GreenChips-EDU project: Educate for a Sustainable Tomorrow

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Since the invention of the first microchip almost sixty years ago, the microelectronics industry has quickly evolved. Nowadays, integrated circuits (ICs) are present in almost all aspects of our lives. Nearly every electronic system, from automotive and industrial applications to consumer electronics, avionics, and space technologies, contains billions of transistors. ICs drive technological advancements in areas such as smartphones, security systems, automated driving, smart manufacturing, and the Internet of Things. These components are essential for building our future. They can also be a key element in improving Europe's competitiveness and innovation..

To strengthen European leadership in semiconductor technologies and applications, the European Chips Act was enacted on September 21, 2023. This package of measures aims to strengthen the EU's resilience its technological leadership. To this end, the ECA aims to secure the EU's supply chain, stimulating manufacturing and supporting the European design ecosystem, and fostering growth and innovation along the entire value chain. The European Commission's goal is to increase the EU's global market share in this sector to 20% by 2030.

The development of Europe's microelectronics industry and the operation of new semiconductor production facilities require a large number of qualified engineers and technicians. To address the current shortage of skilled workers, seven European universities have joined forces with eight companies and research organizations in the EU-funded “GreenChips-EDU” project. Six of these universities are also part of “Unite!”, a strategic alliance of European technical universities. GreenChips-EDU aims to develop a common European education program in electrical engineering and microelectronics to effectively train future experts. In addition, the project will establish higher education programs for industry professionals, offering a range of options from short, stand-alone modules and micro-credentials to MBA programs. To attract more young people to the field of microelectronics, the project focuses on digital content and interactive teaching formats, while promoting more sustainable microchip development. Through these initiatives, the project aims to increase the number of people pursuing a career in the semiconductor industry.

Vision and concepts towards new degrees

To offer the possibility to students of each involved university to have access to this program, all the courses will be available in an online format. These typically four-semester programs introduce students to essential foundational courses at the beginning. In a second time, they will select from a variety of courses focusing on chips and applications. An emphasis will be done on sustainable production to highlight the need of the microelectronics industry for a greener future. Then, to complete the degree, students must write a thesis on a “green electronics” topic. Additionally, they will be encouraged to participate in summer schools, hackathons, or makerspaces as part of the program.

Upon graduation, students will receive a master’s degree and, depending on their university program, may also earn an additional certificate or a specialization in “green electronics”. Since six universities participate in the Unite! program, students will have the opportunity to enroll in and complete a double degree program during the project. Double degree programs are planned to encourage student mobility and intercultural university experiences.

The first student pilot cohort has already begun its courses, facilitating the testing and fine-tuning of the approach.

In addition, the GreenChips-EDU project plans to set up lifelong learning modules and an MBA for professionals working in the semiconductor industry. Workshops are currently being organized with the partners to identify the needs related to sustainability and energy efficiency in the industry. Together, the partners are defining the skills and knowledge to be provided by the project to fill this gap through tailor-made courses and an MBA. Most of the partner universities have set up Life Long Learning departments that can effectively manage the roles of continuing education and requalification. In addition to the highly modular 5 ECTS modules offered in their Masters programs, the plan is to offer shorter, digitally-enhanced learning materials (micro-credentials) to reinforce knowledge in specific areas, for both students and experienced professionals.

Content development strategies

A significant challenge is to adapt and implement the content within a common platform, as most of the existing courses were already created and stored in the Learning Management Systems (LMS) of the partner universities. As a first step, the GreenChips-EDU consortium decided to use Unite!'s platform, Metacampus, to transfer courses and learning materials, enabling easy access for all Unite! students. In some cases, due to the difficulty of migrating all the content from one local platform to another, links will be provided in Metacampus to redirect students to the local LMS.

As some of the content is based on on-site courses, some courses are presented in hybrid mode (remote and on-site at the same time). This involves logistical readjustments as well as the training of lecturers to deliver their courses effectively in digital format. These lectures will be recorded and combined with slide presentations to create digital versions. Using authoring tools, the courses will be presented in interactive form, with activities and assessments to engage students as they view the course. All types of scientific and academic events organized by partner universities in connection with sustainable electronics, such as seminars and workshops, lend themselves to live streaming and recording for later reuse. In other cases, the aim is to create self-learning modules based on existing content, so that students can follow the course independently at any time. These courses have been specially designed to meet the need for digitalization, using existing media and reworking them to create interactive content based on multimedia elements (videos, images, animations, etc.). The advantage of these tools is that they offer the possibility of exporting content in SCORM format, which can be easily imported into any LMS.

Fostering mobility and industry engagement

Another key objective of the project is to attract qualified personnel and support students in order to fulfil the objectives of the European Chips Act. This is achieved through a range of activities including staff exchanges, student mobility programs and scholarships. In line with existing programs such as Erasmus and the Unite! partnership, the project includes internships, summer schools, learning and repair cafés and hackathons across Europe, with a focus on sustainable electronics. The growing environmental awareness of students, while the number of courses on sustainable electronics offered by engineering schools is still very limited, fully justifies the setting up of this program. What's more, the interactive formats also introduce students to the realities of industry, by working directly with industrial partners. These multi-faceted initiatives underline the project's commitment to fostering a diverse, inclusive and globally connected educational ecosystem in the field of microelectronics. Alongside the activities of partner universities, the involvement of industrial partners is essential to bridge the gap between academia and the semiconductor industry. By sharing cutting-edge technologies, innovative processes, ideas and market trends, industry experts enrich the learning experience of students and contribute to the development of a skilled future workforce.