ME 557
DESIGN FOR MANUFACTURABILITY

Course Outcomes

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

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 a Rear Projection Television (Thomson)
3. Redesign of an Automotive Fuel Sender (Ford)

COURSE NUMBER: ME 557 **COURSE TITLE:** Design for Manufacturability

REQUIRED COURSE OR ELECTIVE COURSE: Elective

TERMS OFFERED: Fall

TEXTBOOK/REQUIRED MATERIAL: G.E. Dieter, *Engineering Design: A Materials and Processing Approach*, 3rd ed, McGraw-Hill, 2000.

PRE-REQUISITES: First Semester Senior Standing or higher

COORDINATING FACULTY: R.J. Cipra

COURSE 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.

COURSE OUTCOMES:

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

ASSESSMENTS TOOLS:

1. Homework assignments.
2. Laboratory projects.
3. Two exams during the semester.
4. One final exam.

PROFESSIONAL COMPONENT:

1. Engineering Topics: Engineering Science – 1 credit (33%)
   Engineering Design – 2 credits (67%)

NATURE OF DESIGN CONTENT: Concurrent engineering design including creativity, feasibility, methodology, synthesis, analysis, as well as consideration of materials, processing, cost, and total life cycle.

RELATED ME PROGRAM OUTCOMES:

1. Engineering fundamentals
2. Engineering design
3. Communication skills
4. Ethical/Prof. responsibilities
5. Teamwork skills
6. Experimental skills
7. Knowledge acquisition

COMPUTER USAGE: Students may use computer tools to assist analysis studies for completing the projects.

COURSE STRUCTURE/SCHEDULE:

1. Lecture – 2 days per week at 50 minutes.
2. Laboratory – 1 day per week at 170 minutes.

PREPARED BY: R.J. Cipra **REVISION DATE:** March 6, 2019