Minorregeling – 2022-2023

1 Name of minor: A-SYSTEMS; High Tech Agricultural Solutions

2 English name: A-SYSTEMS; High Tech Agricultural Solutions

3 Content of minor

Introduction
The agricultural sector is considered to be one of the most dynamic sectors in the world. For example, the sector has been highly professionalised, chains have become shorter, and the market has become increasingly global. In addition, national and international standards, regulations and legislation change.

The government and the business community have jointly identified nine sectors that (coincidentally or not?) have a strong link with the agricultural sector. These are the so-called top sectors in which the Netherlands is strong worldwide. The top sectors were chosen because of their strong international position, high knowledge intensity and the contribution they make to solving social issues. The nine top sectors are: Agri&Food, Chemistry, Creative Industry, Energy, High Tech Systems & Materials, Life Sciences & Health, Logistics, Horticulture & Raw Materials and Water.

Source: www.topsectoren.nl

The top sector Agri&Food is an essential and prominent part of the Dutch economy. This internationally leading sector comprises various (vegetable and animal) food chains with different links in each chain, such as the supply industry, basic materials, primary production, processing (food) industry, trade, retail and out of home sector and, finally, consumers at home and abroad.

In addition to the national level, the top sectors are also represented at the regional level. The Venlo region has traditionally been strong in the manufacturing industry, agro-business and logistics services. Especially in this region there are many companies that produce high quality technological products. In addition to the high technological character of the region, agriculture is also well represented. Both the plant sectors (e.g. horticulture and arable farming) and the animal sectors (dairy farming and intensive livestock farming) are flourishing in the so-called Greenport of Venlo. It is undeniable that agricultural businesses and technology are closely linked. The sector is well on the way to deploying smart technologies more and more. The minor "A-SYSTEMS; High Tech Agricultural Solutions" addresses these challenges that bring the two sectors together in the field of new and smart applications in the technological field, so that the innovations will actually lead to value creation. Get to know the agro-technical Netherlands!

Students who choose this minor take part in technological development at the interface of biology and technology, which must also fit in with (agricultural) companies. In principle, this development is about innovations that lead to more profit, better quality and/or lower costs, but also more knowledge! The emphasis is often on the actual and responsible introduction of new technology in practice. Particularly in the cultivation and production systems, applications are sought in the field of harvesting systematics, climate technology, lighting, vision and robotics, heat and moisture control, geothermal technology, automatic recognition of flowering levels.

In this minor, students will make the connection between the world of biology, the world of technology and the world of business administration, see Figure 1. The still independent biological systems and the technical systems will be linked and influence each other with the aim of gaining more knowledge of the biological world on the one hand and making the biological world function more 'optimally' on the other hand. The end product must be applicable in the current and/or future agro-business where knowledge

is gained from the collected data in order to achieve optimal growth of crops and animals by means of stimuli. The Committee of the Regions believes that it is important not to lose sight of ethics in this context.

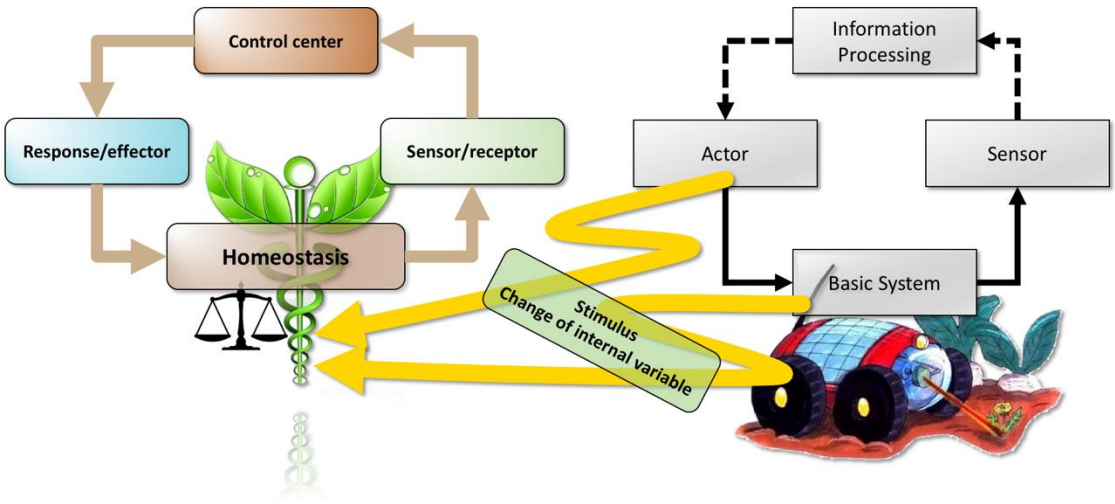

Figure 1: Connection between the worlds [source Frank van Gennip]

Students develop their own studies with passion and talent. They are stimulated to rise above themselves in one or more themes in order to earn a place in the professional field. The student creates his/her own path!

Resume for Diploma Supplement
The student knows the agrifood sector from a biological and technological point of view. The student knows how to measure certain parameters of plants and/or animals and how to regulate the environment in order to influence the growth process and/or behaviour.
Within the minor, the student has made the link between in-depth theoretical technical knowledge and the agrifood practice and is able to advise the client on the use and application of techniques on the farm in the agrifood sector on the basis of experiments, research and prototypes.

4 (Admission) restrictions of the minor

Not applicable.

5 Education components

The total study load for this minor is 30 European Credits (EC), the duration is 1 semester.
During this minor, the student himself is in charge. The student decides for him or herself what has to be learned and in what way. In 20 weeks, the student will work on various aspects and assignments in order to develop himself as a link between agriculture and technology in the business community.

The learning outcomes of this minor are:

- The student is able to use his/her biological and technological knowledge to make an analysis of an issue and to provide advice and a solution.
- The student is able to give a well-founded vision on technological developments that can be applied in the agricultural sector and can make a well-considered assessment of the impact on business and society.

In this minor, the project is central. The students direct their own learning path by choosing specific theoretical modules and practical skills.

5.1 Project

In this minor the student works on his/her future as a professional. The project helps the student to develop, work and communicate in a real-life professional setting. It also prepares for the start of a career or a master's programme.

The aim of the project is to gain insight into the future professional role and to gain a broader knowledge of the technique applied in a biological environment. This is achieved by in-depth study of the assignment/problem definition and by collaboration with field experts. The study of literature is of course part of the project. In this project the skills in the field of planning, cooperation, analysis, communication skills etc. are evaluated.
The student is part of a multidisciplinary team and together the entire project is planned, executed and documented. At the end of the project, each student also delivers an individual product.
There is no fixed timetable. The entire project is planned by the project group. The group will have to anticipate supervision and required knowledge!

Deliverables:

- Action plan;
- Project plan;
- Project Result;
- Individual Study Result;
- Presentation on knowledge sharing and result days.

5.2 Supporting courses

With the help of a coach, students set a course to prepare for a job in the High Tech Agricultural Sector. The student's interest and passion can play an important role in this. The student works together with other students with similar passions. This strengthens, motivates and challenges!

Student teams are being formed. The project will be carried out jointly and the subjects of the required knowledge will be determined. The personal interpretation of the minor depends on the student's own goals, focused on content, skills and attitude. The specific curriculum is expressed in a personal document that also serves as input for the knowledge assessment.

Experts can be 'hired' for the duration of the entire project. During the first week, experts (at Fontys and at the HAS) will give a pitch on themes, experiments, projects, etc. The students will get to know the experts and their fields of expertise, so that they know for which subjects they should be with whom. Expertise in the biological and technological field is available in half-day periods to be determined.

In the initial phase of the minor, a project is chosen together with the project group. Subsequently, expert meetings will be scheduled in the first weeks to discuss the plans, ask questions and above all get inspired. The project group will work on a project plan in the first weeks.

5.3 Personal development

There's a lot of time for students to gain knowledge. Each student has to make an individual action plan on how he will spend his time this semester. Together with the coach it is determined in which area the student will specialize. This can be a subject related to the project, but can also be a subject you are personally interested in.
The topics must be related to Tech meets Agro.

Deliverable: Action Plan

- How are you going to specialise and in which subjects (seminars/conferences, real life cases, excursions, discussion with experts, literature review, etc);
- Personal development: which skills do you want to develop and how do you want to achieve this (measurable?);
- Timetable.

The action plan must be approved by the coach (pass/fail).
Once the action plan is approved, the student and his project group are ready for a nice trip! Every week, time is reserved to hire experts and the coach will accompany the project group during this trip.

The most important themes for the supporting courses are indicated below. This is not exhaustive and the themes depend on project content and personal interest.

- Plant science Physiology, anatomy, photosynthesis, anatomy and morphology, soil cultivation;

- Animal science — Physiology, anatomy, behaviour and nutrition and health;
- Bio sensor — Detecting the presence of chemicals on living organisms or biological molecules;
- Abiotic actuator — Encouraging non-living chemical parts or in other technical ways to influence living organisms;
- Internet of Things — Or in short *IoT*, handles all (wireless) communication to actuators and from sensors;
- Edge Computing — To reduce response times local intelligence can deal automatically on time-critical events, also information compression in order to reduce power consumption of the 'edge'-node;
- Data analytics — Big Data, Data Conversion, Data Clustering and Classification, hyperspectral, data intensive sensors/actuators, omics;
- Data synthesis — Big data, motor babbling, orchestration of multiple and possibly heterogeneous actuations (e.g. movement), data intensive actuators, omics;
- Machine Learning — Machine Learning/Deep Learning (inspired from biology) challenges the normally programmed way of adding intelligence to applications with benefits in lower effort and reduced costs;
- Digital Twin — The creation of a (3D) model of a real object in order to improve the design of a system, that interacts with the object (e.g. accelerate the setup of a deep learned work flow for either plants or animals);
- Ethics — Philosophy that deals with the critical reflection on the right actions;
- Machine vision — The camera as a sensor, image processing algorithms, recognition, exposure;
- Sensory modalities — As with vision, also hearing, touch, smell and taste can be integrated by the tandem sensory device and a post processing subsystem; sensor fusion complements the whole quality-wise;
- Robotics — Field of robotics, types, species, kinematics, programming, tools and operating systems (e.g. ROS2);
- System engineering — System Engineering is a holistic and interdisciplinary approach/methodology to enable the realization of successful systems.
- Artificial Intelligence — Or in short *AI*, deals with autonomous intelligent behaviour of a system to improve quality, productivity while saving on labour cost. AI emerges from the integration of the above-mentioned themes as links in a cyclical chain that aims to optimise the primary business process in the outside world, see Figure 2.

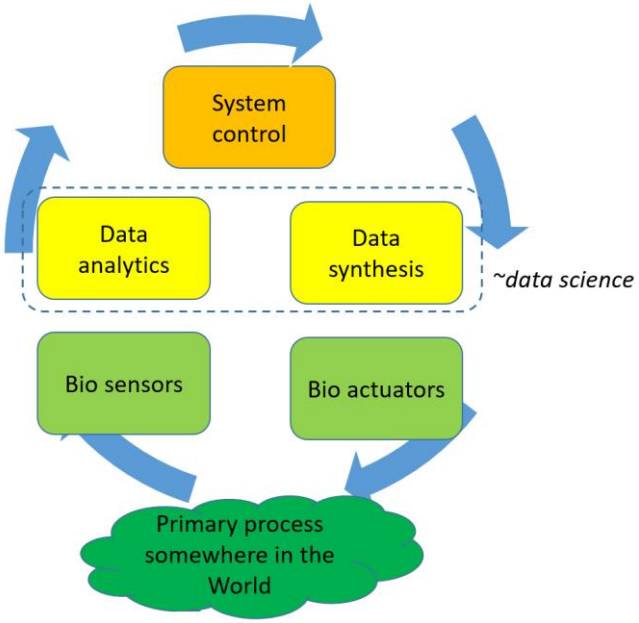

Figure 2: System Engineering, connecting themes [source Jan Jacobs]

5.4 Knowledge sharing day

More information about this knowledge sharing day will follow during the minor.

5.5 Assessment

In this minor, each student is assessed on 6 different aspects, based on the triangle of success, see Figure 3. See Table 1 for these different aspects. Note: all reporting and presentations, oral or written, must be done in English.

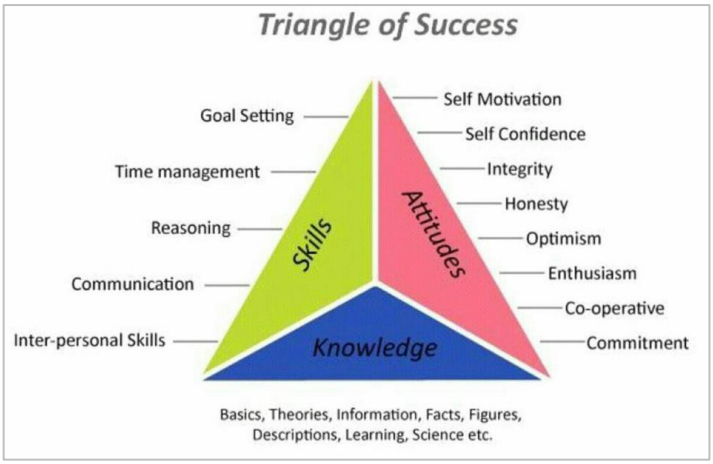

Figure 3: Success triangle [source Lyman Macinnis]

Table 1: Assessment aspects with their weights

Deliverable	Grp/Ind	Description	Grading
Action Plan	Individual	See par. 4.3 and meeting with coach	pass/fail
Project plan	Group*	See par. 4.1 and meeting with teacher	pass/fail
Project result (documentation)	Group*	At the end of the project, the project group documents the results achieved and the working method.	mark (40%)
Knowledge sharing Day	Individual	More information will be provided during the minor. (If necessary, an experience day in the meantime)	pass/fail
Knowledge Assessment	individual	At the end of the semester there is an individual assessment. The student presents his/her project work for 10 minutes and will then be interviewed by two examiners. For this, the student must obtain at least a 5.5.	Mark (30%)
Professional attitude**	Individual	The student must act professionally and show the corresponding behaviour and attitude. Organization, prioritization of own work, high quality of delivered work must meet agreed goals. The student must commit to his/her own learning and development and take action to achieve learning and development goals. He has to keep a logbook and write a self-reflection (See par. 4.3)	Mark (30%)

* Peer reviews are used to discriminate between individuals for group's grade

** Professional attitude also considers attendance to mandatory events. See the module book for details for the current semester.

The table below shows the *study load of* the various modules.

Table 2: Credits schedule (30 credits in total)

20 weeks (term 1 and term 2)	SBUs (study hours)
Project (in groups)	420 hours = 21 hrs/week
Supporting courses (theory, communication & statistics)	364 hours = 18 hrs/week
Knowledge sharing day (incl. preparations)	28 hours
Assessment of knowledge (incl. preparations)	28 hours

6 Enrolments for education components

Application for specific units of study does not apply.

7 Overview of tests and registration for tests

Table 3: Assessment details with rating scale

Deliverable	***Form shape***	***Individual/group***	***Rating scale***
Action Plan	Report	Individual	pass/fail
Project plan	Report	Group	pass/fail
Project result (documentation	Report Presentation	Group	1..10 (40%)
Knowledge sharing Day		Individual	pass/fail
Individual Study Result	Report Presentation Assessment	Individual	1..10 (30%)
Professional attitude	Reflection	Individual	1..10 (30%)

Final grade is calculated by:

Final grade = gradeProject*40% + gradeAssessment*30% + gradeProfAttitude*30%

The final grade is only given when the student also has a 'pass' for each of the following: action plan, project plan, knowledge sharing day.

8 Passing of Minor

The minor has been obtained if all the tests mentioned in point 6 have been completed with a pass grade (i.e. 5.5 per test). A student will be allocated the total number of credits to be obtained as soon as he meets all the (testing) requirements. In other words: 30 EC or 0 EC will be awarded (no ECs will be awarded for each component). For all students a resit is possible in the next half-semester of the study. The exact dates for the resits will be discussed with the students and announced for each half-semester.

9 Examination Board

The board of examiners for this minor is the board of examiners of

- Fontys Hogeschool Techniek en Logistiek (fhtenl-excie@fontys.nl);
- HAS (examencievenlo@has.nl).

The Examination Board responsible for this minor is the Examination Board of Fontys Hogeschool Techniek en Logistiek, (fhtenl-excie@fontys.nl).

10 Validity

This information is valid for the academic year 2022-2023.

11 Minor Entry requirements

In order to be able to take part in the minor, the student must meet the requirements as stated in the Teaching and Examination Regulations (TER)[1] of his study programme or have permission from the board of examiners of his study programme.'

On top of that, the student should be aware that the minor is conducted in English and all assessments are also done in English. A minimum level of B2 in English is therefore strongly recommended.

[1] In Dutch: Onderwijs- en Examenregeling (OER)

12 Accessibility:

The minor is open to students with a technical, biological or business background.

13 Contact

Executing institute is the Fontys University of Applied Sciences (Fontys Hogeschool Techniek en Logistiek) in Venlo. For further information contact the minor coordinator:
Frank van Gennip, +31 8850 77365, f.vangennip@fontys.nl.

Cooperating institute is the HAS university of Applied Sciences in Venlo. Contact person: Tim Minkhorst, +31 (0) 88 890 3170, t.minkhorst@has.nl.

Students are not required to meet any other requirements for participation in and completion of the minor, other than those set out in the detailed Minor Regulations herein.