IEEM3090 Manufacturing Engineering Spring 2020

Instructor: Professor Chih-Hsing Chu (瞿志行), First Engineering Building, Room 823, 5742698
Class Time: Tuesday 1:20-4:10
Course Website: TBA
TA: TBA, Room 727, 33931

Course Description: This course complements IEEM 2080 Manufacturing Processes by introducing modern manufacturing technologies with three focuses. The first one concerns *advanced manufacturing processes* including metal cutting theory and nontraditional machining. The second focus is on *electronics manufacturing*. We will also introduce *manufacturing automation and computerization technologies* including sensor/actuator, robotics, CNC, CAD, CAM, and 3D printing. The target audience is undergraduates with a good understanding of manufacturing processes. In addition to attending regular lectures, students are expected to exercise CAD/CAM software and watch related videos in class. Students in group also need to complete a term project using the automation technologies learned from this class.

References:

1. Fundamentals of Modern Manufacturing, M.P. Groover, Third Edition, John Willy & Sons, 2007.
2. Automation, Production Systems, and Computer-Integrated Manufacturing, M.P. Groover, 2nd Edition, Prentice Hall, 2000.
3. 21st Century Manufacturing, P.K. Wright, Prentice Hall, 2001.
4. SME Instructional Videos for Manufacturing Processes.

Grading: Homeworks (30%) + Final Exam (40%) + Term Project (30%) + Class Participation (bonus 5%)

Policies:

1. All the class-notes will be posted prior to the class.
2. All exams will be held in closed book and closed notes. Relevant formulas will be provided.
3. Most reading materials, homework, exam, and notes are in English.
4. Homework is individual assignment. Any homework not handed in timely is considered late and the grade of the homework will be reduced by 50%.
5. Several video-watching sessions will be arranged and their contents will be included as exam/homework materials.
6. Please try not to use your smart phone during the class time.

Course Contents

Advanced manufacturing processes

1. Metal Cutting Theory and Processes
2. Nontraditional Machining

- Abrasive Machining: Grinding, Honing, Lapping, and Diamond Turning

- Water Jet Machining and Ultrasonic Machining

- ECM, EDM, Laser Machining, and Chemical Machining

- Surface Technologies: Plating, PVD, and CVD

Electronics Manufacturing

1. Silicon processing

2. IC Fabrication

3. IC packaging

4. PCB Assembly

5. Introduction to MEMS (Micro-electromechanical Systems) Fabrication

Manufacturing Automation and Computerization

1. Sensors and Actuators

2. Robotics

3. Metrology/Inspection Technologies

4. Principles of Computer Numerical Control (CNC)

5. CNC part programming

- NC code

- APT

6. 3D Printing

CAD/CAM/CNC Training