



# MANufacturing Education for a Sustainable fourth IndusTRial RevolutiOn

## Introduction

The **fourth industrial revolution**, or **Industry 4.0**, is emerging from the introduction of several technological advancements in the way we design and engineer enterprises and their manufacturing and support systems. Mechanization and automation of repetitive jobs, miniaturization of the components and digitalization of processes and services across the firms ICT infrastructure are the main trends shaping the activities of researchers and practitioners.

For the first time **technology** is not seen simply as a new mean to promote economic growth but also as pivotal element that will enable a greener future. The *2030 Agenda for Sustainable Development*, suggested by the UN, promotes the goal towards **sustainable industrialization and foster innovation**. This includes a specific requirement to **harmonize** the technological development and the future of environment and society. The industrial landscape will be reshaped by this fast and structural paradigm shift.

**Higher education** must keep the pace of this process by ensuring that incumbent as well as newly graduated engineers have no gaps or mismatch between their skills and what is required by the labour market.

## Objectives

The aim of this initiative is to bring together excellences in manufacturing research in order to define and deliver the **new competences** required by **future engineers** working in the context of the fourth industrial revolution. In particular:

- New **contents** and **models** will be developed with particular emphasis given to the aspect related with a sustainable transition to the digital era.
- New **educational units** will be formulated in term of independent learning blocks which can be easily integrated in existing mainstream programs in the domain of industrial, mechanical, production and electrical engineering.

## Key Actions

The objectives will be addressed by the present Key Actions:

- **Mapping** the relevant industrial and research contributions in the domain of the Industry 4.0. The aim is to present all the **eligible innovative topics** as well as the rationale for including them in undergraduate education. For instance Virtual reality, augmented reality, Additive manufacturing, Autonomous Robot and Human robot cooperation, Sustainable Business Models, Multi Agent based distributed Control, Machine Learning, Big Data.
- **Definition** of relevant and updated **skills** and **competences** in the Industry 4.0 domain with focus on sustainability issues for different engineering profiles. The resulting profiles specifications will be formulated in term of new learning outcomes.
- **Development** of Constructively Aligned **educational units**, moving towards a student centred learning process. The courses will include: specifically designed, up to date, learning content-case studies featuring the existing implementation of Industry 4.0 technology in industry; specific reference to the sustainability dimension, a very particular and innovative requirement in the Maestro initiative. The Constructive Alignment gives the necessary common framework for sharing educational objectives among different institutions and different teaching methodologies.
- **Validation** and **implementation** of the proposed courses, running a first set of pilot courses which includes the whole spectrum of technologies coming out of Industry 4.0.
- Long term **cooperation and synergies** among the involved organizations to mutually strengthen each institution.

By its nature these activities can only be carried out in an **international environment** for two reason. First, the scientific contributions that will be analysed and introduced into higher education are developed by transnational teams and multinational companies across the Union. It is not possible to find all the required competences within a single country. Second, the results must be open and available to all the institution devoted to engineering education. This will promote inclusive education and prevent that some areas of the Union are left behind.



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