ME317 Design for Manufacturability
Call for Projects: Class of 2007-2008!

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Design for Manufacturability (dfM) is more than production efficiency. Our 6-month project-based course sequence covers systematic methods that enable companies to deliver enhanced value to their stakeholders with increased profitability.

Stanford df*M*: Call for Projects 2007-2008

If you're interested in improving the competitiveness of your company's products by addressing new value propositions, life-cycle cost and quality issues, you should participate in Stanford's project based course ME317 df*M*. Partner companies provide a challenging problem that will enable teams of 4 students to achieve meaningful results in six months.

What's Involved in Supporting a Project?

A flat fee of $18,000 per project will cover all expenses for running the project for the course sequence and includes nominal travel expenses (US West Coast only; extra fee applies for distance travel). A partner organization will designate a liaison to communicate periodically with the students, provide relevant information and help guide their efforts.

Typical Topics for Student Projects

- New value creation and enhancement: improved features and value propositions for customers and other stakeholders.
- Manufacturability improvements of an existing or a planned product: simplifications in design and process.
- Life-cycle improvements: reliability/availability enhancements, reduction of life-cycle ownership & service costs, eco-design.
- Design for product variety: improved flexibility in product options, robust product architecture, etc.
- Cost improvements: Critical study of cost drivers, elimination of non-value added activities.

Key Dates for year 2007-2008

Oct & Nov:	Interact with Stanford to define the project
12/7/2007:	Final Project Proposal & Project Fee Due
1/16/2008:	Project proposal presented by company liaison
1/21/2008:	Formation of the project team
Jan.–March:	ME317A New Product Definition
3/12/2008:	Design Review on Product Definition
April–June:	ME317B Quality by Design
June 2008:	Final Project Presentation

For other collaboration modes, contact ishii@stanford.edu.

Current On-campus Projects in ME317 dfM 2006-2007

Alza (Johnson &Johnson Co.) – *Transdermal Drug Delivery*
Alza is a leader in combinatorial medical device-drug delivery device. These devices bring significant value to patient care, but are still very expensive. The challenge for the Stanford team is to reduce cost and complexity, while maintaining high quality.

Bloom Energy – *Ultra High Availability Fuel Cell Power:*
Bloom is a young company that brings exciting new fuel cell technology distributed power generation. The company requests the team to improve the reliability and availability of their system as well as manufacturing efficiency.

Ebara – *Personal Fluid Transport and Control System:*
Ebara is a leading company in Japan in fluid transport and control (Pumps). They are seeking new ideas for future businesses in "personal" fluid control systems. The challenge for the team is to find new market needs and develop a development roadmap.

General Motors – *Massively Flexible Interface Architecture:*
Human Machine Interface (HMI) is a significant differentiator in cars. The speed at which the technology advances is faster than the basic elements of automotive platforms. Student team's challenge is to benchmark best practices for this platform strategy.

Medtronic – *Next Generation Stent Graft System:*
The stent graft technology has made significant advances in endovascular treatment. However, the manufacturing of stent grafts continues to be very complex and manual labor intensive, and thus expensive, and requires innovative improvements.

Nissan – *Gentle and Friendly Engine Manufacturing:*
Engine Manufacturing involves harsh and dangerous environment such as forging and casting. Nissan seeks student team to generate ideas to make the work environment "gentle and friendly" across the globe, and thus improve productivity and quality.

Toyota – *Towards Zero Automotive Traffic Injuries*:
Toyota is committed to develop safe vehicles for , pedestrians and other surroundings. The team will focus on emerging countries such as India and China and investigate technologies and other means to achieve zero injury.

ME317A&B Design for Manufacturability Course Content

Customer Value Chain Analysis and Value Engineering
Functional Analysis and Competitive Benchmarking
Product Definition & Concurrent Engineering
Quality Function Deployment & Affinity Diagrams
Cost Driver Identification and Cost-Worth Analysis
Design for Assembly & Design for Variety
Process & Material Selection
Design for Producibility & Process Analysis
Ownership Quality, Failure Modes & Effects Analysis (FMEA)
Design for Serviceability & Environmental Product Design
Concept Generation: Morphological Analysis
Review of Product Definition Methods
Concept Selection: Pugh's Method
Quality by Design: Six Sigma Quality Scorecarding
Robust Design: Closed-form Optimization
Design of Experiments & Taguchi Method
Zero Defect and Poka Yoke (Mistake Proofing)
Product Architecture and Platform Design (Platform Sigma)
Scenario-based FMEA for Life-cycle Value
df*M* for Amorphous Products
Project Risk Management (Net Present Value Analysis)
Effective Product Testing and Validation

For more information, call Sandi Cano (650)724-4786 fax 723-3521, e-mail: scano@stanford.edu, http://me317.stanford.edu

Research Focus at the Manufacturing Modeling Lab (MML): Home of ME317

"Design for Product Life-cycle Innovation: Technology, Marketing/Sales, Manufacturing/Supply Chain"

Design for Product Life-cycle Innovation

Through ME317 and our research projects, Stanford MML interacts with industry on more than 30 df*M* projects every year. We have seen trends that extend the traditional df*M* methods: 1) Design for Innovation in Technology, Marketing and manufacturing/supply chain, and 2) Lean New Technology Introduction.

Our partnership with international companies such as ABB, Ebara, Hitachi, Nissan, Toshiba and Toyota continues with frequent mutual visits. In the Fall of 2007, we are planning an Executive Workshop in India, as well as a joint event on RFID at MIT. Roundtables in Europe and Australia are in the planning stage, as well as an executive short course in India. Our global collaboration enhances our work with US sponsors such as Cisco, GE, GM, and J&J through our annual MML roundtable scheduled in mid July 2007.

Lean NTI A trend toward Lean Manufacturing became popular in the 1990's when the American automotive industry faced intense global competition. That "Lean" mentality has now branched beyond manufacturing into almost all aspects of product development cycle and into corporate organizational structure. The questions of "when are the new technologies ready" and "how can we integrate the new technologies into new products in a lean fashion" continue to challenge product developers. Lean NTI seeks to identify best practices and key developmental areas for improvement and guide companies to an improved NTI process.

Design for Service Innovation: As sales growth for new products slow and profit margins fall, adding services to products have become an increasingly attractive way of competitive differentiation. This is because service yields higher margins and returns on invested capital compared to product sales alone. In response to this trend, this research explains why a manufacturing based company should go into service business and how companies can successfully make the transition from a product to a serviced based company by using "Design for Service Innovation" methodologies.

Ecodesign Value Alignment: In a world of globalization, environmental regulation, environmental policy and societal pressure are the main drivers for Ecodesign. Eco-innovation and green money are concepts used by companies to create marketing advantages and differentiate from their competitors. The concept of Environmental Value Chain Analysis (EVCA) helps identify the players implementing environmental improvement programs and the value relationships between them. Strategically leveraging the business needs and societal concerns is the key to success for the eco-design value alignment. Case studies of Ecodesign demonstrate how companies can deploy eco-design practices into their product development process, leading both consumer and producer to a win-win situation.

Design for Micro Electro Mechanical Systems (MEMS) MEMS is an emerging field with large market potential. As more MEMS products reach the high volume production arena, the competitive advantages df*M* offers will increase in importance. Research work at MML is focusing on modifying existing df*M* tools, such as QFD, to utilize the tie between product and process in MEMS. Future work will address developing additional tools to strengthen application of df*M* for MEMS for such products as bandwidth filters, acoustic sensors and transducers.

Design for Workshare: Global companies realize the importance of collaborative design, or workshare, to develop products to sell to the entire world. This paradigm integrates diverse customer values into products and exploits the economy of scale of distributed resources, but also introduces challenges in workshare management. To assess different work distribution scenarios, we develop a risk framework that identifies and evaluates workshare risk and consists of two levels: system-level focuses on risk due to the systems' interdependence and component-level addresses handover risk of distributed development work tasks. This risk framework has been applied to several ongoing global vehicle developments and validated with actual rework data.

System Design for Supreme Reliability As products and services become increasingly complex, system level failure modes become increasingly challenging. Collaborating with industries such as aerospace, aircraft engines, and power systems, we are developing advanced df*M* methods that combine Life-Cost FMEA and functional modeling to help design engineers meet this challenge. Also, design validation and verification are vital to risk reduction. Traditional methods of verification include prototype testing, simulation, analysis, redundancy and cross-checking. The focus of this project is finding ways to move these validation and verification methods earlier in the design process.

Companies can collaborate with the MML in several ways. Providing an ME317 df*M* project is an educational partnership at $18K/year. Companies can send a Visiting Industrial Associate for $60K/year. Research contracts with specific deliverables cost at least $200K/year and involve dedicated research assistants and a portion of the MML director/associate directors' time. For more details, contact ishii@stanford.edu.

df*M* Around the World—Choices in Delivery including Course Licensing

The Stanford Center for Professional Development (SCPD) delivers ME317 to over 60 off-campus students in six countries around the world including Asia and Europe. Remote students form teams, define their own projects, and benefit from on-site visits by the teaching staff. The Stanford Online System delivers ME317 lectures on the web, allowing the students to view the lectures anywhere on-demand. Companies can subscribe to ME317 through SCPD in several ways. Their engineers can take the course towards a Stanford degree, or for credit under the Non-Degree Option (NDO). They may transfer the credits to degree programs at other Universities. Companies can also "**license**" the ME317 curriculum and package the program into an intensive educational module. LG Electronics in Korea condensed the course into a four-week program. Cisco ran their package in 11 weeks. Hitachi is our most recent licensee. Companies must provide their own projects, form teams, and provide a facilitator with ME317 experience. While university credit is not granted, students may receive a *certificate of completion* from Stanford MML.

For more information, please contact:

SCPD Deputy Director	Paul Marca	(650) 723-8453
MML & ME317 Director	Prof. Kos Ishii	(650) 725-1840
MML Associate Director	Dr. Kurt Beiter	(650) 799-8396
MML Administrator	Sandi Cano	(650) 724-4786

Note: MML/ME317 also has a close collaboration with the Stanford Global Supply Chain Management Forum.