Manufacturing Methods Industry 4.0

Course Description

The aim of the course is to enable students to evaluate and identify appropriate manufacturing methods in the context of Industry 4.0. For that purpose, the course provides a comprehensive introduction of such processes based on traditional, standardized manufacturing techniques that have influenced and are still influencing production processes through technological developments under the generic term Industry 4.0. These include technological advances in additive manufacturing processes that enable applications such as rapid prototyping, rapid tooling, and direct manufacturing. Finally, the course deals with the consequences of the digitization and networking of production facilities and their elements in terms of a cyber-physical system.

Contents

1. Introduction to Manufacturing Methods
   1. Basic Concepts
   2. Historical Development of Manufacturing
   3. About the Long Tail
2. Manufacturing Methods
   1. Casting and Molding
   2. Shaping
   3. Machining
   4. Joining
   5. Coating
3. Additive Manufacturing and 3D printing
   1. Basics and Legal Aspects
   2. Material Extrusion
   3. Vat Polymerization
   4. Powder Bed Fusion
   5. Material Jetting
   6. Binder Jetting
   7. Direct Energy Deposition
   8. Sheet Lamination
4. Rapid Prototyping
   1. Definitions
   2. Strategical and Operative Aspects
   3. Application Scenarios
5. Rapid Tooling
   1. Definitions
   2. Direct and Indirect Methods
   3. Application Scenarios
6. Direct/Rapid Manufacturing

6.1 Potentials and Requirements

1. Implementation Examples
2. Cyber-Physical Production Systems

7.1 Introduction

1. Cyber-Physical Production Systems
2. Impact on Design and Maintenance of Plants
3. Dynamic Reconfiguration of Plants
4. Application Examples