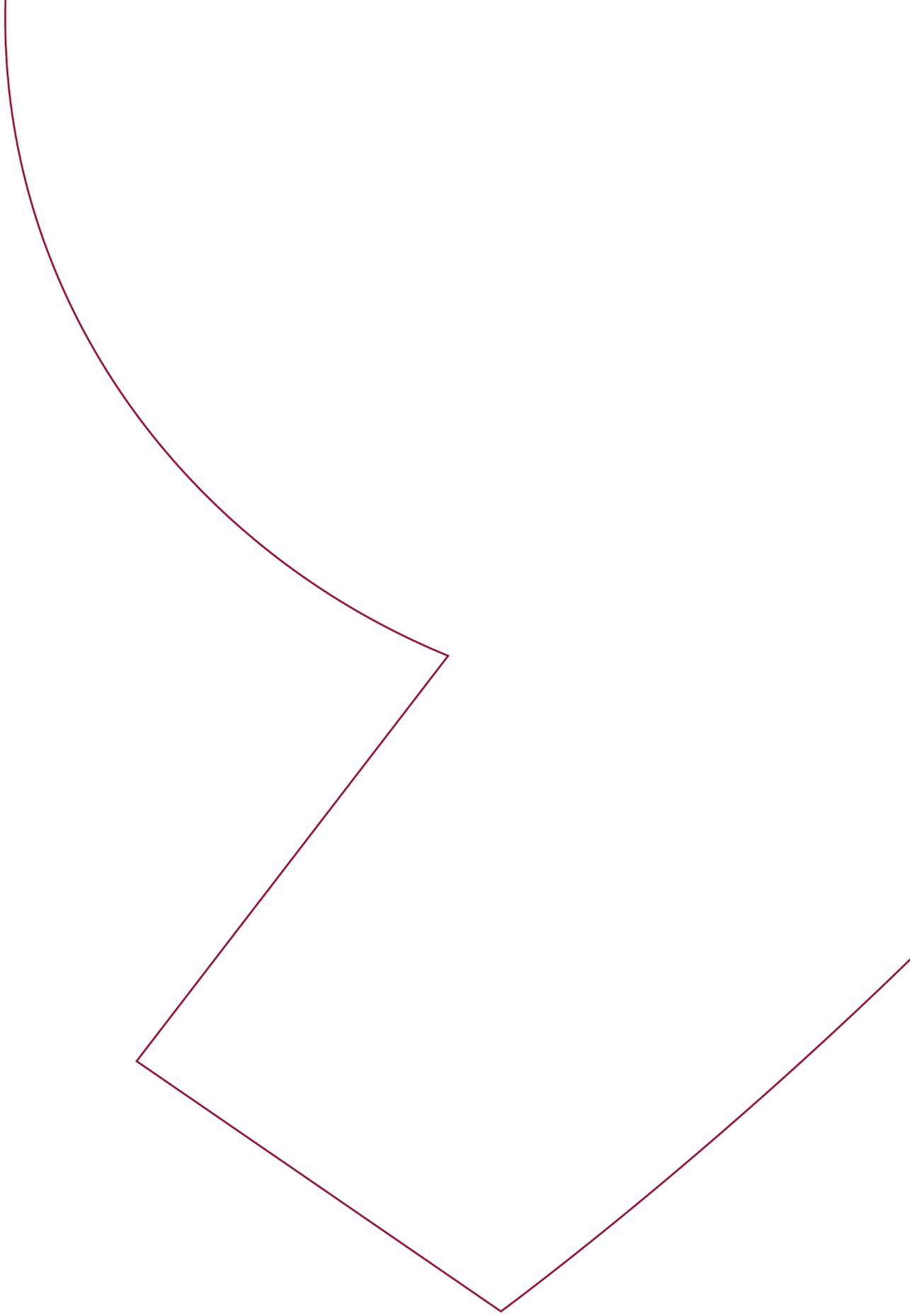# ASSESSMENT REPORT

Limited programme assessment

**Bachelor programme
Informatics**
Full-time

Fontys University of Applied Sciences

ASSESSMENT REPORT

Limited programme assessment

Bachelor programme Informatics
Full-time

Fontys University of Applied Sciences
Fontys Technology and Logistics Institute Venlo

Croho registration: 34479

Audit Panel
H. Brezet
U. Van Heesch
B. van Moorsel
J. Toonen
Secretary
I. van der Hoorn

TABLE OF CONTENTS

1. GENERAL AND QUANTITATIVE DATA

Name Institution	Fontys University of Applied Sciences
Status	Funded
Outcomes of Institutional Quality Assessment	Positive, 30-08-2019
Name of programme in Central Register of Higher Professional Education (CROHO)	B Informatica (Information Technology)
ISAT-code CROHO	34479
domain/sector croho	Technology
Orientation and level	Hbo bachelor
Degree	Bachelor of Science
Tracks	▪ Business Informatics ▪ Data Science / AI ▪ Software Engineering ▪ Embedded Software
Number of credits	240
Location	Venlo
Variant	Full time
Language(s)	English with some year 1 classes in Dutch or German
Date site visit	14-05-2024

2. SUMMARY

The Informatics programme of Fontys University of Applied Sciences in Venlo educates its students to become versatile IT professionals. The programme aims to prepare students to operate in a dynamic, rapidly changing, international IT-environment. It offers a thorough and comprehensive base in Informatics and can be characterized by being international, student-centered with a personal touch, and practice-oriented with a focus on software engineering. After their studies, students can work as software developer, database developer, developer of artificial intelligence or data scientist, among others.

The Informatics programme is part of the Fontys Technology and Logistics Institute (FTenL) in Venlo. With currently about 334 students, the Informatics programme has become the largest programme of FTenL.

Standard 1. Intended Learning Outcomes
The panel finds that the intended learning outcomes of the English-language Informatics programme **meet the requirements of Standard 1**.

The programme's intended learning outcomes are based on the HBO-i national IT Domain Descriptions (2018), incorporating feedback from the industry and aligning with the European e-Competence Framework. The focus on software engineering resonates with the needs of the (inter)national and regional industry.

The intended learning outcomes align with the Dublin descriptors and the HBO standards for bachelor level, with proficiency levels reflecting increasing complexity and autonomy from years one to four. Graduates must demonstrate level 3 proficiency in key activities across all architectural layers as well as professional skills such as ethics, management, and communication.

Research skills are appropriately integrated, enhancing practical problem-solving abilities and contributing to finding suitable solutions to technical issues. The programme's international orientation is evidently represented in the intended learning outcomes, for instance when it comes to working together internationally and interdisciplinary.

Standard 2. Teaching-learning environment
The panel considers that the well-structured Informatics programme ensures that students can achieve the intended learning outcomes. The level of mastery of competences increases throughout the curriculum. The learning objectives are clearly formulated, and the modules contribute to developing the required knowledge and skills.

Content-wise, the foundation phase (first three semesters) offers a solid base in informatics. The panel suggests incorporating more modern programming languages, as well as paying more (regularly) attention to topics like DevOps and cloud computing. Despite this, the projects effectively connect to industry needs, with students working on real-world projects from the start. The curriculum maintains horizontal and vertical cohesion, with modules contributing to the central projects.

From the fourth semester on, students can personalise their learning by choosing tracks and electives. The programme's practical orientation includes projects, internships, and guest lectures from industry professionals. The development of professional behaviour and research skills is integral, though the panel recommends enhancing the focus on research methodologies in projects, where applicable.

With a significant number of German and other international students, the programme's international orientation is supported by offering the programme in English and providing

Dutch language courses. It's clear to the panel that this programme, its students and the regional field benefit from the international environment, which legitimises the English-taught programme. Despite some understaffing – which the programme is working on – the staff's subject matter expertise and the personal approach are appreciated. Facilities are adequate and the use of industry-standard tools enhances the learning environment.

The programme succeeds in creating a close-knit international learning community. Student involvement is high, with feedback mechanisms leading to curriculum adjustments. Overall, the panel concludes that the Informatics programme **meets the requirements for Standard 2**.

Standard 3. Student assessment
The panel reviewed the Informatics programme's assessment system and found it satisfactory, despite the absence of a formal testing programme. The assessment policy aligns well with FTenL's standards, ensuring valid, reliable, and transparent assessments. The programme demonstrates strong alignment between learning objectives and assessment methods, transparent assessment matrices, and clear assessment criteria. Students are generally satisfied with the transparency and fairness of assessments.

Key strengths of the Informatics' assessment system include collaborative exam construction, adherence to the four-eye principle, and analysis of results on a regular basis. Graduation projects follow robust procedures, ensuring that students meet intended learning outcomes through comprehensive supervision and assessment processes.

The panel noted that some assessment forms lacked detailed feedback. The Exam Board, active and critical in its oversight, has already addressed this issue and emphasized the need for more comprehensive written feedback to complement oral feedback. The Exam Board showed the panel that it is sufficiently in control.

Overall, the panel concludes that the Informatics programme's assessment system is effective and **meets the criteria for Standard 3**.

Standard 4. Achieved learning outcomes
The panel reviewed 15 final projects, finding that students generally demonstrate the intended learning outcomes. While some projects were highly complex and impressive, others were less so, but all met HBO-bachelor level standards.

The panel noted a lack of full analyses and design documents as part of the final projects. It recommends the inclusion of e.g. Software Requirements Specifications (SRSs) and/or Software Design Documents (SDDs) in the final projects.

The panel confirms that the programme ensures students demonstrate bachelor-level competencies. Industry feedback is positive, highlighting graduates as adaptive and greatly employable.

The panel confirms that students demonstrate bachelor-level competencies and concludes that the Informatics programme **meets the requirements of Standard 4**.

Overall conclusion:
The panel finds that the Bachelor of Informatics offered by Fontys University of Applied Sciences in Venlo meets the requirements of all the standards of the limited NVAO framework for programme accreditation. The panel advises that the NVAO re-accredit the programme on that basis.

Upon agreement with the panel members the chair adopted this report on October 4th 2024.

3. INTRODUCTION

The Informatics programme trains its students to become versatile IT professionals. The programme aims to prepare students to operate in a dynamic, rapidly changing, international IT-environment. After their studies, students can work as software developers, database developers, developers of artificial intelligence or data scientist, among others.

The Informatics programme is part of the Fontys Technology and Logistics Institute (FTenL) in Venlo. FTenL offers its about 1.100 students study programmes in the domains of Logistics, Engineering (Mechatronics, Mechanical Engineering and Industrial Product Design) and IT.

With currently about 334 students, the Informatics programme has become the largest programme of FTenL. It offers a thorough and comprehensive base in Informatics and can be characterized by being international, student-centered with a personal touch, and practice-oriented with a focus on software engineering.

Assessment framework
For this audit, the panel applied the standards for the limited programme assessment, as listed in the "Assessment Framework for higher education accreditation system Netherlands, September 2018". The site visit took place on May 14, 2024.

Cluster visitation
Fontys' Bachelor's degree programme in Informatics is part of the cluster 'HBO Informatica'. This cluster also includes the Informatics programmes of Avans University of Applied Sciences, Leiden University of Applied Sciences, Rotterdam University of Applied Sciences, Inholland University of Applied Sciences, NCOI University of Applied Sciences and NHL Stenden University of Applied Sciences.

Follow-up on recommendations from previous accreditation

Recommendations 2017	Follow-up
Make the internationalisation aspect an integral, but explicit, part of the intended learning outcomes.	The HBO-I domain description [HBO-i 2018] states explicitly for the area targeted interaction of professionals skills that students have to "build up trust ... in an inter-cultural context." This means that internationalisation is now part of the learning outcomes. (see Standard 1)
Interlink the various elements of internationalisation and add coherence to them in an explicit learning track.	All communication is now in English, except for semester 1. From semester 2 on, project groups are composed of students of different nationalities and cultures. Since 2016, the number of international students has been growing. Now, about 40% of the new students are international. Therefore, various elements of internationalisation are built-in into the programme. (see Standard 2)
Expose all students equally to multidisciplinary activities.	Nowadays, most students choose a minor in which they work together with students from other domains. FTenL offers modules for semester 7 students of IT and Engineering programmes. And in the autumn of 2023, Informatics started with project groups composed of semester 7 students of IT and Logistics programmes.

4. FINDINGS AND JUDGEMENTS

4.1. Intended learning outcomes

> **Standard 1: The intended learning outcomes tie in with the level and orientation of the programme; they are geared to the expectations of the professional field, the discipline, and international requirements.**
>
> <u>Explanation</u>: The intended learning outcomes demonstrably describe the level of the programme (Associate Degree, Bachelor's, or Master's) as defined in the Dutch Qualifications Framework, as well as its orientation (professional or academic). In addition, they tie in with the regional, national or international perspective of the requirements currently set by the professional field and the discipline with regard to the contents of the programme. Insofar as is applicable, the intended learning outcomes are in accordance with relevant legislation and regulations.

Findings

The intended learning outcomes of the Informatics programme of Fontys University of Applied Sciences are based on the national IT Domain Descriptions (2018) of HBO-i with its cubic model. HBO-i is the partnership of ICT programmes in higher vocational education in the Netherlands. The cubic model was developed by representatives of the programmes affiliated to HBO-i. The European e-Competence Framework for ICT professionals was taken into account. A large number of companies provided feedback on the formulated intended learning outcomes of HBO-i. These include members of the HBO-i Advisory Board, representatives from sector organisations, and members of professional field committees of the programmes participating in HBO-i. The Professional Field Committee of Fontys Venlo plays an active role in keeping the competence profile and the curriculum up to date.

The cubic model has three dimensions, namely (i) activities, (ii) architectural layers and (iii) proficiency levels. The five activities are analyse, advise, design, realise and manage & control. The five architectural layers are user interaction, organisational processes, infrastructure, software, and hardware interfacing. Depending on the specific study programme, certain activities and architectural layers are more applicable than others. Fontys Venlo positions itself as an Informatics programme with a strong focus on the development of high-quality software as a basis for all its students. This typically results in individual profiles with high proficiency levels on the software layer.
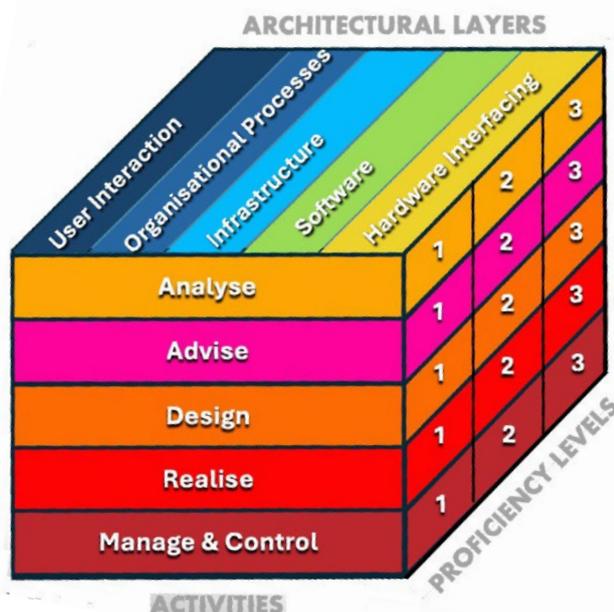

Fig. 1: Cubic model HBO-i
Source: Self-evaluation report
Fontys Informatics

The panel studied the national IT Domain Descriptions (2018) and notes that the competency profile for Informatics programmes relates to the Dublin descriptors and the HBO Standards for bachelor level.

In line with the European e-Competence Framework, the Informatics programme has three proficiency levels in terms of complexity (context and content) and autonomy. Level 1 roughly corresponds to skills on propaedeutic level, level 2 corresponds to internship level (year 3) and level 3 corresponds to bachelor level (year 4).

To succeed the programme, students must demonstrate at least three times level 3 on any architectural layer. Students are free to decide which activities they want to demonstrate at level 2 or level 3.

Activities *Architectural layers*	Analyse	Advise	Design	Realise	Manage & Control	Prof. skills
User interaction						
Organisational processes						
Infrastructure	2 or 3	2 or 3	2 or 3	2 or 3	2 or 3	3
Software						
Hardware interfacing						

Table 1. Final competency profile of the Informatics programme

Professional skills
The panel investigated the HBO-i 2018 document, the programme's 'Roadmap Professional Skills' document, and the CLUS[1] 2024 document to understand how the intended learning outcomes of the programme pay attention to Professional Skills. Professional Skills is not a dimension of the cubic model of HBO-i as such, but it is adequately interwoven in the attainment of specific levels for professional activities. The professional skills include ethics, management, research-based problem-solving, entrepreneurialism, personal development, communication and collaboration. Students must have accomplished level 3 in Professional Skills to be able to graduate.

Profile
Traditionally, the focus of Fontys Informatics in Venlo has been on software engineering. It's clear to the panel that, even today, this profile still matches the needs of the regional field of activity, which mostly consists of small and medium-sized enterprises (SMEs).

International dimension
Also part of the profile of Fontys Informatics is the international orientation of the programme, which the panel applauds. Located in the Euregion near the German border, Fontys Venlo has a substantial influx of German students. Also because of the international character of the region, regional companies look for internationally oriented employees. This has been the reason for Fontys to offer the programme in English (see Standard 2).

The panel thinks it's a strong asset of the programme that it offers foreign students the opportunity to learn Dutch during their studies. Students are positive about this. The panel spoke to several foreign students and found that some of them speak Dutch quite well. In doing so, the programme increases the chances of graduates getting jobs in the Netherlands.

---

[1] CLUS is the abbreviation of Competences, Learning goals, Educational Units, Study points per educational unit. It's a schedule describing relations between competences (competenties), learning goals (leerdoelen), learning outcomes (leeruitkomsten), educational units (onderwijseenheden) and credits (studiepunten).

During the previous visitation in 2017, the panel recommended "to make the internationalisation aspect an integral, but explicit, part of the intended learning outcomes". At that time, the 2014 HBO-i Domain Descriptions were still being used. The Domain Descriptions (2018)[2], currently used by the programme, state explicitly for the area targeted interaction of professional skills that students must "build up trust in an interdisciplinary and intercultural context". (See Table 2.)

Targeted interaction (HBO-i 2018) Determine which partners play a role in the ICT assignment, work constructively with them and communicate appropriately aimed at the desired impact.	
Sub-area	*Explanation*
Partners:	Address the various groups of cooperation partners such as stakeholders, interest groups, own team members.
Communicating	Attention to what one wants to communicate with what impact, the most appropriate form to do so and its actual implementation.
Working together	Attention to one's own role in the context of the ICT assignment, recognising and taking up tasks, addressing others, seeking enrichment and building trust in an interdisciplinary and intercultural context.

The panel also notes that in the infrastructural architectural layer's final qualifications, students are also expected to consider international developments in their designs and advice.

Research skills
Looking at the research skills, the panel concludes that they are reflected in the intended learning outcomes in a way appropriate to a practice-based bachelors' programme. See table 1 on the next page. Attaining these research skills contributes to finding a suitable solution to an issue and serves a proper performance of the daily work of an IT-professional.

Research Skills (HBO-i 2018) Considering ICT assignments critically from different perspectives, identifying problems, finding effective approaches and arriving at appropriate solutions	
Sub-area	*Explanation*
Approach	Identifying the problem, determining direction of the solution and choosing an appropriate approach.
Research	Throughout the solution process being curious and asking questions from different perspectives, answering these questions with an appropriate approach pragmatically, critically and based on sources.
Problem solving	Being able to solve problems both methodically and creatively, finding alternatives and being able to go through one's own and others' chain of reasoning critically.

Considerations and Judgement
The panel finds that the intended learning outcomes of the English-language Informatics programme **meet the requirements of Standard 1**.

The programme's intended learning outcomes are based on the HBO-i national IT Domain Descriptions (2018), incorporating feedback from industry and aligning with the European e-Competence Framework. The focus on software engineering resonates with the needs of the (inter)national and regional industry.

---

[2] Only recently a new 2024-version of the domain description has been published. The programme currently checks whether adaptation of the intended learning outcomes to the 2024-version of the HBO-i domain description is necessary.

The intended learning outcomes align with the Dublin descriptors and the HBO standards for bachelor level, with proficiency levels reflecting increasing complexity and autonomy from years one to four. Graduates must demonstrate level 3 proficiency in key activities across all architectural layers as well as professional skills such as ethics, management, and communication.

Research skills are appropriately integrated, enhancing practical problem-solving abilities. The programme's international orientation is evidently represented in the intended learning outcomes.

4.2. Teaching-learning environment

> **Standard 2: The curriculum, the teaching-learning environment and the quality of the teaching staff enable the incoming students to achieve the intended learning outcomes.**
>
> Explanation: The intended learning outcomes have been adequately translated into educational objectives of (components of) the curriculum. The diversity of the students admitted is taken into account in this respect. The teachers have sufficient expertise in terms of both subject matter and teaching methods to teach the curriculum and provide appropriate guidance. The teaching-learning environment encourages students to play an active role in the design of their own learning process (student-centred approach). If the programme is taught in a language other than Dutch, the programme must justify its choice. This also applies if the programme bears a foreign language name. The teaching staff must have a sufficient command of the language in which they are teaching. Services and facilities are not assessed, unless they have been set up specifically for the programme concerned.

Findings

Curriculum

Programme structure and linkage to competencies
The four year Informatics programme comprises 240 EC, divided into 60 EC per academic year. Each academic year is divided into two semesters and each semester is divided into two periods.

The panel notes that the CLUS schedule provides an overview of the curriculum and of the elaboration of the intended learning outcomes. The schedule shows how the programme prepares students for reaching the intended learning outcomes during their graduation project. The panel studied the curriculum and the CLUS schedule intently and concludes that the learning objectives of the modules collectively build up to students achieving the intended learning outcomes. The competencies of the programme are elaborated in learning objectives at three levels: propaedeutic, main and final phase. The table below shows an example of the learning objectives of the central Project of the second semester.

Table 1. Learning objectives of Project 2 (semester 2)

The student …	Activities					Architectural layers					Professional skills
	Analyse	Design	Realise	Manage & control	Advise	User interaction	Org. processes	Infrastructure	Software	HW interfacing	
… analyses the functional requirements of a business case and model them in a consistent set of diagrams.	2					x	x		x		1
… develops the design (IU, DB, task logic) for a web application, based on the functional requirements, and describes it with a consistent set of models (design)		2				x	x		x		1
… builds tests based on the functional requirements to manage software quality (implement)			2						x		1
… builds a multi-tier application realizing the design (implement)			2						x		1
.. uses and evaluates agile project management techniques in a project with changing requirements (manage)				2					x		1

Content
The panel members investigated various modules and projects of the Informatics programme. They found that FTenL offers a solid curriculum. The first three semesters – also called the foundation phase – are designed for students to develop a thorough understanding of informatics. In this phase, students learn about databases, algorithms, data structures, programming concepts (Java), computer architecture and networks. They get trained in the use of development processes, such as Entity Relationship Model (ERM), agile frameworks like Scrum, Unified Modeling Language (UML), version control and testing.

The panel found that some of the courses in the foundation phase are somewhat traditional in nature. For example, the waterfall model is used in semester 1. As of semester 2 onwards, the agile approach that is mainly used in professional practice, is advocated. Also the programme uses PHP in semester 1 since students do no yet have better programming skills to use Java. Java is the language in which student learn (concepts of) programming and is the main programming language in the foundation phase. The panel finds that using both PHP and Java in the foundation phase helps students learn programming. However, the panel thinks it could also be interesting for students to work with more modern programming languages (e.g. Phyton).

The professional field representatives told the panel that they would like students to also learn more about DevOps and cloud computing, in general. The integration of DevOps in the programme is planned for. Cloud computing is already integrated in semester 3. The panel thinks it is advisable to pay attention to cloud computing with some regularity; especially transferring to a production environment takes practice.

Whereas the some courses in the foundation phase might seem a little traditional, the projects more than compensate for it. The projects are a particularly good means for connecting to the needs and realities of the professional field. From the start, students work on a 10 EC project every semester (except for semester 5 (internship), 6 (minor) and 8 (graduation)).

The panel understood that the foundational semesters (1 to 3) are relatively stable, whereas semester 4 and 7 are more flexible by design through regularly offering new electives which allows the adaptation of important trends. Students must choose one track[3] for semesters 4 and 7. For their track, students must choose three modules (each 5 EC) of that track, as well as a track specific project 4 (10 EC). That leaves three free electives to choose from. Table 2 shows the tracks, the modules available per track and additional modules to choose from for semesters 4 and 7.

Sem	Track Business Inform.	Track Data Science/AI	Track Embedded Sys.	Track Software Engineering
4	Business Processes	Data Mining	Intro to Embedded	Databases 2
4	Data Warehouses	Data Warehouses		Front End Development
4	IT Service Mgmt	Databases 2	OS & Concurrency	OS & Concurrency
4	Introduction to Cyber Security, Module from another Programme/Domain			

Sem	Track Business Inform.	Track Data Science/AI	Track Embedded Sys.	Track Software Engineering
7	Project Management	Advanced AI	Internet of Things	Enterprise Sys Development
7	Module from another Programme/Domain			

The panel was impressed by the very active and highly involved Professional Field Committee (PFC) of Fontys Informatics. This committee provides the programme with input on current

---

[3] There is no final profile linked to a track. If a student finds that the chosen track is not interesting after all, he can then make other choices further down in the programme.

trends and developments, which affect the knowledge and skills that students need to master in order to enter the job market well prepared. The panel applauds the programme for its ability to very rapidly develop new modules covering topical trends and developments. The panel finds this particularly commendable as there are no lectureships (Dutch: *lectoraten*) in the field of informatics at the Fontys location in Venlo. The panel encourages the Informatics programme to continue this *modus operandi*.

During the site-visit, the panel was given 'a tour' of different projects that students are currently working on. The panel members were pleasantly surprised by the substantive conversations they were having with the students about their projects. This was quite compelling. The panel was particularly charmed by the innovative Software Factory projects in semester 7. It also became clear that for all these projects students work with modern development tool chains, such as Git, Github, GitHubActions, and IntelliJ.

Coherence
FTenL offers a cohesive curriculum for its Informatics programme. The panel found that each semester has a central project to which individual modules contribute (horizontal cohesion). Project 3, for example, is about mobile development. Students get theory on Algorithms & Data Structures and Computer Architecture & Networks and they also develop their designing skills and learn about applied research and data analysis. Vertical cohesion is created by building activities and architectural layers in learning paths from one skills level to the next. Overall, students are satisfied with the programme structure that shows increasing complexity. Based on the interview with students, the panel established that the research learning line still needs some attention when it comes to vertical coherence. (See subheading 'Research skills')

Creating one's own path
From the fourth semester onwards, students have ample opportunities to make their own choices to suit their interests. For example, since 2022, students can choose one out of four tracks (Business Informatics, Data Science & AI, Embedded Systems and Software Engineering) in the fourth semester. In the third year (semesters 5 and 6), students can freely select a company and a project for their internship, and they can choose a minor they are interested in, also from another (foreign) university or university of applied sciences. Semester 7 allows students to choose multiple electives. Finally, in semester 8, students select a company and a project for their graduation semester. Students, as well as the panel, are pleased with the way in which the programme offers its students the opportunity to follow their own path within the structure of the programme.

Practical orientation
The Bachelor of Informatics is clearly a practice-oriented programme. The didactical approach – the teaching is based on social constructivism – contributes to a practical orientation, by working in projects and receiving individual coaching. All projects from year 1 on, are authentic cases derived from the professional field. In the Software Factory (semester 7), small groups of students are paired with a real client, for whom they will carry out a project. During the internship in semester 5 and during the final project in semester 8, students work in the IT field.

Some lectures and workshops are given by guest lecturers from the professional field, adding to practice-orientation. In the foundation phase, the programme organises company visits and a career day to give students insight into the kind of companies they might end up working for. The fact that most lecturers have themselves worked as an IT professional, also contributes to the practical orientation of the teaching and learning environment.

Professional behaviour
The panel observes that particular emphasis is placed on fostering professional behavior. Integrated in the modules and projects students learn to communicate, report, present, reflect, pitch, apply for jobs and work together. Students noted that these lessons help them with

overcoming the culture clash, as they learn to work together with people from different backgrounds. Also, ethics, psychology and personal development are part of the professional behaviour learning path.

Research skills
Starting from the first semester, the program engages students in practice-based research. Students develop their research skills during projects. The CLUS shows that each semester focuses on developing the students' professional skill in 'Investigative problem solving'. This includes modules such as Programming concepts 1 and 2, Analysis & Design and Algorithms & Data Structures. The third semester contains the Applied Research & Data Analysis module, in which students learn about various systematic research methodologies. Among other things, students are taught how to do literature research, how to prepare interview questions and how to conduct an interview. Students also learn to make reasoned choices for a specific framework or development platform. They must elicit customer/user requirements, specify criteria, identify how those criteria can be measured, come up with a scoring model, etc.

Although students learn about various research methods in semester 3, the panel does not see this fully reflected in all subsequent projects. For example, some of the final projects the panel assessed did not include a section on research methodology, although the projects would have benefitted from research approaches. The panel recommends paying structural attention to the research method(s) to be used and, even more important, the reasoning behind these choices.

The opportunity for students to participate in research projects as a student assistant or for their internship or graduation project is an asset of the programme, specifically for those who are interested in applied research. For them, FTenL also offers the two minors A-Systems and Smart, both focusing on applied research.

International orientation
The panel learned that Fontys Venlo attracts many students from Germany, because of its location close to Germany. On top of that, some German students prefer the more practice-oriented Dutch higher vocational education (*HBO*) over the more theoretical German education. Because of its Euregional function and the strong interest of German students, FTenL chose to offer the Informatics programme in English. The panel understands and supports this choice. Moreover, this choice also stemmed from the needs of the regional field, many of which operate internationally.

Besides Dutch and German students, the English-language programme also attracts other international students (± 40%), mainly from European countries. The panel finds that the programme has thought carefully about its language policy. For a soft landing, during the first project (semester 1) students are divided in groups of their own language (Dutch, German or English). As of semester 2, students work together in multicultural groups, coached by lecturers of diverse origins. Having exchange students on the programme adds to this. The panel found that students and lecturers truly form a close-knit international community.

The lecturers' English proficiency clearly meets high standards, with all of them having achieved C1 or C2 levels. The panel was also truly impressed by the profound English communication skills of all students.

Furthermore, it's commendable that the programme offers its international students the opportunity to learn the Dutch language to support integration into the regional work field. Currently, foreign students can still choose whether to learn Dutch. From next year on it will become mandatory.

Staff

The ability to build an international community of students and staff who feel at home in their studies is truly a strong and distinctive feature of the programme. Students appreciate the personal approach and the commitment and involvement of their lecturers. If students experience a lot of work pressure or other problems, they can always approach a lecturer to help them get back on track.

Lecturers' didactical skills are up to standard. They all have a *BKO* or are working on achieving it. It's a requirement for new lecturers to obtain the *BKO* within the first year of their employment. Students confirm that lecturers teach and coach them in a pleasant and effective manner. The panel found that the subject matter expertise of the lecturers was adequate. Most team members have a Master's degree, three have a Bachelor's degree and two have a PhD. Most of them have a degree in IT, one has a degree in Logistics and two have a degree in Mechatronics. One lecturer is currently working towards a PhD in AI and another lecturer is an assistant professor for data science at the Jheronimus Academy of Data Science in Den Bosch. The panel also found that three other lecturers are currently involved in applied research.

Students have noticed that the programme is currently somewhat understaffed, as some teachers take a bit longer to respond to an email. Nonetheless, students know that they are the first priority of their lecturers and appreciate this. Indeed, teachers indicate that they experience quite a bit of work pressure. The team consists of 16 members (13,9 FTE). They try to organise their work smartly and more efficient. A clear example of making work procedures more efficient is the introduction of the curriculum committee. Before the introduction of the curriculum committee, all lecturers participated in discussions about the curriculum, which is time-consuming. Now only a small group of lecturers is involved with curriculum matters. Also in terms of time savings, it was decided to switch to group assessments instead of individual assessments for some modules. The deployment of student assistants also contributes to workload reduction for the lecturers. The panel established that the workload is still manageable for the lecturers, and they have or make time to go to conferences. However, lecturers notice that they don't have time to sometimes freewheel, try new things or participate (more) in research.

The panel established that the management team is working towards a solution to the understaffing and the associated workload. Three new junior lecturers have been hired. They have been shadowing with an experienced lecturer for some time and are now going to give lectures independently for the first time. Over time, this should reduce the workload of all lecturers.

Facilities

Students were asked about their opinion of the facilities available on campus. They expressed their satisfaction. The classrooms are adequate, as are the computer software licences available. The panel agrees that, also based on a tour around the premises, the facilities seem adequate. There are many open areas, were outlets and tables are provided, as well as essential technological requirements. The campus offers rental of digital equipment (laptops, beamers and cameras) and a digital library with access to licensed services.

The panel thinks it's beneficial for students that the Informatics programme provides elements of professional life in the learning environment. For instance, MS Teams is used for group work, Git as version control system for saving and sharing results, licenses for software (e.g. Visual Paradigm) and cloud services (e.g. MS Azure) and specific hardware for certain projects (e.g. embedded projects).

Information provision
The programme uses Canvas as the digital learning environment. On Canvas, students can find all material and information in English. Students are satisfied with the information provision. They get access to the module descriptions in time.

Student involvement
The panel noticed that students are closely involved in improving the Informatics programme. Because the programme manages to create a close-knit community, students do not experience any barrier to providing feedback to their lecturers and to the programme management.

In accordance with the FTenL policy the Programme Committee (OC) of the Informatics programme consists of two students and two teachers. The programme believes that two students cannot adequately represent the diverse perspectives of the entire student body. Therefore, in 2022, the programme founded a Student Board with about 15 student members, of all years and several nationalities. This board elects the student members of the OC. The OC meets regularly, sometimes together with the Student Board. Formal decisions are made by the OC, but these are usually pre-discussed in the Student Board.

The meeting with the students highlighted to the panel that students are well-informed about the ongoing changes within their programme. The faculty places a high value on student feedback and regularly adjusts the curriculum in response to it.

Considerations and Judgement
The panel concludes that the teaching and learning environment of the Informatics programme **meet the requirements of Standard 2,** based on the considerations below.

The well-structured Informatics programme ensures that students are able to achieve the intended learning outcomes. During the programme, the level of mastery of competences increases. The learning objectives are clearly formulated, and the modules contribute to developing the required knowledge and skills.

Content-wise, the foundation phase (first three semesters) offers a solid base in informatics. The panel suggests incorporating more modern programming languages, as well as paying more (regularly) attention to topics like DevOps and cloud computing. Despite this, the projects effectively connect to industry needs, with students working on real-world projects from the start. The curriculum maintains horizontal and vertical cohesion, with modules contributing to the central projects.

From the fourth semester on, students can personalise their learning by choosing tracks and electives. The programme's practical orientation includes projects, internships, and guest lectures from industry professionals. The development of professional behaviour and research skills is integral, though the panel recommends enhancing the focus on research methodologies in projects.

A significant number of German and other international students are enrolled in the programme. This results in a strong international orientation, not only in content but in culture as well. The strong international orientation is supported by offering the programme in English and providing Dutch language courses. Despite some understaffing – which the programme is working on – the staff's subject matter expertise and the personal approach are appreciated. Facilities are adequate and the use of industry-standard tools enhances the learning environment.

The programme succeeds in creating a close-knit international learning community. Student involvement is high, with feedback mechanisms leading to curriculum adjustments. Overall, the panel concludes that the Informatics programme meets all educational and professional standards, complying with the NVAO criteria.

4.3. Student assessment

> **Standard 3: The programme has an adequate system of student assessment in place.**
> <u>Explanation</u>: The student assessments are valid, reliable and sufficiently independent. The requirements are transparent to the students. The quality of interim and final examinations is sufficiently safeguarded and meets the statutory quality standards. The tests support the students' own learning processes.

Findings

Assessment system

The Informatics programme adopted the Assessment Policy of FTenL [2020]. The panel noticed that FTenL processes have been implemented to ensure the quality of assessment. The FTenL Assessment Policy also states that every programme writes its own testing programme (*toetsprogramma)*. Currently, Informatics does not have a testing programme. However, it does have its own testing plan. The panel viewed several tests and had extensive discussions with management, lecturers and the Exam Board about the assessment system. The documents and conversations convinced the panel that - despite the absence of a documented testing programme – the assessment does take place in a valid, reliable, independent and transparent way. The panel sees the lack of a testing programme as something that should be improved on soon if the recently assigned new assessment specialist joins the team.

The panel found evidence of the adequate functioning of the assessment system in the following:
- the adequate alignment between the modules' learning objectives and the corresponding testing methods.
- the transparent assessment matrices used for integrated assessments (projects).
- the recording of all learning objectives in the module descriptions and the availability of these module descriptions at the start of a semester.
- the students' satisfaction with the transparency regarding assessments.
- exams are constructed together with or reviewed by at least one other lecturer.
- to become appointed as an examiner it's required for lecturers to obtain the BKE (*basiskwalificatie examinering*).
- the four-eye principle that is applied in all examinations and oral examinations involve two lecturers of whom at least one is an examiner.
- the analysis of results, well-supported by TestVision, is done by at least two lecturers.
- the assessment specialist (*toetsdeskundige*) is responsible for carrying out checks regarding exam analyses. Once every semester, an exam is chosen and together with the module's coordinator and buddy, the assessment specialist evaluates whether the exam still meets the quality criteria. The panel learned that the assessment specialist recently quit. A new assessment expert has now been hired and will start soon.
- students always receive an individual grade for a group project to prevent free-riding.
- supervision of students and their assessment is separated during graduation projects to ensure objectivity.
- internal calibration sessions are carried out for internship and graduation criteria.
- external calibration of graduation projects is organised by HBO-i.

As the core tenet of the Informatics curriculum is that 'the project is the key', in each semester the project is central. Projects are graded individually, even though the work is done in a group. Since the projects never fully cover all learning goals and outcomes, all other educational modules are still assessed separately.

The panel finds that the Informatics programme uses an adequate mixture of assessment formats to assess whether students have achieved the respective learning goals. Among others, the programme uses online exams (TestVision), assignments, reports, reflections, peer assessments, oral assessments, workshops and presentations as assessment tools.

Fontys recently introduced a new philosophy on talent-based education, which will also have an impact on the education and the testing approach of Informatics. The panel learned that, in this respect, Informatics already started a pilot with programmatic testing, in which students must work on building a portfolio. The Exam Board is involved in this pilot. The panel commends the programme for its diligence in this regard.

Graduation
Graduation takes place in semester 8. During this five-month period, students carry out an assignment for a company. The panel applaud the solid procedures that the programme has in place for admission, supervision and assessment of the graduation projects.

For approval, students must provide a description of the project assignment to ensure the project allows the student to prove achievement of the intended learning outcomes. Each student is allocated with two examiners: one as supervising lecturer, the other as responsible assessor. The company provides a supervisor as well. An external domain expert (Dutch: *gecommitteerde*) is appointed to the student as part of the quality assurance procedure but does not have a supervising task.

Three weeks after the official start date, students must hand in a project plan upon which they receive feedback from their supervising lecturer. After two months, students must hand in a midterm report and present the current state of their project upon which they again receive feedback from the supervising lecturer, as well as the assessor and the domain expert. Two weeks before the end of the graduation project, students must hand in the final report, and the company supervisor hand in its overall impression of the student.

Finally, the student presents the graduation project to the assessor, both the school supervisor and the company supervisor as well as the domain expert. Assessor, supervisors and domain expert then discuss the results and decide on the final grade. If they do not come to a shared conclusion, the vote of the assessor is leading. Students are assessed based on the professional products which must be shown and explained in the final report and the presentation including the defence. With these, students must prove whether they have shown to have achieved the intended learning outcomes.

Assessment form
In preparation of the site-visit, the panel reviewed 15 graduation projects as well as the completed assessment forms. The form is well-constructed and has a clear connection to the intended learning outcomes.

The panel found that the assessments are generally imitable, and some are very comprehensive. However, there were some other completed assessment forms that contained only a few explanatory sentences. The Exam Board recognises the limited feedback and already addressed this to the programme management. The panel learned that Exam Board members regularly attend graduation sessions. They see in-depth debates between the assessor, the supervisors and the domain expert. Students receive clear oral feedback. This was also confirmed by a recent alumnus. Taking this into account, the panel recommends to the programme that the feedback given orally should also be integrated more extensively in the written assessment form.

Exam Board
Informatics is represented in the FTenL Exam Board. The panel learned from the Exam Board members that they feel sufficiently facilitated to perform their statutory duty. They also have sufficient time given to them by the management, to professionalise. For instance, two members are currently attending the SKE training. Furthermore, members take part in professionalisation sessions organised by Fontys, e.g. on talent-oriented education and programmatic testing.

The panel finds that the Exam Board is sufficiently in control. It's effective in exercising its power to appoint examiners. It has an active role in ensuring the quality of tests and it evaluates the examination process of a sample of graduation projects to ensure that the procedures laid out in the Teaching and Examination Regulations (TER) are followed. As mentioned above, members of the Exam Board also attend several graduation assessments (presentation and defence).

It is clear to the panel that the Exam Board takes a critical stance. It has a good overview of what is going on within the program, is involved in current developments regarding testing and shares its findings regularly with the program and faculty management.

Considerations and Judgement
The panel reviewed the Informatics programme's assessment system and found it satisfactory, despite the absence of a formal testing programme. The assessment policy aligns well with FTenL's standards, ensuring valid, reliable, and transparent assessments. The programme demonstrates strong alignment between learning objectives and assessment methods, transparent assessment matrices, and clear assessment criteria. Students are generally satisfied with the transparency and fairness of assessments.

Key strengths of the Informatics' assessment system include collaborative exam construction, adherence to the four-eye principle, and regular analysis of results. Graduation projects follow robust procedures, ensuring that students meet intended learning outcomes through comprehensive supervision and assessment processes.

The panel noted that some assessment forms lacked detailed feedback. The Exam Board, active and critical in its oversight, has already addressed this issue and emphasized the need for more comprehensive written feedback to complement oral feedback. The Exam Board showed the panel that it is sufficiently in control.

Overall, the panel concludes that the Informatics programme's assessment system is effective and **meets the criteria for Standard 3**.

4.4. Achieved learning outcomes

> **Standard 4: The programme demonstrates that the intended learning outcomes are achieved.**
> <u>Explanation</u>: The achievement of the intended learning outcomes is demonstrated by the results of tests, the final projects, and the performance of graduates in actual practice or in postgraduate programmes.

Findings

The panel finds that the programme fulfils the requirements of standard 4.

The panel reviewed the final projects of 15 graduates. Of these, 5 were from Dutch students, 5 were from German students and 5 were from other international students. It was not possible to select final projects based on the tracks offered, because the programme does not differentiate for that aspect at graduation. The final projects do not reflect the chosen track. If a student finds that the chosen track is not interesting after all, he can make other choices further down the programme. So, the thesis subject does not automatically correspond to the track the student has previously chosen.

The panel generally agrees with the evaluations of the projects and finds that the graduates demonstrate the realisation of the intended learning outcomes in their work. The selection included interesting assignments, of which some are complex and impressive. One of the theses even goes towards academic level. On the other hand, the panel also saw some theses of less complexity. But all in all, the students showed *HBO*-bachelor level.

The panel noted that in some final projects it was challenging to understand what the outcome of the project exactly was, as the panel did not see full analyses and design documents of the students (e.g. Software Requirements Specification (SRS) and Software Design Document (SDD) following IEEE[4] standards). Since the programme's focus is on software engineering, the panel had expected students to produce these kinds of documents. The panel recommends that the program should also require students to write a Software Requirements Specification (ISO/IEC/IEEE 29148:2018) and/or a Software Design Description (IEEE 1016-2017).

Another difficulty was the lack of comprehensive feedback from the examiners on the initially received assessment forms. In addition, the panel received 'rationale for grading' forms prior to the audit. In these forms, examiners explained in much greater detail why they gave a specific grade. These 'rationale for grading' forms made it clear to the panel that students demonstrated the intended learning outcomes, as they also clarified which learning outcomes students demonstrated during their presentation (as part of graduation) and how this was taken into account in the grading.

The panel discussed the interpretation of the graduation requirements with lecturers. It understood that students also show their knowledge and skills during the presentation. From this discussion the panel concludes that the programme ensures that all students demonstrate the realisation of the intended learning outcomes and the *HBO*-bachelor level.

Industry's opinion
The panel found out that industry is highly satisfied with the knowledge and skills of graduates. They characterise the students as adaptive, eager, and fast learners. Alumni quickly find suitable jobs and can use the knowledge and skills they have gained to good effect in their work. The panel notes that the advisory board members are close to the programme and are always thinking along about how to connect the programme to the continuously evolving needs of the field. As a result, students are well prepared for the professional field.

---

[4] Institute of Electrical and Electronics Engineers

Considerations and Judgement

The panel reviewed 15 final projects, finding that students generally demonstrate the intended learning outcomes. While some projects were highly complex and impressive, others were less so, but all met HBO-bachelor level standards.

The panel noted a lack of full analyses and design documents as part of the final projects. It recommends the inclusion of e.g. Software Requirements Specifications (SRSs) and/or Software Design Documents (SDDs) in the final projects.

The panel confirms that the programme ensures students demonstrate bachelor-level competencies. Industry feedback is positive, highlighting graduates as adaptive and greatly employable.

The panel confirms that students demonstrate bachelor-level competencies and concludes that the Informatics programme **meets the requirements of Standard 4**.

5. OVERALL CONCLUSION

The panel finds that the Bachelor of Informatics offered by Fontys University of Applied Sciences in Venlo meets the requirements of all the standards of the limited NVAO framework for programme accreditation. The panel therefore advises the NVAO to re-accredit the programme.

6.   RECOMMENDATIONS

Substantiate research methods used
Although students learn about various research methods in semester 3, the panel does not see this fully reflected in all subsequent projects. In subsequent semesters, students also conduct projects that require them to conduct research. It just seems as if, in those later semesters, less attention is paid to justifying the chosen research methods. Therefore, the panel recommends paying structural attention to the research method(s) to be used and, even more important, the reasoning behind these choices.

More modern programming languages
The panel suggests incorporating more modern programming languages, as well as paying more (regular) attention to topics like DevOps and cloud computing.

Analyses and design documents
The panel noted that in some evaluations it was challenging to understand what the outcome of the project exactly was, as the panel did not see full analyses and design documents of the students (e.g. Software Requirements Specification (SRS) and Software Design Document (SDD) following IEEE). Since the programme's focus is on software engineering, the panel had expected students to produce these kind of documents. The panel therefore recommends that the programme should also have students writing a Software Requirements Specification (ISO/IEC/IEEE 29148:2018) and/or Software Design Description (IEEE 1016-2017) in the final projects.

Testing programme
The panel found that the programme has a solid assessment system. Although implementation in practice is satisfactory, a documented testing programme is lacking. Therefore, the panel recommends that the Informatics programme document the testing programme.

Extend examiners' considerations on assessment form
The panel found that the completed assessment forms of the final projects contain limited feedback and substantiation of the grade given. The panel learned that much more feedback is given during the oral presentation and defence session. To strengthen the transparency of the assessments, the panel recommends to the programme that the feedback given orally should also be integrated more extensively in the written assessment form. It should more clearly reflect the examiners' considerations.

ANNEX I   Overview of judgements

Overview of the panels judgements Fontys University of Applied Sciences Bachelor of Informatics full time	
Standard	
Standaard 1. Intented learning outcomes	Meets the standard
Standaard 2. Teaching-learning environment	Meets the standard
Standaard 3. Student assessment	Meets the standard
Standaard 4. Achieved learning outcomes	Meets the standard
Overall judgement	**Positive**

ANNEX II   **Agenda of the site-visit**

Bachelor of Informatics
The site visit took place on May 14 2024

Time	Activity
08.15 - 08.30	Welcome and short presentation by management
08.30 – 09.30	Consultation panel
09.30 – 10.15	Meeting alumni and professional field
10.15 – 10.30	Break
10.30 – 11.30	Student project presentations and tour
11.30 – 12.15	Meeting students
12.15 – 13.00	Lunch break
13.00 – 13.45	Meeting lecturer team
13.45 – 14.00	Break
14.00 – 14.45	Meeting exam board and educational sciences team
14.45 – 15.00	Break
15.00 – 15.30	Meeting management
15.30 – 16.45	Consultation panel
16.45 – 17.00	Feedback from panel
17.00 – 17.10	Break
17.10 – 18.00	Development meeting

The names of auditees are not included in this report due to privacy concerns. The names of auditees are known to the secretary of the panel.

Working methods

Selection of the auditees and open consultation opportunity
In compliance with the NVAO regulations the audit panel prior to the audit decided on the composition of the auditees delegations in consultation with the programme management and on the basis of the points of attention that arose from the panel's analysis of the provided documentation.

Students, faculty and other stakeholders of the programme, who were not invited as auditees in the site-visit, were given the opportunity to inform the panel about important matters by email. The audit panel found that the programme brought the opportunity to do so to the attention of all students and faculty in a timely and proper manner and informed them how to contact the secretary of the audit panel. The audit panel did not receive any responses.

Auditing process
The following procedure was adopted. The panel studied the documents regarding the programme (see Annex Documents reviewed) and fifteen theses. The panel secretary organised input from all auditors and distributed the preliminary findings among the panel members prior to the audit. An online preparatory meeting with all panel members took place before the site-visit.

The panel formulated its preliminary assessments per theme and standard immediately after the site visit. These were based on the findings of the site visit, and building on the assessment of the programme documents.

Absent panel member
Due to personal circumstances one of the panel members was not able to attend the site visit, that took place on May 14 2024.The programme as well as the NVAO have been informed about his absence. Both agreed to let the audit proceed, as did the other panel members. The absent panel member did provide his extensive input in the preparation process. During the site visit the other panelists addressed the issues/questions he had raised in the preparation phase.

A first version of the assessment report was drafted by the secretary and circulated among all members of the panel, including the panel member who could not attend the site visit. They all reviewed the draft report and gave their comments. The final draft was subsequently forwarded to the institute to correct factual inaccuracies. The panel finalised the report on October 4th 2024.

Assessment rules
According to the NVAO assessment rules, a programme can either meet, partially meet or not meet the requirements of each standard. Hobéon applied the decision rules for the limited programme assessment, as listed in the "Assessment Framework for higher education accreditation system Netherlands, September 2018".

ANNEX III   List of documents examined

List of documents examined

- Self-evaluation 2024 Fontys Informatics
- HBO-i Domain Description 2018
- HBO-i Addendum Applied Data Science 2021
- Fontys – Kader talentgericht onderwijs 2023
- Fontys – Kader toetskwaliteit 2023
- Fontys Venlo – Transitionplan Fontys Venlo for Society
- FTenL – Missie, visie, doelen 2024
- FTenL – Toetsbeleid 2020
- FTenL – Beoordelen en begeleiden, procedures en richtlijnen 2017
- FTenL – Beleid student coaching 2022
- FTenL – Graduation regulations technical programs 2023-2024
- FTenL – Internship regulations English programs 2023-2024
- FTenL – Teaching and Examination Regulations, incl. appendixes 2023-2024
- FTenL – Fraudebeleid
- FTenL – Kwaliteitsbeleid
- FTenL – Onderwijsvisie en -concept
- FTenL – Quality policy 2023-2026
- Informatics – Organigram
- Informatics – Roadmap Assessment system
- Informatics – Roadmap Curriculum development
- Informatics – Roadmap Professional skills
- Informatics – Roadmap Quality
- Informatics – Roadmap Student coaching
- Informatics – Roadmap Team Informatics
- Informatics – Minutes Professional Field Committee June 2022
- Informatics – Curriculum
- Informatics – Annual Report Programme Committee Informatics 2022-2023
- Informatics – Concept Toetsprogramma Professional Skills
- Informatics – Assessment overview 2024
- Informatics – Graduation project assessment criteria 2017 and 2023
- Informatics – Team table 2024
- Informatics – CLUS
- Informatics – Professional Behaviour and Research Skills in the FHTenL Informatics program, adaptation to new (2018) HBO-i Domain Descriptors (revised version 2022)
- Informatics – Minutes and slides Student Board 2023 and 2024
- Informatics – Verslag gecommitteerden Techniek 2019
- Informatics – Verslag evaluatiebijeenkomst gecommitteeerden 2023
- Informatics – Advisory Board Minutes
- Informatics – Test questions with corresponding assessment criteria and requirements (answer models) and a representative selection of actual completed and assessed tests;
- Informatics – List of all recent final projects examined (last two years)
- Informatics – Representative selection of fifteen final projects, selected by the panel, of the past two years with corresponding assessment criteria and requirements;
- Exam Board – Jaarverslag 2023
- Exam Board – Eindrapport Borging Kwaliteit Eindwerken
- Exam Board – Bevindingen steekproef afstuderen Informatica 2023
- Exam Board – Bevindingen grading tables
- Exam Board – Administratieve review beoordelingsformulier afstuderen Informatica 2023
- Exam Board – Rules and Regulations

Following NVAO regulations the panel prior to the audit the panel has studied 15 students' final projects. For privacy reasons, the names of these graduates and their student numbers are not included in this report. The names of the graduates, their student number, as well as the titles of the final projects, are known to the secretary of the audit panel.

ANNEX IV   Composition of the audit panel

The Bachelor of Informatics belongs to the visitation group H Informatica.
Reference number PA-1830.

Name	Succinct CVs
Prof. dr. ir. J.C. (Han) Brezet	Parttime professor of Sustainable Innovation Aalburg University (Denmark) and emeritus professor Industrial Design TU Delft
B.L. (Bing) van Moorsel	Director operations SWIS Digital Agency
Dr. U. (Uwe) van Heesch	Software architect and DevOps engineer, Bildungsinnovator GmbH
J. (Jelle) Toonen	Student B Informatics Inholland UAS

I. van der Hoorn	NVAO certified secretary

Prior to the audit all panel members signed a declaration of independence and confidentiality which are in possession of the NVAO. This declaration certifies, among other things, that panel members do not currently maintain or have not maintained for the last five years any (family) connections or ties of a personal nature or as a researcher/teacher, professional or consultant with the institution in question, which could affect a fully independent judgement regarding the quality of the programme in either a positive or negative sense.

On February 14 2024 the NVAO endorsed the composition of the panel to assess the Bachelor of Informatics of Fontys University of Applied Sciences.

Hobéon

Sir Winston Churchilllaan 273
2288 EA Rijswijk
Postbus 70, 2280 AB Rijswijk
+31 (0)88 998 3140
www.hobeon.nl
info@hobeon.com