Innovative Training Materials: IoT integrated into Composite Material manufacturing

The Internet of Things has long been the core of the Industry 4.0 revolution: Smart, green, and digital manufacturing. However, the transformation into a digital smart industry comes with a hidden challenge: training human resources to understand smart devices and interact with them.

In fact, early analysis performed in Transform -Erasmus+ project identifies a critical scenario where technical training in Europe is disconnect with the technological demands of the modern productive environment. A common needs for all industrial partners to better understand the possibilities Digitalization could bring to make different sectors more competitive; Moreover, when Circular economy aspects are considered.

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In simple terms, IoT is A network of sensing and actuating devices connected to a central platform, usually with wireless technologies. Sensors collect a huge amount of data and send it back for storage and analysis in the platform, where the smart part of the system is residing. A user of the system can use applications to browse the collected data and use the system's smart features, including big data and Artificial Intelligence.

For Europe, to stay competitive in the global market, there is a remarkable need to transform Composite Materials technologies, mainly vacuum infusion, into digitalization, where monitoring manufacturing at near-real time will enhance operators' and engineers' understanding of the ongoing processes in the field. Enhancing reactions will help avoid manufacturing defects leading to reducing waste, cost, and energy.

One of the project goals is to produce pedagogical Materials for engineering students, providing academic insight into industrial applications. The materials aim to serve both telecommunications and mechanical engineers, providing an applied experience beyond their theoretical curriculum. For telecommunications engineers, this will provide a valuable example of how IoT technologies can be applied in industrial environments. On the other hand, Mechanical engineers, who are familiar with Composite Materials, will be introduced to networking and computing technologies.

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With this diverse audience, the materials developed need to be carefully crafted to bridge the knowledge gaps. On one hand, a general introduction to networking will be included, including IP addressing, subnetting, routing, and the IoT model. On the other hand, Several materials science topics will be covered, including composite Materials, infusion process, and post-infusion treatment.

Engineers from ESTIA Institute of Technology and its composite platform, Composiadour, are actively working on creating a training program with 24h of theoretical and practical activities. The training will span three days and will include performing vacuum infusion to create a mechanical piece with basic geometry, as well as monitoring the infusion process parameters using sensors of the IoT network.

The course materials will be completed before the start of the academic year 2026-27, and will be available under the CC BY Creative Commons license. Stay tuned!

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