



University of Applied Sciences

SEMESTER GUIDE

Semester 3 - ICT & Infrastructure

Course-based learning

INTELLIGENT INFRASTRUCTURE AUTOMATION

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1. Introduction

Welcome to semester 3 ICT & Infrastructure course-based at Fontys ICT.

In this semester the education is designed according to the principles of course-based learning. The focus lies on learning in the context of real-life tasks, and on clarity and predictability concerning learning outcomes, educational activities and assessment. At the beginning, the semester is more teacher-driven, and gradually you will take more ownership of your own learning process.

The main theme of this semester is a roadmap to Intelligent Infrastructure Automation. The entire semester program will be structured around six focus areas or building blocks of this roadmap. Learning these building blocks will set a strong foundation for becoming ICT & Infrastructure professionals. Later in your educational and professional path, you will be stimulated to make well-founded choices based on this foundation.

The learning environment is organized in such a way that you interact closely with your teachers and fellow students. The physical learning environment, also called Open ICT Lab (OIL), consists of classrooms for planned lessons with your class, but also of more general areas for guided self-study, working on course assignments and case-study projects, learning and meeting up with fellow-students, tutors and teachers.

2. Content

Semester 3 covers different aspects of intelligent automation of the infrastructure. Due to the size and diversity of various systems and software in the context of manageability, it is necessary to master this from a well-organized point. The semester approaches intelligent automation from 6 different focus areas (FA):

FA 1: Orchestration

FA 2: Network Orchestration

FA 3: Automation

FA 4: Security incident & event management

FA 5: Monitoring

FA 6: Supporting Services

2.1. Semester overview

Semester 3 is divided into two phases: Primary and Secondary. The phases will last 18 weeks. During the semester, a student will compose the individual Personal Development Portfolio (PDP) with a Case study, Multidisciplinary project and course exercises. The Case study and Multidisciplinary project serve as evidence to demonstrate 10 learning outcomes. Course exercises in the form of learning and practical materials, also with regard to the 10 learning outcomes, are the supportive activities for a student in realizing the two projects.

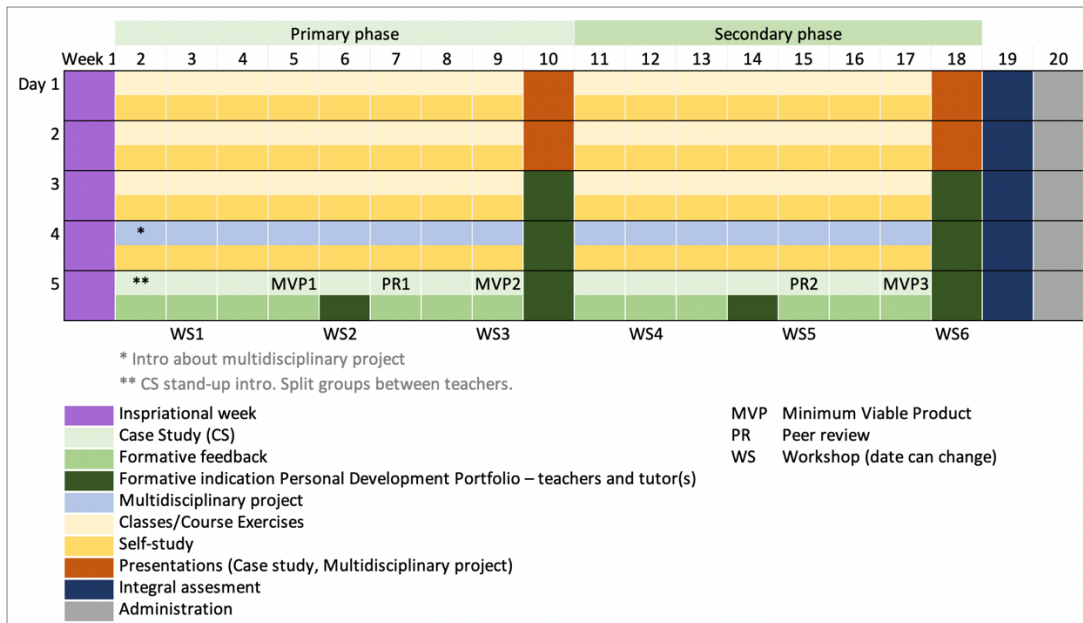


Figure 1. Semester overview

Figure 1 depicts an abstract overview of the semester; a more detailed overview can be found on the Canvas course.

2.2. The learning outcomes

For the bachelor's degree there are 6 learning outcomes (see Table 1) related to the knowledge and skills of ICT & Infrastructure and 4 learning outcomes (see Table 2) related to professional development.

Focus Area	Learning Outcome
Orchestration	(LO1) You have shown that you can create a process and choose the right tools that coordinate the installation, configuration and deployment of applications in an infrastructure.
<i>Explanation:</i>	The process and tools coordinate the infrastructure as a whole.
Network Orchestration	(LO2) You have shown that you can create a process and choose the right tools that coordinate the topology of the network in an infrastructure.
<i>Explanation:</i>	Configure the network on logical level such as modification of the bandwidth, connections, routing, filtering etc.
Automation	(LO3) You are able to develop the code to install, manage, and configure systems and networks.
<i>Explanation:</i>	The right tools that support the installation, configuration and deployment of application requires code in the form of scripts or playbooks for execution.
Security	(LO4) You have demonstrated, using tools, that you are able to monitor an infrastructure on vulnerabilities.
<i>Explanation:</i>	To secure an infrastructure, all logging of the hosts and network equipment must be collected, normalized, correlated and analyzed to alert the security operator of the presence of vulnerabilities in the infrastructure.
Supporting Services	(LO5) You are able to organize the (automated) processes in such a way as to create support services.
<i>Explanation:</i>	The support service includes an automated workflow that can transcend multiple departments.

Monitoring	(LO6) You collect and interpret relevant data with the aim of forming a judgment and making proper considerations for the infrastructure.
<i>Explanation:</i>	To keep the infrastructure up and running, all critical hosts and network devices must be monitored on performance, availability and response.

Table 1. Learning Outcomes for bachelor's degree

Competence	Learning Outcome
<i>Future-oriented organizing</i>	(LO7) You can explore the organizational context of ICT assignments, make business, sustainable and ethical considerations and manage all aspects of the execution of the assignment.
<i>Explanation:</i>	Identifies characteristics and roles of the mission environment and knows business legitimization. Knows ethical standards, involves social ethical themes in judgment, recognizes its own and other people's borders and acts accordingly. Inventory subtasks, plan and monitor time, money, quality and ethics of the execution of the work, recognize opportunities and risks and ensure a forward-looking embedding of the solution in the organization.
<i>Solving research problem</i>	(LO8) You can consider ICT assignments critically from different perspectives, identify problems, find an effective approach and come to suitable solutions.
<i>Explanation:</i>	Identifying an unstructured practical problem, guiding the solution and taking an appropriate approach. Throughout the solvable process are curious and ask questions from different perspectives, answer these questions with an appropriate approach pragmatic, critical and based on sources. Being able to solve both methodical and creative problems, finding alternatives and being able to go through the private and other people's reasoning chain critically.
<i>Personal leadership</i>	(LO9) You are enterprising around ICT assignments and personal development, paying attention to your own learning skills and keeping in mind what kind of ICT professional and/or what type of functions you aspire to.
<i>Explanation:</i>	Be attentive, see opportunities and seize them, motivate themselves and others, profile themselves or a team, be able to establish themselves independently, bring others into their own development, show leadership. Take responsibility and work results-oriented on a professional assignment outside the college. Create a considered choice of study, strengthen equity, recognize a learning need with themselves and act appropriately, reflect, evaluate, actively ask and give feedback. Exploring what type of professional one would like to be in the long term describes his professional talents and development ambitions. What field of occupations and type of functions one aspires to and how to distinguish themselves from others in the industry.
<i>Target-oriented interact</i>	(LO10) You can determine which partners play a role in the ICT assignment, work constructively with them and communicate appropriately focused on the desired impact.

<i>Explanation:</i>	<p>Attention to the various groups of cooperation partners such as stakeholders, interest groups, their own team members.</p> <p>Attention to what one wants to communicate with the impact, the most appropriate form and its actual implementation.</p> <p>Attention to one's own role in the context of the ICT assignment, recognizing and picking up tasks, addressing others, seeking enrichment and building trust in an interdisciplinary and intercultural context.</p>
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Table 2. Learning Outcomes, Professional Development for bachelor's degree

3. Assessment

During the 18 weeks semester program, a student composes the individual Personal Development Portfolio (PDP) with the Case study, course exercises and the Multidisciplinary project. The Case study and Multidisciplinary project serve as evidence to demonstrate the 10 learning outcomes. Additionally, course exercises in the form of learning and practical materials also with regard to the 10 learning outcomes, are the supportive activities for a student in realizing Case study and Multidisciplinary project.

3.1. Assessment model

During the semester there are several scheduled consultations with Semester 3 teachers, in which a student's PDP is evaluated. The aim of such a consultation is to give a student insight into his/her progress towards the learning outcomes. The consultation provides a formative indication indicating a certain level of progress. Table 3 defines different formative indication levels in UOBPA scale.

Indication	Explanation
Undefined (U)	The portfolio does not (yet) show any progress towards the learning outcome, or the demonstration is not clear enough for the teachers.
Orienting (O)	The student has set up exploratory actions to understand what the learning outcome is about. The student looked for theories that might match his goals and has tried to apply a few things at a basic level.
Beginning (B)	The student has produced more complex work and made attempts to show that he controls the learning outcome. However, the teacher's feedback indicates that he still needs to make an improvement.
Proficient (P)	The student has convincingly demonstrated that he controls the learning outcome and the teacher has confirmed this by giving positive feedback.
Advanced (A)	The student has shown in different situations that he controls the learning outcome and the teacher has confirmed this by giving positive feedback.

Table 3. UOBPA, Formative indications (F.C.W. Deenen, 2019).

3.2. Integral assessment

In week 19, the assessor meeting will take place in the form of an integral assessment. During the assessor meeting, the individual Personal Development Portfolio of a student is summarily assessed by a teacher(s) and tutor(s). The individual PDP is assessed by at least 2 assessors. For each learning outcome, the development-oriented UOBPA scale is converted into a summative semester assessment (see Table 4).

Result (assessment)	Criteria
Passed (30 EC)	
Outstanding (O)	50% or more learning outcomes: "Advanced".
Good (G)	Multiple learning outcomes: "Advanced". Other learning outcomes: "Proficient".
Satisfactory (S)	All learning outcomes: "Proficient".
Failed (0 EC)	
Unsatisfactory (U)	One or more learning outcomes: below "Proficient".

Table 4. Integral assessment model. Transformation of formative indications to summative scores.

3.3. Permitted tools and aids

During the course, a physical or virtual server will be assigned per group of students. The server will be used to work on the Case study, Multidisciplinary project and course exercises.

Additionally, Canvas will be used as an electronic learning environment. It contains all the teaching material, and this is also the hand-in place for the elaboration of problems. In addition to oral feedback, written feedback on the submitted assignments and the PDP will be given and registered via Canvas. During the semester, a student has access to the submitted assignments, PDP document and the feedback received.

There are also orientating sources in Canvas. The exploratory sources can be information sites, online courses, videos, articles, books, etc. These sources will help a student to orient on the underlying theory, common methods and/or concepts.

3.4. Retakes or repair

Our education makes it possible for the student to demonstrate learning objectives during the semester. The student does this on the basis of regular feedback in which product and performance are frequently shown and the teacher has a good picture of the learning process that has been completed. We expect the student to be regularly present and regularly request feedback from the teacher (\geq once every two weeks). The student processes this feedback and validates it with the teacher. If the student is not sufficiently present during the semester, does not regularly request feedback and does not validate the processing of this, this cannot be corrected in the last week or weeks. In that case, a good picture of the completed learning process would be lacking. Therefore, the portfolio inspection cannot be retaken within the semester. Resit is only possible in the following six months, by means of a restart or customization (see OER, Article 28 Re-sit) of the semester.

3.5. How is the assessment determined?

The PDP serves as an input for the feedback discussions you have with your teachers and tutors. During the feedback interview, you can ask specific questions about your Case study (tutor), Multidisciplinary project (tutor) and course exercises (teacher). Table 5 shows the time path and guidance of Primary and Secondary phases. In addition, you can see during which weeks you have a possible feedback talk with your teacher or tutor. Furthermore, it shows during which weeks your PDP is evaluated by the teachers and tutor(s) with a formative indication and written feedback in Canvas.

	Primary phase	Secondary phase
Guidance Case study	Tutor	Tutor
Guidance Multidisciplinary project	Tutor	Tutor
Guidance Course exercises	Teacher 1 and Teacher 2 and Teacher 3	Teacher 1 and Teacher 2 and Teacher 3
Formative feedback Possible with teachers and tutors	Week 2, 3, 4, 5, 7, 8, 9	Week 11, 12, 13, 15, 16, 17
Formative indication of PDP, written in Canvas - UOBPA	Week 6, 10	Week 14, 18
Integral assessment Canvas - USGO**		Week 19

Table 5. Guidance, feedback and assessment weeks.

A student does not need to be present during the integral assessment meeting. During this meeting, his/her PDP is summarily assessed by course teachers and tutors (at least 2 assessors).

Appeal to Exam board

In case the grading procedure was not followed correctly, or invalid criteria have been used to determine the grade, a student can appeal to the Exam Board. In such a case, the student needs to be explicit about which part of the procedure was not followed or which criteria were used for grading. Simply disagreeing with the examiner is not a valid reason to appeal. The student can contact his/her mentor for more information about appeals.

4. Learning activities

Semester 3 is made up of many different learning activities, which are organized in the key areas and two phases. These activities are guided by course teachers, a project tutor or mentor.

4.1. Case study

From week 2 to 17 there is a Case study in which a student works together in a pair group, which is guided by a tutor.

The Case study is an authentic professional-related ICT & Infrastructure challenge in which a student applies his/her acquired knowledge and skills from supportive course exercises. Additionally, it is an educational form of a project, related to the key areas: Automation, Orchestration, Monitoring, Supporting Services, Security and Network Orchestration (learning outcome 1 to 6, see Table 1).

A student describes the Case study activities/results in Personal Development Portfolio. A tutor coaches a student in the form of formative feedback for the Case study (project-based collaboration). In weeks 6, 10, 14 and 18 the tutor(s) and teachers give individual formative indication the development-oriented feedback scale **U**ndefined, **O**rienting, **B**eginning,

Proficient and **Advanced** (see Table 3) in Canvas. This gives a student insight into his/her development towards the 10 learning outcomes based on the case study.

4.2. Multidisciplinary project

The Multidisciplinary project is an authentic professional-related ICT & Infrastructure challenge in which a group of students applies their acquired knowledge and skills from supportive course exercises while implementing requirements of another group: students' group from a different study stream(s), external client or a stakeholder(s) that needs infrastructure to be prepared for his/her project. The Multidisciplinary project is an educational form of a task, related to the focus areas: Automation, Orchestration, Monitoring, Supporting Services, Security and Network Orchestration and learning outcomes (see Table 1) and professional skills (see Table 2). The Multidisciplinary project continues from week 2 to 17, where students work together in a pair group guided by a tutor.

A student describes the Multidisciplinary project activities/results in Personal Development Portfolio. A tutor coaches a student in the form of formative feedback for the project (project-based collaboration). In weeks 14 and 18 the tutor(s) and teachers give individual formative indication using the development-oriented feedback scale **Undefined**, **Orienting**, **Beginning**, **Proficient** and **Advanced** (see Table 3) in Canvas. This gives a student insight into his/her development towards the 10 learning outcomes based on the Multidisciplinary project.

4.3. Professional development

Professional development is integrated by a student in the Case study and Multidisciplinary project. Teacher(s) and tutor(s) also provide individual formative feedback on professional development. The 4 learning outcomes (see Table 2) are related to professional development: Future-oriented organization, Investigative problem solving, Personal Leadership and Targeted interaction skills.

4.4. Course exercises

During the week 2 to 17, a student realizes course exercises for the focus areas: Automation, Orchestration, Monitoring, Supporting Services, Security and Network Orchestration (see Table 1) and professional development: Future-oriented organization, Investigative problem solving, Personal Leadership and Targeted interaction skills (see Table 2). The course exercises are supportive to the Case study and Multidisciplinary project. Teachers coach students in the form of formative feedback for the course exercises. A teacher starts a class with an instruction/learning and practical materials, after which a student performs the appropriate course exercises with personalized coaching.

4.5. How to organize your Personal Development Portfolio?

In your Personal Development Portfolio (PDP) you collect the individual evidence regarding the 10 learning outcomes. You demonstrate those evidence in the Case study and Multidisciplinary project, which are the basis of your PDP. Course exercises are supportive and not mandatory for the PDP. In case you do not demonstrate enough evidence regarding the 10 learning outcomes in the Case study and Multidisciplinary project, you must show that knowledge by executing and describing the course exercises.

PDP is an **individual** development portfolio with a selection of the learning activities in this semester. You are responsible for the structure and implementation of your PDP. In PDP you

give a critical reflection on the work delivered. This facilitates your progress and gives an insight into your learning process.

There are different forms of evidence. It can be a report, presentation, video, photo or audio material, link to a project repository. For semester 3 ICT & Infrastructure, the following types of evidence are important:

- elaborated Case study and Multidisciplinary project with self-description
- course assignments with self-description *
- reflection
- self-evaluation
- feedback from a fellow student
- feedback from teachers and tutors
- bibliography
- presentation slides
- link to a project repository with a history of activities and software/hardware solutions files
- observation *
- interview *
- recorded presentation *
- business visit photos *
- photos of brainstorm session *

* optional.

You may also provide additional evidence that are important to you.

4.6. Self-study

You work on the learning activities of the modules with an arbitrary teacher(s) present in the open space. When needed, your module teacher, project tutor or mentor may also supply formative feedback to you during these hours.

5. Quality assurance

Every semester we evaluate our education to continually improve it, and we will organize sessions with you during the semester for this. Your feedback and suggestions are invaluable. We would therefore greatly appreciate you giving us an insight into your experiences while studying with us and/or filling course evaluation form at the end of the semester.

You can always give your feedback to your mentor, your course teacher, or your project tutor. In addition, you are welcome to share your thoughts and experiences with the semester 3 ICT & Infrastructure coordinator (Andrius Kuprys – a.kuprys@fontys.nl).