

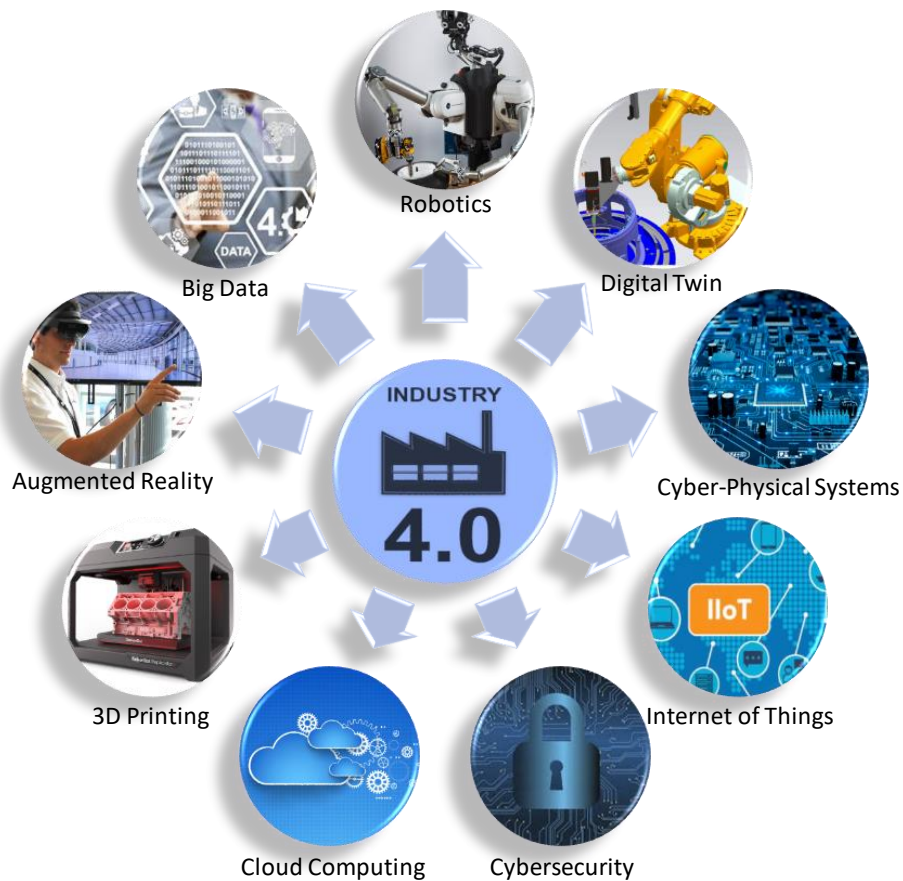
# Industry 4.0 Winter School Course Syllabus



Isfahan University of Technology

# UT5

5 Top Iranian Universities of Technologies



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Isfahan University of Technology

Isfahan, Iran

## **1 General information**

Industry 4.0 is a novel paradigm for industrial production in which digitization plays a fundamental role. Implemented examples are mainly characterized by closely linked machines and their virtual representations via data networks and IT applications. In future factories, cyber-physical systems are used to create a virtual representation of the real world and take decentralized decisions. Today's static central control (the automation pyramid) will change to a network of decentralized production units capable of adapting their behaviour to changing production conditions and batch sizes. The next step towards future production will be that the factory itself will become an intelligent entity. Robots and machines know their abilities and can react flexibly to varying process requirements. Products know their production process and interact with people and machines on the shop floor to optimize their way across production. Artificial Intelligence enables processes in the Smart Factory to be stable and fast. Customers, manufacturers, and suppliers are digitally linked to each other and the individual product with lot size one in automated high-tech production becomes possible.

This course provides a comprehensive overview of the role of digitization, big data, cyber-physical manufacturing systems, robots, human-robot collaboration, artificial intelligence, and all relevant Industry 4.0 technologies. We will try to focus on applications and case studies to make the audience understand the new technologies and demonstrate the benefits of Industry 4.0. We also include contributions from researchers and industry to the opportunities and challenges of Industry 4.0. One of the greatest challenges in upgrading to Industry 4.0 is education. Without young academics, the transition to Industry 4.0 won't be sustainable.

## **2 Qualification**

This course starts with a simple introduction to the most important topics of Industry 4.0. It does not require detailed knowledge of Industry 4.0 technologies but an excellent knowledge of operational processes and relationships in enterprises. On the first day, the most important core technologies and their importance for implementing Industry 4.0 are explained. From a management perspective, the basics and innovations of digitalization in companies are deepened on the second day. The knowledge gained on both days enables the participants to get an overview of Industry 4.0 and the underlying Business strategies.

## **3 Learning objectives**

This course provides participants with an introduction to Industry 4.0, its building blocks, its applications, and its advantages compared to conventional production techniques. Learners get a first insight into how intelligent processes, big data, and artificial intelligence can be used to build up the production of the future and to implement new business models.

## **4 Learning outcomes**

### **Knowledge and understanding**

1. Knowledge of basics, drivers, and enablers of Industry 4.0
2. Knowledge of modern methods and techniques of planning, dimensioning, design, and optimization of Industry 4.0 production systems
3. Knowledge and understanding of value chains in the Industry
4. Knowledge and understanding of the Smart Factory paradigm

**Applying knowledge and understanding**

5. Development of practical skills in dealing with methods and techniques of production system planning and optimization through the application of theoretical learning content in the context of case studies

**Making judgements**

6. Ability for timely and goal-oriented planning and implementation of technical projects
7. Ability for individual working, structuring and documentation of innovative problem solutions using modern technologies for information acquisition and processing.

**Communication skills**

8. Ability to structure, prepare and present scientific and technical documentation
9. Ability to describe project activities and to discuss them amongst each other and with lecturers (online forum)

**Learning skills**

10. Ability to autonomously extend the knowledge acquired during the study course by reading and understanding scientific and technical documentation
11. Ability to enlarge knowledge through self-study and consultation with scientific and technical texts

**5 Learning content and teaching**

The course consists of 2 days with 4 lectures each. A discussion panel will allow participants to ask questions and discuss specific topics with each other and with the lecturers.

**6 Discussion panel**

There will be a discussion panel at the end of 2nd day, and participants can ask their questions to the presenters.

**7 Recommended readings**

Recommended Readings will be published on the course's website at IUT.

**8 Teaching language**

This winter school is held in Farsi.

**9 Course schedule**

The following table is the course schedule.

Any new information will be posted in the Course Updates & News on the course website at IUT.

Schedule	Contents
<p><b>Day 1</b>  <b>8:30 to 8:45</b>  <b>Prof. Dr. Peiman Mosaddegh</b></p>	<p><b>Introduction of Institutions / Lectures and general scope of the winter school</b></p>
<p><b>Day 1</b>  <b>8:45 to 10:00</b>  <b>Prof. Dr. Peiman Mosaddegh</b></p>	<p><b>Introduction to Industry 4.0</b></p>
<p><b>Day 1</b>  <b>10:00 to 10:30</b>  <b>Discussion led by Prof. Dr. Peiman Mosaddegh</b></p>	<p><b>Break &amp; Discussion forum</b>                      Challenges and chances of a new industrial paradigm                      Lecturers are available in different break-out sessions for questions</p>
<p><b>Day 1</b>  <b>10:30 to 11:45</b>  <b>Prof. Dr. Majid Nabi</b></p>	<p><b>Internet of Things (IoT) &amp; Industrial Internet of Things (IIoT) &amp; Internet of Services</b></p>
<p><b>Day 1</b>  <b>11:45 to 13:30</b></p>	<p><b>Lunch break</b></p>
<p><b>Day 1</b>  <b>13:30 to 14:45</b>  <b>Prof. Dr. Iman Izadi</b></p>	<p><b>The Smart Factory</b></p>
<p><b>Day 1</b>  <b>14:45 to 16:00</b>  <b>Eng. Mohammad Hossein Kalbasi</b></p>	<p><b>The Smart Product</b></p>
<p><b>Day 1</b>  <b>16:00 to 17:00</b>  <b>Discussion led by Prof. Dr. Peiman Mosaddegh</b></p>	<p><b>Discussion forum:</b>                      What can we learn from the application of Industry 4.0                      Lecturers are available in different break-out sessions for questions</p>

## Day 2 of winter school on Industry 4.0

Schedule	Contents
<b>Day 2</b> <b>8:30 to 10:00</b> <b>Prof. Dr. Rassoul Amirfattahi</b>	<b>Machine Learning and Artificial Intelligence in Production</b>
<b>Day 2</b> <b>10:00 to 10:30</b> <b>Discussion led by Prof. Dr. Peiman Mosaddegh</b>	<b>Break &amp; Discussion forum</b> Lecturers are available in different break-out sessions for questions.
<b>Day 2</b> <b>10:30 to 12:00</b> <b>Prof. Dr Ali Fanian</b>	<b>The importance, role, and challenges of cyber security in Industry 4.0</b>
<b>Day 2</b> <b>12:00 to 13:30</b>	<b>Lunch break</b>
<b>Day 2</b> <b>13:30 to 15:30</b> <b>Discussion panel</b> <b>Dr. Rasoul Saraeian</b> <b>Prof. Dr. Peiman Mosaddegh</b> <b>Prof. Dr. Sayed Hadi Hossaini</b> <b>Prof. Dr. Jamshid Parvizian</b> <b>Eng. Goodarzi</b>	<b>Challenges of leadership and digital governance of large companies and providing a practical model</b>  <b>Q&amp;A and discussion:</b> What is the right digital strategy for different industries in Iran?
<b>Day 2</b> <b>15:30 to 16:00</b> <b>Closing and Feedback Session</b>	<b>Participants fill out the feedback forms.</b>