Industry 4.0 and the applications

Introduction

The term of Industry 4.0 was first used in 2011 at the Hannover Fair and has become a fashion. Many organizations want to enjoy the benefit of Industry 4.0 through introducing the new technologies, such as cyber-physical systems, IoT, AI or 3D printing. However, it is often not clear how those technologies are related to the objective of Industry 4.0, and the concept of Industry 4.0 is sometimes obscure to the public and even researchers. Nevertheless, implementing the technologies should aim at improving an organization's competitiveness, but not just following a fashion. In the lectures, the concept of Industry 4.0 will be explained and the courses are arranged along the three dimensions of Industry 4.0. The roles of different technologies and their relations with Industry 4.0 will be clarified. To have a better understanding of a smart factory, case studies from industries are given. After the training, you will have a clearer picture of different industrial revolutions in human history, as well as the future trend to improve the competitiveness of manufacturing systems.

Course objectives

1. Understand the scope and objective of Industry 4.0.
2. Explain the relations and roles of the important technologies in Industry 4.0.
3. Demonstrate how to improve productivity by Industry 4.0 through case studies.

Course outline

Session 1: Introduction to Industry 4.0 – Part 1

- Industrial revolutions and the distinct features of Industry 4.0
- The three dimensions of Industry 4.0

Session 2: Introduction to Industry 4.0 – Part 2

- AI, robotics and their role in Industry 4.0
- CMP case study introduction

Session 3: Vertical Networking of a smart factory

- MES, ERP and APC in the third industrial revolution
- Cyber-physical systems in Industry 4.0

Session 4: Horizontal Integration of smart supply chains

- Case studies of horizontal Integration
- Design of a smart supply chain

Session 5: Cyber-Physical Production Systems for a Smart Factory

- Realization of a CPS in the semiconductor industry

Session 6: Group presentation
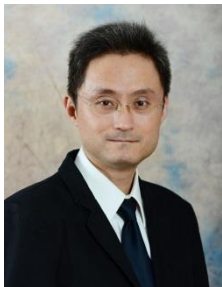
- Intelligent control for the CMP case study

Duration

2.5 hours x 6 sessions

Teaching Methodology

- Interactive/Participative method
- Student-Centered Discussions
- Explaining abstract concepts through case studies

Instructor

Dr Kan Wu is an Assistant Professor in the School of Mechanical & Aerospace Engineering at Nanyang Technological University. He received the B.S. degree from National Tsinghua University, M.S. degree from University of California at Berkeley, and Ph.D. degree in Industrial and Systems Engineering from Georgia Institute of Technology. He has ten years of experience in the semiconductor industry, from a consultant to an IE manager. He has guided the development of scheduling and dispatching systems in Taiwan Semiconductor Manufacturing Company and ramped up a 300mm DRAM fab for Inotera Memories. Before joining NTU, he was the CTO and founding team member of a startup company in the US. His PhD dissertation was awarded the 3rd place for the IIE Pritsker Doctoral Dissertation Award in 2010. His research interests are primarily in the areas of queueing theory, with applications in the performance evaluation of supply chains and manufacturing systems.