

Course No: MET 4460
Course Name: Product Design & Development
Credits: 3 semester credits, (0 – 3 – 3)
Semester: Spring 2007
Section: R03
Day / Time: Recitation T TH 1:05 – 1:55 (07-314)
 Lab W 3:05 - 4:55 (07-314)

Instructor: Mark A. Johnson Ph.D.
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Office Hours: M-Th 10:00 – 11:00
 F 1:00 – 2:00

Textbook: Dieter, George E. (2000). Engineering Design, 3rd edition, USA, McGraw-Hill, Inc, ISBN#0-07-366136-8.

Prerequisites: MET 3450

Additional Materials/References: There may be additional reading, homework, etc. distributed via email or on reference in the library. Even though it is not listed on the syllabus, it is your responsibility to make sure that you review the material. This material could be included on exams.

Course Description: A treatment of design and development issues such as design for manufacturing, prototyping, industrial design, and customer needs. Utilizes integrated methodologies that examine marketing, manufacturing, and cross-functional teams. Includes concurrent engineering and projects utilizing CAD systems.

Course Objectives: After completing this course, you should be able to:

- Understand the process to takes place to design, market and manufacture a product.
- Develop an understanding of new tools and the latest techniques used in industry during product development.
- Apply the tools you have learned to your senior project process.
- Understand the importance of the engineering design process and how it impacts the organization.

Class Sessions:

Instructional Methods

A variety of methods will be used to transfer the knowledge and skills of manufacturing to you as a student. The following methods will be used:

- Lecture
- Class Discussion
- Review of senior project or enterprise project
- Reviewing Sample Problems as they apply to senior project

Skills

You will be using many different skills in this course. There are several prerequisites prior to taking this course, which serve as the foundation for topics covered. It is important to have completed the prerequisites prior to taking this course. You will use the following skills:

- Problem solving skills
- Critical thinking skills
- Analytical skills

Course Evaluation: Grades will be based on the following:

• Home Work Assignments Linked to Senior Project	25%	250 pts
• Exam #1	25%	250 pts
• Exam #2	25%	250 pts
• Exam #3	25%	250 pts
• Total Points	100%	1000 pts

Perfect Attendance and Class participation will earn 50 Bonus Points

Grading Scale:

A	93% and above (Excellent, with 4.0 grade points per credit)
AB	88-92 (Very good, with 3.5 grade points per credit)
B	82-87% (Good, with 3.0 grade points per credit)
BC	76-81% (Above average, with 2.5 points per credit)
C	70-75% (Average, with 2.0 points per credit)
CD	65-69% (Below average, with 1.5 points per credit)
D	60-64% (Inferior, with 1.0 points per credit)
F	59% and below (Failure, with 0.0 points per credit)

I Incomplete; given only when a student is unable to complete a segment of the course because of circumstances beyond the student's control. It must be made up by the close of the next four quarters in residence or the incomplete grade becomes a failure. A grade of incomplete maybe given only when approved in writing by the department chair. Incomplete grades at graduation are considered (F) grades in computing the final grade

Homework:

No homework assignments will be given in this course, however it is highly recommended that you work all suggested problems in the syllabus. Exams are based on knowledge gained working these text problems. If you have any questions, please feel free to contact the instructor for further information or direction.

Hour Examinations:

There will be three exams. The exams will consist of a combination of multiple choice, short answer, and problems. There will be no makeup exams except in extreme, documented circumstances.

Cheating or Plagiarism:

Proper professional and ethical behavior is expected of all students in this class. If cheating is suspected the Dean of Students will be notified and standard MTU policies will be followed.

Student Expectations:

The most important expectation would be to learn about manufacturing process that you could use in your working life. However, to be able to be successful in this course, the following are expectations I have to ensure your completion and a good grade:

- Attend every class (except under extreme circumstances that you should provide documentation to instructor).
- Read the required material prior to attending the course.
- Complete all assignments on time (Absolutely no late submissions accepted)
- Participate in class and group discussions.
- Be prepared for class.
- Present professional reports and presentations.
- Abide by the Academic Integrity policy.
- Use recommended software and word processing for required assignments.
- Interact with class members and be respectful of other's opinions.
- Apply continuous improvement and make recommendations to instructor.

This class is designed for you to participate in the learning experience. You are responsible for being a learner and a teacher of information. You can learn as much from the instructor as you can from exchanges and discussions with other students in the class. Many of the students bring valuable work experience that is relevant to the subjects being discussed.

If you are not in class, it is hard to participate. If you have an extreme situation, which prevents you from attending the course, please document the circumstance and provide the written notice to the instructor. Students that attend every recitation and participate will receive 50 points toward the final grade. **It will be your responsibility to sign the attendance sheet during class.**

Universities excused absences include documented plant trips and other university related business. Please provide **written notice of absence in advance** of missing class. Class participation includes full attendance, being prepared for in-class group work and discussions, and responding to discussion topics.

Notice:

If you have any special needs because of personal circumstances, please feel free to meet with me in the beginning of the semester or as soon as possible. MTU complies with all federal and state laws and regulations regarding discrimination, including the Americans with Disability Act of 1990 (ADA). If you have a disability and need reasonable accommodation for equal access to education or services at MTU, Associate Dean of Students at 487-2212. For other concerns about discrimination, you may contact your advisor, department head, or the Affirmative Action Office at 487-3310.

Time Management

This course is one of several courses you are required to complete for your degree. It is always helpful to have an idea of the time requirements associated with a particular course. It is estimated that outside of class you will need to spend approximately, on average, 2-3 hours per credit hour or 6-9 hours a week to complete the recommended assignments. It is possible in some weeks that it will be more and other weeks it will be less.

Web

All current material will be found on the MTU W: drive under www.tech.mtu.edu/courses/MET4460

Date **Chapter/Required Reading/Suggested Problems**

Week 1

- 1/16** **Course Introduction**
Review of course syllabus
- 1/17** Senior Project Ideas (MET Faculty)
Chapter 1: The Product Design Process
Required reading: Text pages 1-53
- 1/18** **Chapter 1: The Product Design Process**
Suggested Problems Set: 1.1, 1.3, 1.7

Week 2

- 1/23** **Chapter 2: Need Identification and Problem Definition**
Required reading: Text pages 55-80
Suggested Problems Set: 2.4, 2.5
- **Perform Benchmarking for proposed design (Due 1/30)**
 - **Develop QFD for senior project (Due 2/1)**
 - **Write a PDS for your teams senior project (Due 2/1)**
- 1/24** **LAB: Work on Benchmarking/QFD/PDS**
- 1/25** **Chapter 2: Continued**

Week 3

- 1/30** **Chapter 3: Team Behavior and Tools**
Required reading: Text pages 82-116
Suggested Problems Set: Create a team charter for Senior your Senior Project (Due 2/6)
- 1/31** **LAB: Set up Senior Design Team, Develop meeting times, Build Project Schedule (Due 2/6)**
- 2/1** **Chapter 3: Continued**

Week 4

- 2/6** **Chapter 4: Gathering Information**
Required reading: Text pages 119-149
Suggested Problems Set: 4.4, 4.6
- 2/7** **LAB: Tour of the MTU Library and resources available (Build Research Portfolio) (Due 2/15)**
- 2/8** Winter Carnival

Week 5

- 2/13** **Chapter 5: Concept Generation and Evaluation**
Required reading: Text Pages 151 – 206
Suggested Problems Set: 5.14
- 2/14** **LAB: Break design down into subassemblies, then down into functional descriptions**
Develop cost model (Due 2/22)
- 2/15** **Exam #1 (Chapters1-5)**

Week 6

2/20 Exam #1 Returned

2/21 LAB: Develop Cost Model for Senior Design Project (Due 2/29)

2/22 Chapter 6: Embodiment Design
Required reading: Text pages 210-245
Suggested Problems Set: 6.6, 6.7

Week 7

2/27 Chapter 7: Modeling and Simulation
Required reading: Text pages 247-291
Suggested Problem Set: 7.5, 7.8

2/28 LAB: Through use of parametric model develop simulation of function (Due 3/8)

2/29 Chapter 7: Continued

Week 8

3/6 Chapter 8: Materials Selection and Material in Design
Required reading: Text pages 294-373
Suggested Problems Set: 8.14, 8.15

3/7 LAB: Define functions of each components part
Define method of manufacture, # required pieces, tolerances, how fabricated
Determine materials to be utilized
Make final material selection (Due 3/22)

3/8 Chapter 8: Continued

Spring Break March 10 - 18

Week 9

3/20 Chapter 9: Materials Processing and Design
Required Reading: Text pages 377-459
Suggested Problems Set: 9.13

3/21 LAB: Determine type production system to produce (Ref table 9.1)
Develop plan considering DFM, DFA (DUE 4/3)

3/22 Chapter 9: Continued

Week 10

3/27 Chapter 10: Engineering Statistics
Required Reading: Text pages 462 - 514
Suggested Problems Set: 10.1, 10.4, 10.7, 10.18

3/28 LAB: Continue DFM & DFA

3/29 Exam #2 Chapters (6-10)

Week 11

- 4/3 Exam #2 Returned
- 4/4 **LAB : Instructor Review of Senior Project Drawings**
- 4/5 **Chapter 11: Risk, Reliability, and Safety**
Required Reading: Text Pages 521-569
Suggested Problems Set: 11.3, 11.8, 11.9

Week 12

- 4/10 **Chapter 12: Robust and Quality Design**
Required Reading: Text pages 573-626
Suggested Problems Set: 12.7, 12.9, 12.10
- 4/11 **LAB: Develop Failure Mode & Effect Analysis for senior project**
- 4/12 **Chapter 12: Continued**

Week 13

- 4/17 **Chapter 13: Economic Decision Making**
Required reading: Text pages 629-667
Suggested Problems Set: 13.2, 13.6, 13.7
- 4/18 **LAB: Determine ROI for proposed design**
- 4/19 **Chapter 13: Continued**

Week 14

- 4/24 **Chapter 14: Cost Evaluation**
Required reading: Text pages 671-710
Suggested Problems Set: 14.12, 14.13
- 4/25 **LAB: Develop Life Cycle Cost Model for your Senior Project**
- 4/26 Exam #3 Review & Problem Review

Finals Week April 30 – May 4