independence and confidentiality.

The panel has based their assessment on the standards and criteria of the NVAO Initial Accreditation Framework (Stcrt. 2010, nr 21523).

The following procedure has been adopted. The members of the panel studied the documents presented beforehand by the programme management (please refer to Annex 3: Documents reviewed).

On 16 May 2012 the panel held a preparatory meeting. In this meeting the panel members shared their first impressions, based upon the documents the panel had received. Panel member Somerville attended the meeting via a Skype connection. During the meeting on 16 May 2012 the panel drew up a list of questions, some of which were meant to be presented to the programme management before the site visit and some of which were meant to serve as a guide for the discussions with the representatives of the programme during the site

visit. On 14 June 2012 the panel convened again to discuss the answers of the programme to the questions put to them, and to adapt the list of questions for the site visit accordingly.

On 15 June 2012 the panel conducted a site visit at the premises of the programme on the campus of the University of Twente. The site visit was conducted in accordance with the schedule drawn up beforehand (please refer to Annex 2: Agenda of the site visit).

Immediately after the site visit the members of the panel shared their considerations for each of the standards of the NVAO Initial Accreditation Framework. These considerations were based on the findings during the site visit, building upon the evaluation of the documents submitted by the institution. The chair of the panel presented a broad outline of the findings of the panel to the representatives of the programme.

A draft version of this report was finalised by the secretary taking into account the information presented as well as the findings and considerations of the panel. The draft report was then sent to the members of the panel on 3 July 2012. The panel members corrected and amended the draft report. Finally, the secretary drew up the final report on 10 July 2012.

2.2 Panel report

The first chapter of this report is the executive summary, while the current chapter is the introduction.

The third chapter gives a description of the programme.

The panel presents its assessments in the fourth chapter. The programme has been assessed by examining the standards in the Initial Accreditation Framework. For each standard the panel presents an outline of its findings, considerations and a conclusion.

The *outline of the findings* are the facts as found by the panel in the programme documents, in the additional documents and during the site visit. The panel's *considerations* are the panel's evaluations with respect to these findings. The *considerations* presented by the panel logically lead to a concluding assessment.

The panel concludes the report with a table containing an overview of the assessments for each of the standards and for the programme as a whole.

3 Description of the programme

3.1 Overview

Country	The Netherlands
Institution	University of Twente
Programme	Technology and Liberal Arts & Sciences
Level	bachelor
Orientation	academic
Degree	Bachelor of Science
Location	Enschede
Mode of study	Full-time
Field of study	(in Dutch:) Sectoroverstijgend; subonderdeel onderwijs/landbouw en natuurlijke omgeving/natuur/techniek/gezondheid

3.2 Profile of the institution

The goal of the University of Twente is to create a learning and research environment in which the students and the staff may realize their talents to their full potential. Together, 3,300 scientists and professionals carry out research, aim to bring about socially relevant innovation, and provide teaching for more than 9,000 students. Fostering entrepreneurship is an important goal for the university. The campus is home to around 100 businesses, including student-run businesses. The University of Twente has also generated more than 700 successful spin-off companies. The university's business park, Kennispark Twente, encourages and assists entrepreneurs to start new companies.

The proposed academic bachelor programme Technology and Liberal Arts & Sciences is to be part of the new academic institution ATLAS, the University College of the University of Twente. The Board of ATLAS includes the deans of all of the Faculties of the University of Twente. The co-ordinating Faculty is the Faculty of Electrical Engineering, Mathematics and Computer Science. The dean of this Faculty is the chair of the ATLAS Board.

The ATLAS dean is responsible for the ATLAS strategy and internal and external relations. The dean and the director of education make up the ATLAS management team. The director of education is responsible for the quality of the Technology and Liberal Arts & Sciences programme.

3.3 Profile of the programme

ATLAS is a so-called University College offering a liberal arts and sciences programme. These programmes were introduced in the Netherlands some years ago, having been derived from the programmes in the United States. The main feature of these programmes is to combine various academic disciplines.

This programme will, however, be different from the majority of liberal arts and sciences programmes in the Netherlands in the sense that this programme addresses technology and engineering as well as social and behavioural sciences. The University College ATLAS will be the first in the Netherlands to offer an engineering, liberal arts and sciences programme.

The intended learning outcomes of the programme are listed below. These are stated as competences the graduates of the programme should have achieved. The graduate of the programme:

- 1) Has a broad perspective and high level of academic and intellectual development, including a profound understanding of a selection of subjects. Typically, he is able to integrate the insights of different disciplines into a coherent view and approach.
- 2) Is competent to do research, in order to acquire new scientific knowledge. He has excellent analytical skills: he can cope with the complexity by unravelling phenomena, systems or problems into sub-phenomena, sub-systems and sub-problems.
- 3) Is competent in designing. The graduate is able to create value in accordance with the predefined requirements and desires. He can combine various perspectives related to engineering, technology, social and natural sciences, as well as circumstantial information, in the design. The design competence is based on excellent synthesis skills: combining elements into a coherent structure that serves a certain purpose. That result can be an artefact, product or process, and also a theory, interpretation or model.
- 4) Is competent in organising and is able to contribute to realistic, functional and effective solutions. The graduate is able to evaluate the results from prototype testing and small-scale experiments for scaling and re-design and is able to plan and organise an effective implementation process.
- 5) Has an academic approach, shown by a systematic and critical way of using theories, models and coherent interpretations. The ATLAS graduate is excellent in generalising and contextualising.
- 6) Has intellectual skills, as shown in his reasoning, reflecting, forming and defending a judgement. The ATLAS graduate has a flexible mind, can transfer skills from one field or application to another, has the overview without losing the eye for detail, and is outstanding in noticing relevance for new situations and adjusting his knowledge and experience accordingly. He takes the lead.
- 7) Is competent in co-operating and communicating with colleagues and others. This competence is based on a sense of responsibility and respect for colleagues and non-colleagues.
- 8) Takes account of the temporal and the social context and has the competence to integrate these insights into his scientific work.
- 9) Behaves in a socially responsible manner and is inclined to take leadership.
- 10) On graduation he is prepared to make a decision about his future and future studies.

The curriculum has the structure as presented in the table below:

Year 1/semester 1	
Theme	Theme with common project (12 EC)
Foundation	Science/Engineering (10 EC)
Foundation	Social Science (5 EC)
Personal Pursuit	Elective (3 EC)
Year 1/semester 2	
Theme	Theme with common project (12 EC)
Foundation	Science/Engineering (5 EC)
Foundation	Social Science (5 EC)

Integration	Integration/Generalisation (5 EC)
Personal Pursuit	Elective (3 EC)
Year 2/semester 3	
Theme	Choice out of two themes (12 EC)
Foundation	Science/Engineering (5 EC/10 EC)
Extension	Social Science (5 EC/10 EC)
Personal Pursuit	Elective (3 EC)
Year 2/semester 4	
Theme	Choice out of two themes (12 EC)
Foundation	Science/Engineering (5 EC/10 EC)
Extension	Social Science (5 EC/10 EC)
Personal Pursuit	Elective (3 EC)
Year 3/semester 5	
Specialisation	International Exchange, Qualification for Master's programme; Minor (10 EC/27 EC)
Extension	Choice in specialisation area (0 EC/17 EC)
Personal Pursuit	Elective (3 EC)
Year 3/semester 6	
Theme	Graduation Assignment; Capstone (20 EC)
Extension	Courses related to the assignment (Capita Selecta) (7 EC)
Personal Pursuit	Elective (3 EC)

New programme in the Netherlands

The programme as presented in the application is new in the Netherlands as it constitutes the first liberal arts, sciences and engineering programme.

New programme for the institution

The programme as presented in the application form is new for the University of Twente. This is the first liberal arts and sciences programme for this institution.

Credits

The programme consists of three years of full-time study for a total of 180 EC.

4 Assessment per standard

This chapter presents the evaluation by the assessment panel of the four standards.

4.1 Intended learning outcomes (standard 1)

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

Outline of findings

The mission of ATLAS is to provide learning opportunities for the advancement in technology and liberal arts and sciences for the personal benefits of talented and ambitious students. The programme intends to educate the engineers of 2030, these engineers being able, after having completed this programme and after further study and work experience, to address the challenges of complex and large projects and to solve problems related to these projects. After having completed the programme, the graduates are junior engineers who have systems and process capabilities.

The programme management has performed a survey of literature and other programmes in the world in this field of study. So, the programme has, among other things, studied the book of Duderstadt (2008) and has considered programmes of Olin College (United States) and of the Department of Aeronautics and Astronautics of the Massachusetts Institute of Technology. The management of this programme intends to design the programme using the concepts which are present in this literature and these programmes.

The programme management has drafted the intended learning outcomes of the programme (please refer to section 3.3 for a complete overview). The learning outcomes meet the so-called 3TU requirements, which are generally considered to be an appropriate reflection of the Dublin descriptors. These Dublin descriptors reflect the bachelor's level of the programme.

The learning outcomes meet the requirements of specialist engineering programmes. The intended learning outcomes 4 and 9 listed in section 3.3 have been added to specifically target the Liberal Arts & Sciences character of the programme. The programme has these extra two learning outcomes, to distinguish this programme from the specialist engineering programmes.

The programme is meant to be a liberal arts and sciences programme. This implies the programme meeting the requirements thereof. According to these requirements, the programmes are interdisciplinary, the students of these programmes are able to evaluate in a fundamental way personal, social, scientific and technical developments, the students can assess complex problems from different perspectives and the students have learning skills enabling them to analyse different social and scientific positions and to develop a personal problem-solving ability.

The students of this programme should have an attitude conforming to the ATLAS academic and professional code of conduct, the honour code of conduct for ATLAS students and the

code of social conduct. These codes of conduct specify the requirements regarding their attitude and behaviour the students of this programme will have to meet.

Considerations

The panel regards the goal of the programme to educate engineers being able to manage complex and large projects as sound and appropriate. These engineers are different engineers from the more specialist engineers, as they have the ability to address topics from the social sciences as well. The programme has, rightly, taken into account relevant literature and the design of other programmes to specify the aims and the design of the programme.

The panel considers the intended learning outcomes the programme management has drafted to be sound. These learning outcomes not only reflect the competences of the specialist engineering programmes but also the interdisciplinary competences, required for the graduates of this programme.

The intended learning outcomes meet the 3TU requirements and, therefore, the Dublin descriptors, indicating the level of the learning outcomes is the level of a bachelor's programme.

The learning outcomes reflect the learning objectives drafted for liberal arts and sciences programmes in the Netherlands. Therefore, this programme may be regarded as being a liberal arts and sciences programme.

The panel considers the codes of conduct the graduates have to comply with as being valuable for the personal development of the students.

Conclusion

The panel assesses the standard *Intended learning outcomes* (first standard) to be satisfactory.

4.2 Teaching-learning environment (standard 2)

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

Outline of findings

The programme management has conducted a market research survey, including visits to about 40 secondary schools. The secondary school students who have been interviewed by the programme management have expressed their interest in this programme, mainly because the programme will be broader than a regular science or engineering programme permitting them to keep more opportunities for future study and work open. The programme aims to attract gifted students. These gifted students are not only students with excellent grades in their secondary school but also students who are gifted but, nevertheless, relatively underperformed in these schools.

The influx of these students is expected to come on top of the students already enrolling in the University of Twente. The programme management does not foresee many students

entering the programme who would otherwise have chosen for one of the existing programmes of the university.

The programme management has set the target for the influx of students at 50 students in the first year, increasing to a number of 70 students in the second year, leading to an influx of 100 students in the steady state, from the third year onwards. Half of the incoming students will be Dutch and the other half will come from abroad. The programme management wants to attract a substantial number of female students, in order to increase the number of female students pursuing a career in the engineering and technical sciences. The programme management also expects this to be realistic on the basis of the above mentioned interviews.

The students who are interested to enrol in the programme have to meet a number of prerequisites. Specifically, these students ought to have a good command of English and mathematics, meaning a grade above 7.0 for English and a grade above 7.5 for mathematics. Students coming from abroad have to meet similar prerequisites.

The students have to apply for admission to the programme by means of sending an application form, a letter by the student with his or her motivation and a letter of recommendation of the school. With candidates who are selected the programme management will conduct a face-to-face interview. The ATLAS dean is the one who formally accepts candidates.

The programme management has drafted a series of programme objectives which meet the intended learning outcomes. These programme objectives direct the contents of the courses and the projects. The programme management has drafted a table in which the relations between the learning outcomes of the programme and the programme components have been demonstrated.

In each of the semesters the students will take courses to be taught the various disciplines the programme has been made up of. These disciplines are, on the one hand, engineering and technical sciences, including natural science, design, engineering, engineering science and mathematics. On the other hand the disciplines are social science, including humanities, business and public administration, governance, economics, behavioural science and philosophy. The courses address either engineering and technical science or social science. In the courses other disciplines may be addressed. The courses in the first year, which are all compulsory, cover the fundamentals of the disciplines and provide the students with the orientation of these disciplines. In the second year the courses are meant to be an extension of the knowledge and insights gained in the first year. The third year courses are intended to enable the students to specialise in the major they have chosen.

In the semesters the students, also, will have an interdisciplinary project of, typically, 12 EC. These projects have interdisciplinary subjects (for instance Human movement and Tracers for personal safety) and are meant to lead to the integration of the aforementioned disciplines, thereby achieving the aim of an interdisciplinary programme. In the projects the students consider the subject from different disciplinary perspectives, analyse topics and solve problems in an interdisciplinary manner. There will always be a teacher from the social science and a teacher of the engineering and technical science for the teaching in these projects.

The University of Twente has ample experience with interdisciplinary programmes such as Advanced Technology, Industrial Design, Creative Technology, Industrial Engineering & Management and Biomedical Engineering. A number of teachers involved in the Technology and Liberal Arts & Sciences programme participate in the aforementioned programmes and will bring their experience to this programme.

During each of the six semesters the students devote a part of their study to their own Personal pursuit project. The number of credits of this project is 3 EC per semester, adding up to 18 EC for the project as a whole, being 10 % of the entire curriculum. The students choose the subject of their Personal pursuit project from a wide variety of topics ranging from projects oriented at social work to musical performance. In these projects the students are responsible for relating their extra-curricular activities to the curriculum by defining its learning outcome. The students build their own project around the topic of their choice. They will be required to undertake the activities in the project, reflect upon these activities, link the project to theoretical notions and present a portfolio with an account of the project. The Personal pursuit project the student has chosen has to be presented to the examination board for approval.

The students may make a number of choices in the programme. They are encouraged to compose their own, personalised programme. The students may, of course, choose the subject of their Personal pursuit. From the second year onwards they, also, may choose some of the courses. The students thereby have the chance to influence the relative weight of engineering and technical science and social science. They may make choices resulting in a ratio of engineering and technical science to social science ranging from 1: 1 to 3:1. By making a choice for a number of specific courses the students may prepare for a specific master's programme.

The programme management has listed the literature and other study material to be used in the courses and the projects.

The programme will be managed by the dean and the director of education. The staff core team consists of 10 teachers which together will make up about 3 full-time equivalents. Each of these teachers will contribute at least one day per week to the programme. They will regularly be present in the buildings of the programme. Other teachers will be involved as well. In the steady state the core team will consist of between 16 and 20 teachers. Another 60 to 70 teachers will teach in the programme.

The teachers in the programme will have to meet a number of requirements. They are required to have obtained a basic teaching qualification (in Dutch: BKO), they will have to be able and willing to transcend their own discipline and they will receive extra training to guide gifted students and to lecture in an international setting. This training will qualify them for a senior teaching qualification (in Dutch: SKO).

The didactical concept of the programme is project-led education. This concept implies a student-controlled form of education. To a group of between 4 and 8 students a problem is presented. The students are required to define the problem, to find and pursue a number of problem-solving strategies, to work together and assign tasks to each of the members of the group and to present a number of solutions. The study methods the programme will include are lectures (teaching theory and concepts), tutorials (teaching analytical skills) and workshops (teaching of practical and academic skills).

The student-to-staff ratio for the programme will be 16:1. This ratio may be compared to the ratio of the University of Twente as a whole which is 26:1. For the social sciences programmes of the university the ratio amounts to 30:1, whereas for the technical programmes the ratio is about 20:1.

The study year has been divided into two semesters, each of which has 20 weeks including a block of two weeks. The courses will not be spread over the entire semester but will be given in a relatively short period of time. The examinations immediately follow the courses, with no extra time to prepare for these examinations.

The number of contact hours in the programme is 500 hours in the first year and 420 hours in the second as well as in the third year. These figures lead to about 14 contact hours per week, not counting the extracurricular activities which may include teacher-student contact and not counting the hours of student counselling and the meetings between students and their mentors. If these hours are taken into account, the number of contact hours will amount to about 20 hours per week between teachers and students and another 10 hours per week of contact between students. Furthermore, the contact hours are more intensive than contact hours in other programmes, since the number of students in the class is relatively small.

A typical course of 5 EC will consist of 10 to 12 hours of lectures for the whole group of students (100 students), 20 to 24 hours of tutorials and seminars for groups of 20 to 25 students, 100 hours of self-study and 6 hours for assessments. A typical project of 12 EC will be divided into a part of 8 EC for project work. This part will consist of about 30 contact hours with the tutor, about 60 hours of group work and about 120 hours of hours of study by the individual students. The remaining part of the project (4 EC) is meant for skills training, reflection, team dynamics and guest lectures. In this part the ratio of guided work to individual study is 1:1.

The students are entitled to individual guidance by a mentor during the whole of the programme. This guidance amounts to 0.5 hours per week. Each of the mentors will have 8 to 10 students to guide. The guidance during the Personal pursuit project is about 20 % of the hours spent on these projects. To monitor the progress the students make, each student is required to maintain a portfolio. In this portfolio the students list their results, feedback given to them and personal planning, reflections and outlook. The student and the mentor will regularly discuss the student's progress, using this portfolio.

The programme management will enforce a binding study advice at the end of the first year. If a student by then does not have 60 EC worth of credits, this student is obliged to leave the programme.

The programme will have its own building in the foreseeable future. This building will be on the University of Twente campus. The students will be provided with housing facilities. In addition, the programme has class rooms for small-scale teaching and for project meetings. The University of Twente has laboratory facilities and library facilities which the students may use.

The teaching-learning environment has now been laid out on paper. In some respects reality may be different from the projections. The programme has a system for quality assurance in

place to cope with situations as these. The quality assurance documentation indicates the ATLAS evaluation committee monitoring the students' evaluations and having regular meetings with the students to hear their views on the programme. The ATLAS core team of teachers meets every two weeks to discuss the evaluations as well as other inputs regarding the quality of the programme.

Considerations

The panel considers the target group of gifted students the programme management has identified for this programme to be the right target group. The admission procedure is sound, selecting the students who have the abilities to complete the programme in an orderly way and without delay.

The programme management has ensured the intended learning outcomes to be completely and evenly reflected in the curriculum. The panel feels the concept of the programme to be well elaborated in the curriculum.

The courses of the programme are appropriate in transferring the disciplines which the students need. The theme projects provide an interesting and appropriate structure to implement the interdisciplinary nature of the programme. Still, the projects ought to be elaborated in more detail. The panel, therefore, recommends the programme management to draft the learning objectives of the projects more precisely in order to ensure these to meet one or more of the intended learning outcomes.

The panel considers the Personal pursuit projects appropriate for the students' personal development. These projects reflect the concept of *Bildung*. As these projects are inherently self-directed, the panel advises the programme management to monitor these projects closely. The programme management should, in the opinion of the panel, ensure the Personal pursuit projects meet one or more of the intended learning outcomes of the programme, to ensure that credits are given for the 'learning' and not for the activities. As the students' Personal pursuit projects are a choice of the students themselves who, also, draft their own criteria, linking the project to the learning outcomes seems to be even more important. The panel does not question the willingness and the ability of the programme management to achieve this. The panel applauds the role of the examination board in approving the plans for these projects.

The degree of choice of courses the students have is satisfactory and provides the students with the means to prepare for the master's programme of their preference.

The panel assesses the course material of the programme to be appropriate in terms of quality and level. Nevertheless, the panel encourages the programme management to make certain that the choice of texts is aligned with the learning objectives.

The members of the staff core team the panel has met are all very motivated and enthusiastic teachers. The cohesion of the team is strong, enabling them to execute the programme in the way the programme management envisages. The disciplinary knowledge of the teachers is up to standard. Their didactical abilities meet the requirements of this small-scale, intensive programme. The panel feels the teachers will be able to effectively transfer knowledge and skills to the students in the programme.

This didactical concept of project-led education is well-suited for this programme. Teams of 4 to 8 students have to handle ill-defined situations that they have to redefine into a set of problems for which they conduct research and design solutions. The didactical concept has been elaborated well in the interdisciplinary projects in the curriculum.

The student-to-staff ratio of 16:1 is appropriate for this small-scale programme and compares favourably to the ratios in the other programmes of the university. The number of contact hours is adequate as well. The study guidance as represented in the mentoring system is good.

The building and the material facilities of the programme enable the staff and students to organize the learning processes effectively.

The panel regards the programme to be very ambitious with respect to the workload for its staff. The panel would advise the programme management to be careful in adjusting the programme to the resources available and to identify the priorities. One of the examples of this may be found in the study guidance. If the study guidance by the mentor takes about 0.5 hours per week per student, with 300 students in the programme (steady state) this would amount to 150 hours per week. The panel questions the feasibility of the study guidance in this form, recommending the programme management to look for less labour-intensive methods.

The panel has observed awareness on the part of the programme management and the teachers to adjust the plans if the real situation would prove to differ in important aspects from the plans. The programme management and the staff are well aware of the process they are in and the problems they may encounter. The panel, therefore, is confident the programme management will be able to execute the programme along the lines now drawn.

Conclusion

The panel assesses the standard *Teaching-learning environment* (standard 2) as being satisfactory.

4.3 Assessment (standard 3)

<i>The programme has an adequate assessment system in place.</i>
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Outline of findings

The programme has an examination board. This board will operate in accordance with the applicable Dutch law. The examination board determines the academic progress made by the students in the programme, approves the grades of the students for the examinations they have taken, appoints the examiners and the members of the assessment committee for the graduation assignment and awards the title to the students. The board has three full professors as their members and meets at least four times per year.

The assessment of the courses includes assignments, written examinations as well as oral examinations. Some of these examinations may be half way the course. The projects are assessed on the basis of the project report. In addition, each of the students, individually, has to present part of the project results and will be, again individually, be questioned on the project and the project results. The assessment procedure is meant to ensure each of the

students has achieved the learning objectives of the project. In the workshops the practical skills of the students are assessed. The Personal pursuit project will be assessed using the evidence the student has assembled, including the assessment by an external teacher. The final assessment will be performed by a staff member of the programme.

The programme management intends to assess the examinations and assessments before they will be taken by the students. The examinations are not only meant to assess the progress the students have made in the programme but also to provide feedback to the students. Results of examinations will only be approved in extraordinary circumstances.

For a theoretical course one assessor examines the students. The reports of the projects and the oral presentations by each student of the team will be assessed by at least two assessors. The programme management intends to evaluate draft versions of all examinations and assessments by a second assessor.

In the final semester the students will complete their Graduation project. This project may be an individual or a group project. The topic to be addressed in this project ought to be the logical outcome of the courses the student has taken and the projects the student has executed. The project will normally be completed in a university laboratory or company in the Netherlands. The assessment procedure of the project ensures most of the learning outcomes to be met. The Graduation project will be assessed by two teachers. The assessment procedure includes a written report, a presentation and a defence in a closed session.

Graduates of the programme will have the competences to enter the labour market. However, they will be advised to continue their studies in a master's programme. The programme management estimates 1/3 of the students to continue their studies at the University of Twente and 2/3 to do their master's at another university. A number of students will proceed to obtain a PhD. This, however, will not be the majority.

The graduates of the programme are broad-based engineers with a profile different from the traditional specialist engineer. The graduates may take courses preparing them for specific master's programmes. So, the programme management has indicated the courses students should take in the second and third year to be able to pursue their studies in master's programmes like Mechanical Engineering or Psychology.

During the site visit directors of education of a number of selective high level master's programmes have indicated students who have completed this programme to be suited to be admitted to their master's programmes.

The programme management expects about 20 % of the students to drop out after the first year. The programme management believes this drop-out rate to be feasible, mainly because of the strict selection procedure for incoming students.

Considerations

The examination board of the programme will work in accordance with applicable Dutch law and is an important safeguard for the quality of the assessments in the programme as well as for the level of the graduates of the programme.

The assessment methods the programme management intends to adopt conform to the learning objectives of the courses and the projects, are very well elaborated and are appropriate to assess the individual contribution of students in the case of group projects.

The panel is positive about the intention of the programme to have all examinations reviewed by a second examiner. The panel felt, nevertheless, these plans not yet fully elaborated and would advise the programme management to work out these plans in more detail. Especially, the plans for the assessment of the personal pursuit projects need to be formulated thoroughly.

The panel considers the assessment of the Graduation project by two assessors and by means of a report as well as an oral defence to be adequate. When this project is a group project, the assessment procedure enables the assessors to identify and rightly assess the individual performance of each of the students.

The panel is confident the graduates of the programme will have the capacities to be admitted to a number of demanding master's programmes and will, therefore, be able to pursue their careers to become the engineers with the broad perspective the programme management wants to educate. The choices for courses the students can make allow them to prepare for a number of interesting master's programmes. The panel agrees with the programme management to advise the students not to enter the labour market upon completion of this bachelor's programme.

Conclusion

The panel assesses the standard Assessment (standard 3) to be satisfactory.

4.4 Graduation guarantee and financial provisions (standard 4)

The institution guarantees students that they can complete the entire curriculum and makes sufficient financial provisions available.

Outline of findings

In the information dossier the programme management has confirmed that students entering the programme will be given the opportunity to complete their studies.

The programme management has drawn up a budget for the programme. The budget has been calculated on the basis of 100 incoming students in the steady state, a projected drop-out rate of 20 % in the first year and a student-to-staff ratio of 16:1. The staff to be involved in the programme will mainly come from the existing programmes of the University of Twente. Some 20 % of the teachers will be recruited from outside the university.

On top of the regular tuition fee in the Netherlands (€ 1,750 per year) the students will be charged an extra tuition fee of € 1,700 per year, leading to a total fee of about € 3,500 per year. The main revenues of the programme will come from funding by the Dutch government. The costs for the development and the execution of the programme are estimated to be about € 3,000,000 per year. Overhead costs of the programme will be borne by the Faculties which participate in the programme. The budget figures show a loss in the years to come. The University of Twente is prepared to finance the investments in the

programme in the first years and to cover the losses in the years to come for an amount of about € 500,000 per year.

Considerations

The panel considers the guarantee by the University of Twente that students will be able to complete the programme to be appropriate.

The panel, also, considers the budget the programme management has drawn up to be realistic. The funding by the Faculties and the University of Twente constitutes important financial safeguards, giving the programme ample opportunity to develop and execute the programme in the way the programme management has envisaged. The panel regards the financial basis of the programme to be sound.

Conclusion

The panel assesses the standard Graduation guarantee and financial provisions (standard 4) to be satisfactory.

5 Overview of the assessments

The panel presents their assessments for each of the standards and for the programme as a whole, as outlined in chapter 4, in the following table.

Standard	Assessment
1 Intended learning outcomes	Satisfactory
2 Teaching-learning environment	Satisfactory
3. Assessment	Satisfactory
4 Graduation guarantee and financial provisions	Satisfactory
Conclusion	Satisfactory

Annex 1: Composition of the panel

- Prof. dr. Josee van Eijndhoven (The Netherlands), chair, is retired Professor of Sustainability Management, Erasmus University Rotterdam; She has a PhD in the Natural Sciences from Leiden University in the Netherlands. Her original education was in chemistry. She is a member of the Netherlands Academy for Technology and Innovation. She has worked at Utrecht University in the area of Science and Society. She conducted projects on risk assessment and risk communication around the chemical industry, for the EU and several Dutch ministries. From 1991-2001 she was the director of the Rathenau Institute in The Hague. From 2001-2006 she was the President of the Executive Board of Erasmus University Rotterdam.
- Prof. dr. Mark Somerville (United States of America), member, Professor of Electrical Engineering and Physics, Olin College, Boston, USA. He joined Olin College from Vassar College, where he had been an Assistant Professor of Physics since 1998. He holds M.S. and Ph.D. degrees in electrical engineering from MIT, as well as an M.A. (first class honors) in physics from Oxford University. He did his undergraduate work at the University of Texas at Austin, where he earned a bachelor of science (highest honors) in electrical engineering as well as a bachelor of arts (special honors) in liberal arts (English concentration). His academic honors include the Joint Services Electronics Program Doctoral and Post Doctoral Fellowship, the Office of Naval Research Graduate Fellowship, and the Rhodes Scholarship.
- Dr. Cis van den Bogaert (Belgium), member, received a PhD in elementary particle physics from the University of Antwerp. He worked at the Belgian Consumer Association in the unit for comparative quality assessment and at the Flemish Interuniversity Council (VLIR) as project leader for educational professionalization. He taught and organized bridging courses for freshmen and coordinated tutoring activities at the University of Antwerp. He is the secretary of the university's Education Council and heads the Department of Education in the university's central administration. The tasks of his department are situated in the domains of educational policy, lifelong learning, doctoral schools, quality assurance and educational innovation, education and examination regulations, and educational administration (study programmes, enrolment, diplomas).
- Drs. Marjolijn Vermeulen (The Netherlands), member, was trained as a physicist at the Radboud University Nijmegen. She was a board member of the Interstedelijk Studenten Overleg (ISO). She worked at Platform Bèta Techniek as a programme manager for several projects aimed at stimulating excellence in higher education (Sirius) or the increase of the intake in science and technology programme. She was Policy Advisor in Institutional development at Erasmus University Rotterdam and is currently working at Radboud University Nijmegen as liaison officer for external relations. In 2012, she participated in the NVAO-panel that assessed applications for the Distinctive feature 'Small-scale and intensive education'.

- Esther van Duin, MSc (The Netherlands), student member, has a Bachelor's degree in Psychobiology at the University of Amsterdam and graduated from the Research Master Brain and Cognitive Sciences-Neuroscience. She is currently working as a research-assistant in genetics at the Psychiatry Department of the Amsterdam Medical Center (AMC). She has been selected as member of the Nationale Denktank for 2012, a think tank of young professional and intellectuals who advise on national and global societal issues and challenges.

Annex 2: Schedule of the site visit

The panel undertook a site visit on 15 June 2012 as part of the external assessment procedure regarding the Academic bachelor programme Technology and Liberal Arts & Sciences submitted by the University of Twente. The schedule of the visit was as follows.

- | | |
|---------------|---|
| 08.30 – 09.00 | Arrival of panel and deliberations (internal) |
| 09.00 – 09.30 | Meeting with representatives of University management team and programme management <ul style="list-style-type: none">▪ Prof. E. Brinksma, rector of University of Twente▪ Prof. T. Mouthaan, dean of Faculty of Electrical Engineering, Mathematics and Computer Science, chair ATLAS Board▪ K. van Ast MSc, vice-president of the Executive Board |
| 09.30 - 10.30 | Meeting with programme management <ul style="list-style-type: none">▪ Prof. J. Herek, ATLAS dean▪ K. Ruijter MSc, programme manager▪ L. Krab PhD, project manager |
| 10.30 – 10.45 | Panel deliberations (internal) |
| 10.45 – 11.45 | Meeting with representatives of the Programme Council and Curriculum Development Group <ul style="list-style-type: none">▪ Prof. J. Herek, chair Programme Council and ATLAS dean▪ Prof. M. Elwenspoek, Programme Council▪ Prof. A. Need, Programme Council▪ Prof. P. Brey, Programme Council and chair ATLAS Examination Board▪ W. Wits PhD, Programme Council▪ S. Van Balen BSc, student member Programme Council▪ F. Janssen BSc, student member Programme Council▪ J. Flokstra PhD, Curriculum Development Group |
| 11.45 – 13.00 | Lunch and panel deliberations (internal) |
| 13.00 – 13.30 | Visit to the ATLAS programme's prospective premises |
| 13.30 – 14.30 | Meeting with teaching staff <ul style="list-style-type: none">▪ W. Wits PhD▪ K. Visscher PhD▪ R. Van Damme PhD▪ A. Beldad PhD▪ Prof. M. Boon▪ P. Wilhelm PhD▪ J. Homminga PhD▪ M. van der Hoef PhD |

- 14.30 – 15.15 Meeting with representatives of the programmes where ATLAS graduates may continue their studies
- J. Flokstra PhD, programme director Nanotechnology, member Curriculum Development Group
 - Prof. A. de Boer, programme director Mechanical Engineering, member ATLAS Examination Board, member Curriculum Development Group
 - Prof. S. Kuhlmann, programme leader Twente Graduate School Programme GKI, member Programme Council, member ATLAS Examination Board
 - H. Boer PhD, programme director Psychology
 - M. Letteboer PhD, programme director Applied Physics
 - Prof. V. Subramaniam, scientific director MIRA, Institute for Biomedical Technology and Technical Medicine
 - K. Eijkel PhD, director Kennispark
- 15.15 – 15.45 Panel deliberations (internal)
- 15.45 – 16.00 Second Meeting with programme management
- Prof. J. Herek, ATLAS dean
 - K. Ruijter MSc, programme manager
- 16.00 – 16.45 Panel deliberations (internal)
- 16.45 – 17.15 Close of visit with presentation of preliminary findings by the panel's chair

Annex 3: Documents reviewed

Programme documents presented by the institution before the site visit

- Report for application for initial accreditation of the new Bachelor of Science degree (BSc) programme, including appendices, 25 January 2012
- Complementary information on ATLAS, on request of the NVAO panel, 4 June 2012

Documents made available during the site visit

- Examination Regulations by the ATLAS Examination Board
- Verwachte instroomvolume in University College (market research document), 2011
- Minutes of Programme Council ATLAS
- Internal Quality Assessment of ATLAS
- Curriculum vitae staff ATLAS
- Study Materials (books)

Annex 4: List of abbreviations

EC	European Credits
ECTS	European Credit Transfer Scheme
NVAO	Accreditation Organisation of the Netherlands and Flanders

The panel report has been ordered by NVAO for the initial accreditation of the academic bachelor programme Technology and Liberal Arts & Sciences of the University of Twente.

Accreditation Organisation of the Netherlands and Flanders (NVAO)

Parkstraat 28

P.O. Box 85498 | 2508 CD DEN HAAG

T 31 70 312 23 30

F 31 70 312 23 01

E info@nvaio.net

W www.nvaio.net

Application number: 000227