ME 55700
DESIGN FOR MANUFACTURABILITY

Course Outcomes

1. Augment the mechanical design process with a body of knowledge concerning the manufacturing aspects as related to design.
2. Provide a design experience in which the students can disassemble, suggest redesigns for, create new parts, and obtain feedback from industry concerning manufacturability.

Design Process Representation (4 wks)
1. Product development cycle
2. Design process
3. Quality function deployment

Manufacturing Considerations (3 wks)
1. Material and manufacturing selection
2. Statistical tolerancing

Assembly (2 wks)
1. Assembly process
2. Design for assembly

Economic Analysis (2 wks)
1. Quality
2. Cost breakdown (fixed and variable cost)
3. Value engineering

Robust Design for Manufacturing (4 wks)
1. Robust design
2. Taguchi methods
3. Reliability, life cycle engineering, failure modes and effects analysis (FMEA)

Laboratory Projects
1. CAD, machining, and measurement exercises. (3 weeks)
2. Quality function deployment exercise focused on household appliances. (2 weeks)
3. Statistical tolerancing exercise. (2 weeks)
4. Design for assembly exercise. (1 week)
5. Industry-sponsored project (Redesign of a product including concept explanation, DFA analysis, manufacturing/material selection, tolerance analysis, FMEA, and cost analysis). (6 weeks)
6. Taguchi exercise. (1 week)

Typical Industry Related Projects
1. Redesign of a Washing Machine (Whirlpool)
2. Redesign of an Automotive Fuel Sender (Ford)
3. Redesign of a Kitchen Mixer (KitchenAid)

Revision Date: 7/30/12
### 1. COURSE NUMBER AND NAME: ME 55700 Design for Manufacturability

### 2. CREDITS AND CONTACT HOURS: 3 credits
- **a. Lecture** – 2 days per week at 50 minutes for 16 weeks
- **b. Laboratory** – 1 day per week at 170 minutes for 16 weeks

### 3. COURSE COORDINATOR OR INSTRUCTOR:
R.J. Cipra

### 4. TEXTBOOK:

### 5. SPECIFIC COURSE INFORMATION:
- **a. Catalog Description:** Introduction to manufacturing concerns such as efficient design, producibility, and quality, which must be considered early in the engineering design process. Topics include the product development cycle, manufacturing process selection, tolerancing, quality function deployment (QFD), design for assembly (DFA), quality control techniques, Taguchi’s robust design methodology, life cycle engineering and reliability. Laboratory projects in the area of tolerancing, assembly and manufacturability are included along with a project from industry in which the students can disassemble, analyze, and redesign a product while obtaining feedback from industry concerning manufacturability. Typically offered in the fall.
- **b. Prerequisites:**
  - First Semester Senior Standing or Higher
- **c. Status:** Elective

### 6. SPECIFIC GOALS FOR THE COURSE

**a. Course Outcomes:**
1. Augment the mechanical design process with a body of knowledge concerning the **manufacturing aspects as related to design**.
2. Provide a **design experience** in which the students can disassemble, suggest redesigns for, create new parts, and obtain feedback from industry concerning manufacturability.

**b. Related ME Program Outcomes:**

### 7. LIST OF TOPICS: See following page.

PREPARED BY: R. J. Cipra

REVISION DATE: July 30, 2012