



SMAGRINET

POWERING SMART GRID
EXPERTISE IN EUROPE



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CONTACT US
info@smagrinet.eu

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DELIVERABLE 3.2

MODULES' PILOT REPORT

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AUTHORS

Christine Michalek
Kai Strunz

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Name	Organisation
Kévin Berger	ULOR

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1. Executive Summary

Work package 3 (WP3) – in particular T3.2 – in the SMAGRINET project is the focus of this deliverable. It gives insight into the piloting phase of the developed modules. WP3 aims at developing, evaluating, and adjusting three teaching modules for the master level engineering students.

This document outlines:

- Context, mission, and objective of WP3
- Details of the first piloting phase:
 - Participation of consortium universities
 - Past and future timeline for the first piloting phase
 - Implementation at all consortium universities

2. Introduction to Work Package 3

Work Package 3 of the SMAGRINET project aims at developing three challenge and case-based modules. They are linked to European university programs in order to teach students about operational problems of modern power grids and are aiming at combining the social, technological and industrial dimensions. The modules are implemented at master level and besides piloting, evaluating, and adjusting the developed modules, students traineeships at companies, and a simulation session are also part of WP3. These activities prepare the next generation of engineers and researchers with interdisciplinary operational and problem-oriented skills. The imparted mind-set supports solving ongoing and emerging challenges of the energy transition.

This section first explains the context and piloting phase of the three developed modules. Next, mission and purpose of WP3 are introduced. At last, the objectives are defined and described in detail.

2.1. Context

This deliverable is focusing on T3.2 and the first implementation phase of the modules. For the sake of completeness, all other work package topics are described briefly as well.

2.1.1. T3.1 Development of Three Challenge and Case-based Modules

Three challenge and case-based master level modules are developed. The modules build on the needs and challenges identified under work package 2 – the competence hub. The set of modules is designed to be implemented within one academic year. SMAGRINET university partners collaborate and bring in their specific area of expertise.

2.1.2. T3.2 Piloting of the Developed Modules

The piloting of the three developed modules is structured in two phases and all six consortium universities are participating. During both phases, the modules are implemented and aiming at involving 20 students per consortium university. In total, $6 \cdot 20 \cdot 2 = 240$ students will be educated. The modules can be completed during one phase, which represents one academic year, which makes them flexible and easily replicable.

During the first academic year, the modules are taught by the experts of the consortium. This ensures high quality teaching. Local teaching staff is invited to observe the classes for learning purposes, as they have to teach these topics by themselves during the second academic year.

An international simulation is planned based on the TalTech ABB simulation lab. This two-week session for students who have shown the best results during the modules is held in Tallinn. Five students per consortium university will attend these sessions. The international simulation supports the collaboration and networking goals of the project and gives students a comparative perspective to the topic.

During the second academic year, modules are taught by local teaching staff at the consortium universities under supervision of the experts from the first academic year. A local simulation will be held at each university following the aims and organization of the international simulation.

2.1.3. T3.3 International Mobility at Enterprises

A complementary mobility program is offered in parallel with the modules. Five students from each consortium university are provided with scholarships for international internships at European hosting enterprises. The duration of the mobility varies from one to three weeks. The attending students afterwards prepare a knowledge sharing seminar for all fellow students.

2.1.4. T3.4 Evaluation of the Pilots and Adjustment of the Modules

After each academic year the modules will be evaluated by students and teaching staff. The first round of evaluation before entering the second implementation cycle allows to identify potential for improvement. These adjustments can be made before teaching the modules for the second time. The second evaluation after the second implementation phase should only discover minor changes to be made.

2.2. Mission

Energy transition and smart grid implementation require training of the next generation of electrical engineers. Replacing the current electrical grids with smart grids calls for knowledge how to implement new technologies and how to manage them effectively in the future. Education and training initiatives in the right fields are crucial to assist this transition.

Mission and purpose of the three master level modules in WP3 are to educate future engineers. They have to be able to respond to emerging operational problems and urgent challenges. Key principles for this purpose are:

- Joint use of top-level expertise from European universities and knowledge sharing
- Close collaboration between industry, academia and societal stakeholders
- Interdisciplinary and involving topics besides engineering competences and develop skills like communication, teamwork, critical thinking, and problem solving

2.3. Objectives

As a long-term objective, the SMAGRINET project aims at preparing a generation of researchers and engineers to meet the challenges of the energy transition.

WP3 in particular aims at developing three challenge and case-based master level modules that are linked to European university programs to teach students about operational problems and combining social, technological and industrial dimensions. The modules are driven from the needs of the industry and bring together top-level expertise from European universities, enhance industry-academia collaboration and are interdisciplinary. Simulation sessions and a mobility program complete the modules. In total, 240 master students are educated in two implementation phases over two years.

3. First Piloting Phase

The first piloting phase started in the beginning of 2020. The following section first introduces all participating consortium universities and allocates the developed models from deliverable 3.1 to these universities. Next, the implementation timeline and the implementation itself are described and how the covid19 situation challenged the piloting phase.

3.1. Participation

Consortium partner universities include:

- Kaunas University of Technology (KTU)
- Tallinn University of Technology (TalTech)
- Technische Universität Berlin (TUB)
- Technische Universität Dresden (TUD)
- Université de Lorraine (ULOR)
- University of Ljubljana (ULJUB)

The module has to be implemented twice at each university. During the first academic year, the modules are introduced for the first time to the curriculum at each university. After an evaluation (deliverable D3.3) some adjustments can be made before teaching the module for the second time during the next academic year.

As three challenge and case-based modules were developed and presented in deliverable D3.1 and the consortium lists six participating universities, each module is taught at two universities. Module 1 “Artificial Intelligence in a Smart Grid with Prosumers” is allocated with KTU and TUD. Module 2 “Economic Operation and Societal Challenges” is taught by TalTech and ULOR. Module 3 “Connection Planning in Smart Grids” is assigned to TUB and ULJUB. Whereas TUB and ULJUB chose to teach the module as a one-week intensive course, all other consortium universities decided on a course over the time period of a few weeks.

3.2. Timeline

Piloting of the modules was scheduled to begin in 2020. As the consortium universities have to integrate the SMAGRINET modules into their curriculum and individual planning horizons, the total time period for piloting the modules reaches from January 2020 to September 2020 and is depicted in Figure 1.

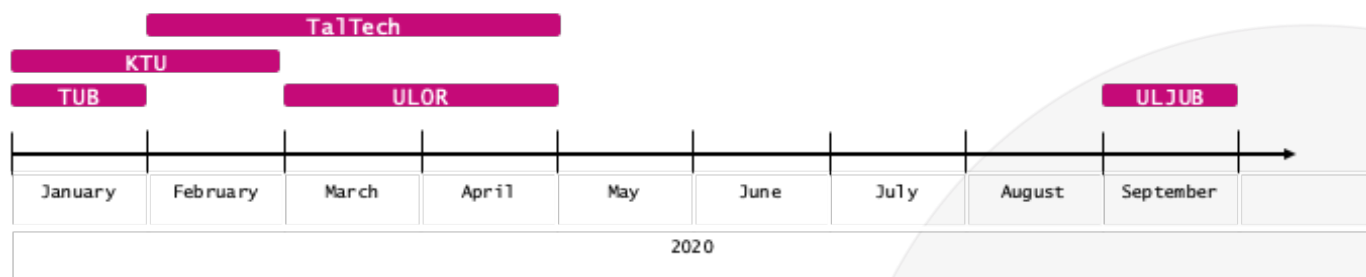


Figure 1: Timeline first piloting phase

Technische Universität Berlin and Kaunas University of Technology scheduled their module for the beginning of the year and were able to meet this plan. TUB taught the module as a

one-week intensive course and was supported by their module partner ULJUB in teaching the module in Berlin. KTU taught their module over the course of a few weeks and got support from their module partner university TUD. Due to administrative issues, TUD scheduled only half of the module for the first piloting phase. With the covid19 situation arising in spring, plans at TUD to teach the SMAGRINET module had to be postponed, as an online solution unfortunately was not possible.

TalTech planned and started to teach their module in February over the course of 14 weeks. ULOR scheduled their module to begin in March and with the covid19 situation arising, relocated the teaching to an online format and completed the whole module.

ULJUB scheduled their module for September 2020. Like at TUB, the module will be taught as an one-week intensive course. Acting on the covid19 situation, the module will be taught online and researches from TUB will join not in persona, but via web meeting tools.

3.3. Implementation

The first implementation of the developed modules faced some challenges. First, the rotation and partnering university principle is explained. Next, the influence of covid19 and university shutdown is described.

3.3.1. Rotation

The modules “Artificial Intelligence in a Smart Grid with Prosumers”, “Economic Operation and Societal Challenges”, and “Connection Planning in Smart Grids” were developed led by KTU and presented in D3.1. Consortium universities contributed according to their field of expertise.

For the implementation during the piloting phase, each module was allocated to two universities. The two universities responsible for one module also split the teaching for this module between them. Due to the different and not synchronous teaching times of all consortium universities, a complete rotation between all universities was not possible. With two responsible universities per module, the expert exchange still took place and hosting universities were able to learn from experts from the partnering consortium university.

3.3.2. Influence of Covid19

Due to the covid19 situation and the shutdown of universities in Europe, SMAGRINET and especially WP3 and the first piloting phase were facing severe challenges.

KTU and TUB finished the piloting as planned and were not influenced by the shutdown. ULOR and TalTech were forced to move parts of their module teaching online. This required spontaneous effort, flexibility and the ability to adjust to the new framework. As ULOR confirmed, the agenda did not change, but the methods did. ULOR deposited the materials step by step before each session on the web platform. They also organized chat sessions for the students and worked on integrating exercises into the curriculum in order to actively involve students during this new teaching format. TUD unfortunately was not able to participate during the first piloting phase, as web formats were no option for the designated module. ULJUB on the other hand can benefit from these past experiences and is scheduled to teach their module in September online and together with TUB.

Unfortunately, the international simulation got postponed due to covid19 as well. As travelling was impossible during shutdown and is constrained by now, a different approach has to be taken into consideration. TalTech is working on this at the moment.



4. Conclusions and Outlook

Although some challenges arose during the piloting phase, the modules were implemented successfully for the first time. Modul 1 “Artificial Intelligence in a Smart Grid with Prosumers” was implemented only once at KTU, but TUD will start with the first implementation in fall. Modul 2 “Economic Operation and Societal Challenges” was taught at ULOR and TalTech. Modul 3 “Connection Planning in Smart Grids” has already been taught at TUB and will be implemented at ULJUB in September.

The covid19 situation brought some challenges for the ongoing teaching, but also gave the opportunity to explore online teaching methods. This can be of value for work package 4 and the blended online learning programs.

In order to successfully accomplish work package 3, the evaluation of the modules will be analyzed and presented in deliverable D3.3. On this basis, the modules will be adjusted content-wise and then be implemented for the second time. The final evaluation should then propose only minor adjustments.



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