



ETLS 603 – “Design to Production Transition”

Spring 2009 Semester

Instructor: Dr. Dennis Ferguson

Contact Info: defferguson@mmm.com, 651-736-7238

Office Hours: By Appointment

Location: Lab: OWS 275

Suggested Reading: “**Fundamentals of Modern Manufacturing**”, Groover, M. P.; Prentice Hall

“**The Goal**”, Goldratt, E.M.; North River Press

“**Systematic Mechanical Design**”, Hundal, M.S.; ASME Press

“**Managing the Design-Manufacturing Process**”, Ettlle, J.E., Stoll, H.W.; McGraw Hill

“**Assembly Automation and Product Design**”, Boothroyd, G.; Dekker

Course Description: Many functions are necessary to bring a product from the concept phase to full scale mass production. This course provides an overview of the sequence of steps required, and addresses the many milestones and interactions that engineers deal with in leading a successful product scale-up.

The course focuses on viewing the process from several different disciplines such as product design, marketing, quality, manufacturing equipment design, and patent liaison. Included is product design for manufacture, an introduction to various engineering and manufacturing processes, and an overview of managing a program of production scale-up. Developing a comprehensive plan, estimating factory cost for up front business evaluation, and selling the proposal is covered as well. Dealing with functions such as management, cost accounting, patent attorneys, equipment designers, manufacturing plants, vendors, and related support groups is addressed. Several case studies are used to illustrate the topics covered.

Learning Objectives:

1. Ability to estimate the factory cost of a proposed new product. Calculate cycle times for various processes.

2. Understanding of product design features that facilitate low factory cost.
3. Understanding the scale-up sequence for mass production.
4. Understanding vendor sourcing and management for various product components and processes.
5. The knowledge of when and how to use basic Design of Experiments for manufacturing processes.
6. Insight in working with patent attorneys and how patents fit into the overall manufacturing process.
7. The ability to communicate with various company functions to provide leadership
8. How to sell proposals to management.

**Learning
Outcomes:**

1. Students will learn to visualize the whole process from prototype to mass production (SE1, SE5, MS6).
2. Students will be able to develop a manufacturing scale-up plan, and estimate the financial impact (SE1, SE4, SG5, SE6, MS6).
3. Students will be able to work effectively with all the functions required in the scale-up process (SE1, SE4, SE5, SE6, SE9, MS6).
4. Students will provide technical leadership in plant start-up (SE1, MS2, MS6).
5. Students will be able to calculate cycle times for various processes using heat transfer, fluid dynamics, and/or dynamic analysis.

Class sessions will consist of lectures, problem solving, small group activities, and student presentations.

Case studies will be used.

Guest speakers may include a patent liaison, a machine designer, and a rapid prototype company.

At least one company tour will be included.

**Grading
Components:**

Homework and class participation **(H)**
(30%) Weekly homework assignments will be due. The problems will relate to the current material in the course.

Exams **(E)**
(40% ea) Two equally weighted exams will be given during the semester.

Design Projects **(DP)**
(30%) Will be discussed in class.

**Attendance
Policy:**

Students are expected to attend all class sessions. Circumstances that prevent attendance will be honored up to two instances. Absences in excess of two times may result in an incomplete grade for the course. Contact the

instructor when a special situation arises. All absences require that the instructor be informed in advance.

Classroom Policy:

The class will be conducted with a mature and respectful atmosphere. Everyone will be expected to actively participate. Disrespectful students will be asked to leave

Qualified students with documented disabilities who may need classroom accommodations should make an appointment with the Enhancement Program – Disability Services office. Appointments can be made by calling 651-962-6315. You may also make an appointment in person in O’Shaughnessy Educational Center, room 119. For further information, you can locate the Enhancement Program on the web at <http://www.stthomas.edu/enhancementprog/>.

Classroom Ethics

Cheating and plagiarism will not be tolerated. These activities will result in students receiving a failing grade in the course.

All students are expected to understand and follow the University of St. Thomas policies on Academic Integrity. These are described at:

www.stthomas.edu/engineering/graduate/policies

About the Instructor

Dr. Dennis E. Ferguson, Sr. Molding Specialist, 3M

A native of Rochester, Minnesota, Dr. Dennis E. Ferguson holds a Bachelor of Science in Mechanical Engineering, a Master of Science in Mechanical Engineering, and a Ph.D. in Mechanical Engineering, all from the University of Minnesota. He was a registered professional engineer in the state of Minnesota and Texas for over 30 years.

After serving in the United States Army, Corps of Engineers, he worked for IBM Rochester for three years while completing his BSME. He has been working at 3M Company since 1972 and has been the project leader on numerous product design, automatic assembly, die casting, stamping, and injection molding programs.

After a four year stint at 3M Austin, Texas as a senior tooling project engineer and completing his Ph.D. in 1989, he returned to Minnesota in 1990 to join the newly formed Corporate Molding Technology Center as a molding specialist and principle investigator. He was a member of the task force set up by 3M to investigate the need for a molding technology center. He has been involved with tooling consortiums at the Massachusetts Institute of Technology, Ohio State University, Stevens Institute, Hoboken, New Jersey, and Los Alamos National Laboratory.

Ferguson is currently a senior molding specialist in the Corporate Research Process Laboratory at 3M. He has filed over 15 patents in the area of manufacturing processes, and is a winner of the “Circle of Technical Excellence” award. Ferguson is a senior member of the

Society of Plastics Engineers, and is the author of several papers in machine design, including a best paper award. He has taught several courses at 3M on automation and injection molding.

Since 1991, he has taught net shape manufacturing and automation at the University of St. Thomas.

Topics in “Design to Production Transition”

Topics	Chapter
Examples of Scale-ups	Notes - Handouts
Team Building and Leadership	“
Product Prototyping Methods	“
Cost Estimating	“
Customer Input and Redesign	“
Patents and Trade Secrets	“
Manufacturing Processes	“
Manufacturing Line Design	“
Manufacturing Roadmap	“
Selling Management and Team	“
Vendor Management	“
Bench Experiments	“
Prototype Manufacturing Line	“
Design of Experiments	“
Production Scale-up Line	“
Plant Installation and Training	“