

# **e-Manufacturing**

**Fan-Tien Cheng**

Institute of Manufacturing Information and Systems  
National Cheng Kung University  
Tainan, Taiwan  
R.O.C.

TEL: 886-6-2757575 Ext 34224

FAX: 886-6-2085334

Email: [chengft@mail.ncku.edu.tw](mailto:chengft@mail.ncku.edu.tw)

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e-Manufacturing integrates Manufacturing Execution System (MES), Equipment Engineering System (EES), Supply Chain (SC), and Engineering Chain (EC) of factories via utilizing Information Technology (IT) and Internet to achieve the integration and transparency within factory (including production & measurement machines, automatic handling & transporting system, and fab monitoring) and within the whole industry (including factories, management personnel, upstream & downstream fabs, client end, equipment and technology suppliers, and other business partners) in order to fulfill the following requirements: (1) effectively enhance production capacity and yield (by using MES); (2) upgrade the Overall Equipment Efficiency (OEE, by using EES); (3) shorten the Order-to-Delivery time of products (by utilizing SC); (4) cut down the Time-to-Market product cycle time from design, development, and on market (by utilizing EC), for reaching the goal of lowering overall production costs. This course focuses on the e-Manufacturing-related specifications, systems, and implementation techniques and takes the semiconductor manufacturing automation and wheel machining automation as the application examples. In addition, this course introduces Industry 4.0, and then merges the Automatic Virtual Metrology (AVM) technologies with Industry 4.0 to accomplish the goal of Industry 4.1—Zero Defects (ZD). Moreover, the Intelligent Factory Automation (iFA) System Platform is also introduced.

## **Course Content**

1. Introduction to e-Manufacturing
2. SEMI Equipment Communications Standards I & II (SECS I & II)
3. Generic Model for Communications and Control of SEMI Equipment (GEM)
4. High-Speed SECS Message Services (HSMS)
5. Generic Equipment Manager (GEMG)
6. Overview of Object Technology & UML
7. Fundamentals of Web Services
8. Holonic Manufacturing Execution System & Holonic Supply Chain System
9. Fundamentals of Cloud Computing & A Novel Automated Construction Scheme for Efficiently Developing Cloud Manufacturing Services (MSACS)
10. ISMI e-Manufacturing Requirements
11. Equipment Data Acquisition (EDA) – Interface A
12. Equipment Engineering System
13. Engineering Chain Management System
14. Automatic Virtual Metrology (AVM)
15. AMCoT & Industry 4.1
16. Docker Container & Kubernetes and their Industrial Applications
17. Intelligent Factory Automation (iFA) System Platform

## **Textbook and References**

- Self-made handouts
- SEMI International Standards CDROM 2006

**Scoring:**     Midterm: 50%                      Final: 50%

# Syllabus

2020.09.10

2020.09.10	1. e-Manufacturing & Industry 4.0 for the Semiconductor Industry
2020.09.17	2. e-Manufacturing – Manufacturing Portion
2020.09.24	3. SECS I / SECS II
2020.10.01	Holiday
2020.10.08	4. GEM & 5. HSMS
2020.10.15	6. Overview of Object Technology & UML [Duke]
2020.10.22	7. Generic Equipment Manager (GEMG)
2020.10.29	8. Fundamentals of Web Services [Duke]
2020.11.05	Midterm
2020.11.12	9. Holonic Manufacturing Execution System
2020.11.19	10. Holonic Supply Chain System
2020.11.26	11. Engineering Chain Management System & 12. Interface A (EDA) Stds
2020.12.03	13. Fundamentals of Cloud Computing & MSACS [Duke]
2020.12.10	14. Automatic Virtual Metrology (AVM)
2020.12.17	15. AMCoT & Industry 4.1
2020.12.24	16. Docker Container & Kubernetes [Hung] 17. Rapid Construction Scheme of Intelligent Manufacturing Edge Device based on Container Technologies & Containerized AVM [Hung]
2020.12.31	18. Final