Digital Factory

In the era of business globalization and increasing personalized customer demands, we are struggling to leverage all the resources available to stay competitive in the markets. These driving forces push the eruption of what is so called today "Industry 4.0". It is a concept firstly invented and introduced by German industrialists exploiting advanced information and manufacturing technologies. In this class, how past industrial revolutions evolved from time to time and finally led the way to Industry 4.0 will be discussed. Digitalization towards Industry 4.0 involves understanding in principles of data exchange between functional units. Students will conceptually learn how to transform traditional factory to become digital one, starting by the Data Flow Diagram. Cyber-physical systems together with Internet of Thing, Big Data, Cloud Computing, and Industrial Wireless Network are core technologies enabling the realization of Industry 4.0. Asides from those information technologies, advanced manufacturing technologies, i.e. Virtual and Augmented Reality (VR/AR), additive manufacturing, robot and AGV are also introduced in this class, along with hand-on experiences in some topics. At the end, ideas of future trend of digital factory will also be exchanged. This class encourages students to actively participate in all activities. It is aimed to promote students' learning achievement through sessions suggested by an innovative learning model "LOVE" devised by Hussadintorn et. al.

Instructor: Prof. Atthakorn Kengpol

Class schedule:

Venue:

Module	Wk	Content	Assignment	Due Date
Overview of Digital Factory	1	**Ch.1 Introduction** Illustration of traditional factories in contrast with digital factories		
		Discussion on readiness of industry		
		Review on factory digitalization		
		Class discussion		
		Lecture on digital factory	Assignment I: One A4-page of material	next day
	2	Factory Visit	Assignment II: Data flow diagram of the case study factory to be presented by the end of Wk4	end of Wk4
	3	**Ch2. Cyber-Physical Systems** Illustration of applications of cyber-physical systems in industry		
		Discussion on establishment of the systems		
		Lecture on cyber-physical system		
		Lab on Product Lifecycle Management	Assignment III: One A4-page of material	next day
	4	**Ch3. Cyber Security** Review on cyber security		
		Class discussion		
		Lecture on cyber security	Assignment IV: One A4-page of material	next day
		Group Project Demonstration I	Presentation of the data flow diagram	

Advanced Technologies in Digital Factory	5	**Ch4. Virtual Reality and Augmented Reality** Illustration of VR/AR technologies		
		Review of VR/AR applications in the industry		
		Class discussion		
		Lecture on VR /AR and AI contribution	Assignment V: One A4-page of material	next day
	6	Lab on VR/AR		
		Class discussion		
	7	**Ch5. Additive Manufacturing** Class discussion		
		Lecture on Additive Manufacturing		
		Case studies		
		Class presentation		
	8	Hands-on Lab for Additive Manufacturing	Assignment VI: One A4-page of material	next day
		Class discussion		
	9	**Ch6. Industrial Communications and Sensors** Class discussion		
		Lecture on Industrial Communications and sensors technology		
		Case studies		
		Class presentation	Assignment VII: One A4-page of material	next day
	10	Hands-on Lab for industrial sensors		
		Class discussion		
	11	Visiting of a Real/Virtual Factory II	Assignment VIII: Data Flow Diagram of the	next day
	12	**Ch7. Robotics and AGV** Class discussion		
		Lecture on robotics and AGV		

		Case studies		
	13	Hands-on lab for robots and AGV with DFD		
		Class discussion	Assignment IX: One A4-page of material	next day
Future Factory	14	Group project demonstration II Final presentation		
	15	**Ch.8 Future Trend of Digital Factory** Class discussion on Future Trends of Digital Factory		
		Case-based Learning on Future Trends of Digital Factory (Present case studies)	Assignment X: Propose ideas of future facctories	
		Course summarization		

Grading Policy

Class discussions (10%)

Class participation (10%)

Peer assessment in class activities (10%)

Individual assignments and presentations (10%)

Progress presentation (15%)

Executive summary for group project (5%)

Project outcome (10%)

Final group project presentation (10%)

Final Examination (20%)