

ME 474 – Design for Manufacture and Modern Manufacturing Strategies

<i>Course description:</i>	Design for manufacture and assembly; modern manufacturing philosophies and practices; lean manufacturing; manufacturing cost and time analysis; quality control.
<i>Number of credits:</i>	3
<i>Course Coordinator:</i>	U. Jayaram
<i>Prerequisites by course:</i>	ME 310
<i>Prerequisites by topic:</i>	<ol style="list-style-type: none">1. Processes used to produce parts and shapes2. Fundamentals of materials: Behavior and manufacturing properties
<i>Postrequisites:</i>	None
<i>Textbooks/other required materials:</i>	<p><u>Required:</u> Introduction to Pro/Sheetmetal Wildfire 3.0, 2007, Yves Gagnon, Schroff Development Corporation.</p> <p><u>Reference:</u> Product Design for Manufacture and Assembly, 3rd Edition, 2011, G. Boothroyd, P. Dewhurst, and W. Knight, Marcel Dekker Inc.</p>
<i>Course objectives:</i>	<ol style="list-style-type: none">1. Understand the complex interrelationships between design and manufacturing2. Explore and understand basic manufacturing processes and the design for manufacturing (DFM) implications of design choices for specific manufacturing processes3. Use assembly considerations and assembly costs in evaluations4. Learn modern manufacturing philosophies and practices5. Understand the role of software applications in evaluating designs for manufacturing and assembly costs; understand approaches and practices related to CAD model building and model checking for specific manufacturing processes such as models for sheet metal and models for casts and molds6. Learn quality related programs in manufacturing
<i>Topics covered:</i>	<ol style="list-style-type: none">1. Introduction to DFMA, Selection of Materials and Processes2. Product Design for Manual Assembly3. Design for Injection Molding4. Design for Sheetmetal Working5. Design for Die-Casting, Sand Casting, and Investment Casting6. Design for Machining7. Design for other Misc Processes ; Design for Human Factors; Design for X – Reliability, Serviceability, Environment, Disassembly8. Lean Manufacturing, Toyota Production System, Poka Yoke, QFD9. Lean Assembly – PQ analysis, Takt time, visualizing assembly process, assembly cells10. Tolerances11. Rapid Prototyping; Product Architecture12. Process variability and control; Statistical Process Control; Six Sigma and DMAIC procedure; Taguchi Methods; ISO 9000
<i>Expected student outcomes:</i>	<ol style="list-style-type: none">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. 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
6. Be able to use modern quality control concepts and approaches
7. Incorporate these concepts in a project

Class and laboratory schedule: Three 50-minute lecture sessions per week, for one semester. This course includes activities where the students are exposed to modern software tools and use them for assignments and projects. Hence lab sessions may be included and arranged as needed.

Contribution to meeting the professional component: Engineering Topics

Relationship of course to program objectives: Meets:

1. School of MME ME educational objectives: 1, 2
2. School of MME ME program outcomes: (a), (e), (g), (i), (k)
3. ABET EC2000, Criterion 3 program outcomes: (a), (e), (g), (i), (k)

Prepared by: U. Jayaram

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POLICIES

A. Reasonable Accommodation (the nature of the particular course determines which one applies):

- **Pullman Campus.** Reasonable accommodations are available for students with a documented disability. If you have a disability and need accommodations to fully participate in this class, please either visit or call the Access Center (Washington Building 217; 509-335-3417) to schedule an appointment with an Access Advisor. All accommodations MUST be approved through the Access Center.
- **WSU Online Course.** Reasonable accommodations are available in online classes for students with a documented disability. All accommodations must be approved through your WSU Disability Services office. If you have a disability and need accommodations, we recommend you begin the process as soon as possible. For more information contact a Disability Specialist on your home campus: Pullman or WSU Online (<http://accesscenter.wsu.edu>), Spokane (<http://spokane.wsu.edu/students/current/studentaffairs/disability/>), Tri-Cities (<http://www.tricity.wsu.edu/disability>), Vancouver (<http://studentaffairs.vancouver.wsu.edu/student-resource-center/disability-services>).

B. Academic Integrity

WSU expects all students to behave in a manner consistent with its high standards of scholarship and conduct. Students are expected to uphold these standards both on and off campus and acknowledge the university's authority to take disciplinary action. The Standards of Conduct for Students can be found at <http://conduct.wsu.edu>.

C. WSU Safety

WSU is committed to maintaining a safe environment for its faculty, staff, and students. Safety is the responsibility of every member of the campus community and individuals should know the appropriate actions to take when an emergency arises. In support of our commitment to the safety of the campus community the University has developed a Campus Safety Plan, <http://safetyplan.wsu.edu>. It is highly recommended that you visit this web site as well as the University emergency management web site at <http://oem.wsu.edu/> to become familiar with the information provided.