

ME 474: Design for Manufacture And Modern Manufacturing Strategies
Syllabus – Fall 2011

Course description: Design for Manufacture and Assembly; Modern Philosophies and Practices including Lean Manufacturing; Quality control in Manufacturing Systems; Use of Software Tools for Analysis of Manufacturing Cost and Time and evaluation of alternatives.

Number of credits: 3

Prerequisites by course: ME 310 Manufacturing Processes

Prerequisites by topic: Processes used to produce parts and shapes
Fundamentals of materials: Behavior and manufacturing properties

Postrequisites: None

Textbooks/other suggested materials:

Required:

Product Design for Manufacture and Assembly, 3rd Edition, G. Boothroyd, P. Dewhurst, and W. Knight, Marcel Dekker Inc., ISBN: 978-1-4200-8927-1, 2007.

Introduction to Pro/Sheetmetal Wildfire 3.0, Yves Gagnon, Schroff Development Corporation, ISBN: 978-1-58503-336-2, 2007. **(TENTATIVE)**

References:

Product Design for Manufacture and Assembly, 2nd Edition, 2002, Marcel Dekker Inc., ISBN: 0-8247-0584-X

Design for Manufacturability & Concurrent Engineering, 2008, David M. Anderson, CIM Press, ISBN: 1-878072-23-4

Design for Manufacturability Handbook, 2nd Edition, James G. Bralla, McGraw-Hill, ISBN: 0-07-007139-X.

Improving Production with Lean Thinking, 2006, Javier Santos, Richard A. Wysk, Jose M. Torres, John Wiley & Sons Inc., ISBN: 0-471-75486-2

The Six Sigma Way, 2000, Peter S. Pande, Robert P. Neuman, Roland R. Cavanagh, McGraw-Hill, ISBN: 0-07-135806-4

Automation, Production Systems, and Computer-Integrated Manufacturing, 3rd Edition, 2008, Mikell P. Groover, Pearson Education Inc., ISBN: 0-13-239321-2

Class: *Lecture:* M, W, F: 1:10 – 2:00 PM

(Friday will usually be for make-up classes, if needed)
EME B46 (Pullman Campus), HSS 306 (Olympic College Campus)
Lab: Time to be announced, EME 152 (Pullman Campus)

Instructor: Dr. Uma Jayaram
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TA Office Hours: Tuesday: 2:45-3:45 PM
Thursday: 12.30 – 1.30 PM
(or email to schedule additional times)

- Lecture Topics:**
1. Introduction to DFMA, Selection of Materials and Processes
 2. Product Design for Manual Assembly
 3. Design for Injection Molding
 4. Design for Sheetmetal Working
 5. Design for Die-Casting, Sand Casting, and Investment Casting
 6. Design for Machining
 7. Design for other Misc Processes ; Design for Human Factors; Design for X – Reliability, Serviceability, Environment, Disassembly
 8. Lean Manufacturing, Toyota Production System, Poka Yoke, QFD
 9. Lean Assembly – PQ analysis, Takt time, visualizing assembly process, assembly cells
 10. Process variability and control; Tolerances; Statistical Process Control; Six Sigma and DMAIC procedure; Taguchi Methods; ISO 9000

- Lab Topics:**
1. Use *Boothroyd Dewhurst Inc.'s Design for Assembly DFA* software to determine cost of assembling a product and minimizes the cost of manufacturing by trying design strategies.
 2. Use Boothroyd and Dewhurst Inc's DFM software:
 - a. *Concurrent costing module* to investigate design changes to reduce costs and to compare alternative processes and materials.
 - b. *DFM die casting module* to compare die casting costs for different materials.
 - c. *DFM sheetmetal module* to perform a cost analysis for a sheetmetal manufacturing operation and compare a turret presswork and a compound die option
 3. Use *DFMPro* software to facilitate manufacturability validation and identification of areas of a design that are difficult, expensive, or

impossible to manufacture.

4. Use *Pro/E* or *Solidworks* and work with the sheetmetal and mold and cast design modules

Expected Student Outcomes:

1. Understand that Design for Manufacture and Assembly (DFMA) is an important aspect of product development and promotes early involvement of manufacturing in design
2. Learn a systematic procedure to analyze a proposed design from the point of view of assembly and manufacturing
3. Quantitatively evaluate the impact of design choices on manufacturing cost
4. Get familiar with key concepts in various new manufacturing paradigms and practices related to lean manufacturing
5. Be able to use modern quality control concepts and approaches
6. Use modern software tools to accurately model parts for specific manufacturing operations, model part costs, simplify products, find specific avenues to reduce manufacturing and assembly costs, benchmark products, and quantify improvements
7. Incorporate these concepts in a project

Grading:	Homework	- 15%
	Labs	- 15%
	In Class Work/Quizzes	- 5%
	Lab Exams	- 15 %
	Exams	- 35%
	Project	- 15%

Website: <https://lms.wsu.edu> (log in with your WSU username and password)

Disability Statement:

Reasonable accommodations are available for students who have a documented disability. Please notify the instructor during the first week of class of any accommodations needed for the course. Late notification may cause the requested accommodations to be unavailable. All accommodations must be approved through the Disability Resource Center (DRC) in Administration Annex 205, 335-1566 in Pullman

Make-up Policy

Make-up will be given for tests only in the following cases:

- Prior permission
- University authorized travel/absence
- Genuine illness leading to hospitalization or some other emergency