

# High-Tech Facility Construction Management

**Purpose:** The purpose of this course is to provide basic knowledge needed for managing high-tech facility constructed project. High-Tech includes, not limited to, the advanced technologies applied in the fields of microelectronics, optoelectronics, precision equipment, telecommunication, nanotech, pharmaceuticals, biotech, medical devices, animal experiment, and Aerospace. The construction processes undertaken in high-tech manufacturing plants require special clean-build protocols with extremely tight schedule, stringent quality and safety control as well as effective communication for integrating all the participants.

The focus of this course is on managing the construction of high tech fabrication plant (fab) and engineering its facilities for life-cycle operation. Students will gain methodologies needed to meet ever-changing challenge of delivering an ultra pure and fast moving semiconductor and related Fabs such as wafer, LED, TFT, and/or Photovoltaic. Moreover, this course will strengthen student' s understanding and background in managing high-tech fab engineering project and integrating its interdisciplinary nature.

This course will be taught in English. Students are encouraged to use English for asking questions and answering homework problems. However, to enhance student's learning and to facilitate the communication between instructor and students, manderin could be used in the case.

**Scope:** This course is intended to offer to both graduate students, juniors and seniors. Students in engineering, science, agriculture, pharmacy, life science, business, management and social science will be exposed to fundamental theories and their applications in the build/certify/manage of the high tech manufacturing plants. Academic faculty will teach basic theories and principles. Professional industrial experts will be invited to reinforce the application of theories and principles in the real world practices. The contents will include lectures, home works, a semester team project with an oral presentation and a written report, and a final examination. Mandatory Field trips to learn from high-tech plants and research labs, and cleanrooms will be arranged.

Moreover, laboratory experiments will be required to enable students to have hands-on experiences on cleanroom testing. And a short supplemental course by applying TSMC' s 3D CAD to Fab Project Management may be provided on a volunteer base, if more than 10 students sign up for the short course. And the supplemental course will be examined and certified by TSMC 300mm Fabs Facility Division.

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WEEK	SUBJECT
1	Course Introduction and Overview of High-Tech Facility Construction Management
2	Fundamentals of Project Management and CPM Scheduling
3	Time-Cost Integration and Floats Management
4	Scheduling Thru Microsoft Project, Planning of Nanoscale Science and Technology Facilities and Nanotechnology Safety
5	Introduction of Group Project, Each Facility System and TSMC 5D Model Demonstration
6	Fundamentals of Nanotechnology, Semiconductor, Integrated Circuit and Manufacturing Processes (CMOS, FinFET and 3DIC)
7	Memorial Holidays for Ancestors- No Class
8	Economics & Profitability of Wafer Manufacturing Industry Construction Safety Program and Quality Management
9	No Mid-term Exam, but, Substituted with a 2-day Mandatory Field Trip to TSMC Fab15 at Taichung on 5/13 & 5/14
10	Construction Management on MEP Systems and Cleanroom Construction Methods, Protocols, and Tests.
11	Operation Management on Process Gases and Chemicals, Ultra-Pure Water and Bulk Gas plant.
12	Intelligent Fab, Green Manufacturing, and Construction Waste Management and Corporate Social Responsibility
13	TFT-LCD Manufacturing and EHS Management
	TSMC Fab15, Taichung Tour Fab15 Green Facilities Cost-Effective Management of Fab Operation Experiments on Electrical, Chemical and Ultrapure Water Systems Night, Staying in Taichung, TSMC Fab15, Taichung Tour TSMC Fab15-P7 Construction Site for Sub-structure and

	Super-structure. Demonstration of TSMC 5D Simulation and Fab Management Control System 5D Scheduling Presentation of Each Group, Integration of Each Group' System and Sponsors Input
14	Resource Leveling, Methods of Shortening Project Duration, Principle and Application Program Evaluation Review Technology (PERT) and Risk Management
15	5D Term Project Scenario Analysis and Integration
16	Project Delivery Methods and Total Quality Management
17	Group Final Term Project Presentation
18	Final Exam

### **HOMEWORK & ATTENDANCE**

Expect to have 5 homework problems. Homework is due at the beginning of the next class session. No homework assignment can be missed without penalty, without an acceptable prior excuse. Homework counts 15% of 'FINAL' grade. In order to receive course credit and full grade, a student must:

**Satisfactorily complete ALL assignments.**

**Two unexcused absences will result in a grade of 'Incomplete' or 'Flunk'**, depending on whether or not the student is considered to be passing in all other aspects at the time of the third absence. Failure to complete ALL assignments will result in a grade of 'I' or 'F', depending on whether or not the student is considered to be passing in all other aspects. Except in emergency situation, a student must attend all the field trips. Unexcused absences will result in a final grade of 'Incomplete.'

### **GROUP**

There will be one (1) group term project. The group term project tests **PROJECT:** student' s understanding of the principal managerial concepts on 3D CAD and CPM scheduling covered in the course within the context of a comprehensive "real-world" problem. It also provides an opportunity to develop skills for working in a project team and learning communication.

The theme of the group project should be "4D Scheduling and specific subject will be

decided within 4 weeks after the 1st class. The group term project report should be well bonded and conform to good engineering practices and should include, as a minimum, a title page, abstract, table of contents, introduction, theories behind the lecture, conclusion, and references. Any citation should be clearly noted and/or referred with specific pages.

### **The following deadlines must be observed:**

1. Group Formed with Topic & Focus Area
2. Abstract & Table of Contents (No more than 3 pages.)
3. Group 4D Project Presentation & Preliminary Results
4. Mail-In Presentation Slides
5. Oral Presentation
6. Turn in: Two Paper Final reports and One CD contains group final report, group oral presentation slides and group field trip report.

Any group misses the deadline will be penalized **10% off** the semester term project grade.

### **The Final Grade Rating**

Term Project	50%
Final Exam	15%
Home Work	15%
Group Field Trip Report	10%
Class Participation	10%