

# WEEF-GEDC 2021 Special Session : e-Engineering Alliance

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**Abstract— The e-Engineering Alliance is a Special Interest Group inside the International Association of Online Engineering (IAOE) whose aim is to disseminate the e-Engineering concept all over the world.**

**The goal of the e-Engineering Alliance Special Session is to exchange ideas and best practices in all aspects related to the set up and running of e-Engineering courses, with a focus on undergraduate and graduate courses as well as vocational and lifelong learning training.**

**The Special Session seeks to disseminate the concept of e-Engineering, and the responses it brings to the continuous need for enlarging and improving engineering education in a rapidly changing world.**

**The special session will focus on the introduction of remote laboratories in the teaching of STEM disciplines. In particular, the pedagogical and technical aspects, the description of successful implementation and good practices will be highlighted.**

*Keywords— e-Engineering e-learning, remote laboratories*

## I. OVERVIEW

e-Engineering is a concept that results from the concatenation of two previous ideas: e-learning and remote laboratories.

The e-Engineering Alliance was created in the scope of the e-LIVES project, an European Project financed by the European Commission, to disseminate the knowledge acquired and systematized by its consortium members. The objective of the e-Engineering Alliance SIG is to disseminate the concept, demonstrating its importance for the development of higher education and lifelong learning training, and to help Universities to build innovative e-Engineering courses by themselves in a sustainable way.

The SIG promotes the transfer of the knowledge necessary for Universities to create their own e-Engineering courses. These are online engineering courses in the electrical and electronics field based on established e-learning concepts and on remote laboratories specially designed to support the students' acquisition of practical skills in the studied subjects.

SIG assistance comprises helping Universities to build a curriculum, obtain the course national accreditation, train teachers and technicians, create contents, design and develop a remote laboratory, and perform their quality assessment.

The long-lasting purpose of the e-Engineering Alliance SIG is to generate in Universities a more committed and professional environment ready to introduce new forms of flexible learning into daily training activities and to create and manage accredited e-Engineering courses.

## II. HOW WAS THE E-ENGINEERING CONCEPT BORN?

Distance learning education is not properly an innovative idea. It has been around since the XIX century when the development of the mail services in England gave to Sir Isaac Pitman the idea of delivering correspondence courses by mail. Back then, the number of courses on offer was very restricted, mainly constrained by the low degree of interactivity between instructor and student due to the only communication channel possible at the time: writing paper material exchanged through the slow post services. It took more than a century for the panorama concerning distance learning start to change. Audio and television players where the first technological means used to deliver new, more engaging, distance learning courses. Despite keeping the same way to communicate with students, the now faster and reliable postal services, the materials were much more diversified, ranging from carefully constructed texts and audio and video records to conventional radio and television broadcasts, in this case, open to all, students and non-students. These were complemented by live individual or group sessions over the phone, between instructor and students, or among students, enabling real interactive teamwork.

However, the breakthrough that represents a true turning point in distance learning was the introduction of the concept of e-learning during the 90s of the XX century, boosted by the two most significant advances in the telecommunications area – the Internet network and the invention of the World Wide Web.

With the Internet, a fast, reliable and interactive channel of communication between instructor and students, or among students, was now available, enabling a degree of interaction never before achieved in distance learning and comparable to face-to-face classes. On the other hand, the World Wide Web with its hypertext links enabled the construction of much more diversified and engaging materials, supported by audio, image, and video, readily available and highly interactive. This revolution was accompanied by the massification of personal computers, which made them accessible and affordable. In a decade, from 1990 to 2000, these very expensive machines, complicated to operate, whose access was almost restricted to scientist and engineers and to

technical university students, became an indispensable household equipment.

Despite all these advances, the undergraduate courses on offer were nevertheless restricted to non-technical areas, with one exception: Computer Sciences. The main reason is that engineering courses require students to perform experimental work, be it in chemistry, physics, mechanics, electrical machines, electronics or optics, which requires the access to specific labs and real-time interaction with equipment and instrumentation. The courses related to Computer Sciences, where the same computer used to follow the course is the only equipment necessary for the student to complete the mandatory practical works, the development of programs in different software languages, are the exception.

Until recently the only solution envisaged enabling students in technical areas to perform hands-on labs work has been the use of blended learning solutions. Maintaining the Integrity of the Specifications.

This reality changed with the help of technology. Technical areas are benefiting from the proliferation of remotely accessible laboratories that enable students to perform hands-on lab work remotely, with a level of interactivity and realism never achieved before [1].

### III. OBJECTIVE OF THE SPECIAL SESSION

The goal of the e-Engineering Alliance Special Session is to exchange ideas and best practices in all aspects related to the set up and running of e-Engineering courses, with a focus on undergraduate and graduate courses as well as vocational and lifelong learning training.

The Special Session seeks to disseminate the concept of e-Engineering, and the responses it brings to the continuous need for enlarging and improving engineering education in a rapidly changing world.

The special session will focus on the introduction of remote laboratories in the teaching of STEM disciplines. In particular, the pedagogical, technical aspects, the description of successful implementation and good practices will be highlighted.

### IV. TOPICS OF INTERESTS

- Curriculum building
- Course organisation
- Learning platforms
- Learning strategies
- Learning scenarios
- Pedagogical innovations
- Gamification strategies
- e-Lecturing and e-Tutoring
- Student assessment end e-Rubric
- Simulation tools
- Virtual and Remote Laboratories in the contexte of e-Engineering courses
- Scheduling access to remote experiments
- Security issues

- Organizational aspects
- Teacher training
- Technicians training
- Financial models and Evaluation of the teacher's load
- Quality assessment
- Accreditation processes
- Legal aspects
- Course examples
- Successful implementations of e-Engineering courses
- Any other aspects related to e-Engineering courses.

### V. PROGRAM COMMITTEE

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#### VI. SUBMISSION

Make sur to submit your proposal inside the Special Session e-Engineering alliance following the instructions in the website:

<https://weefgedc2021.org/index.php/conference/authors-and-call-for-papers>.

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