

## ENGR 371

**Manufacturing Processes and Statistical Control**

Fall 2009 Lecture

**COURSE DESCRIPTION:**

This course covers such basic principles as metal forming, metal cutting, plastic molding, and continuous processes. Students will receive hands-on experience with modern production equipment. Students will learn statistical evaluation tools such as the meaning of population distributions, means, medians, regression analysis, and standard deviations. Statistical process control and acceptance testing in the context of modern manufacturing processes will be covered.

**LECTURE TIME AND LOCATION:**

Tuesday and Thursday from 8:00 a.m. to 9:40 a.m. in OWS 250.

**ASSOCIATED LAB:**

ENGR 317-51 and ENGR 317-52 are the laboratory parts of this course. You are required to take one of them (Instructor – Richard Wold).

**COURSE INSTRUCTOR:**

Dr. John Wentz

OSS 103 – 651-962-5413

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g-talk: wentz.john

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Office hours: Monday 10:00-11:00 and Wednesday 1:30-2:30 but appointments work best. Shoot me an e-mail or instant message to see if I'm in my office and come on by. I'm happy to answer questions by IM but if someone is personally in my office they will get precedence.

**WEBSITE:**

<http://blackboard.stthomas.edu/> (access using St. Thomas login ID and password)

**REQUIRED TEXT:**

Fundamentals of Modern Manufacturing; Materials, Processes, and Systems; Mikell P. Groover, 3<sup>rd</sup> Edition; John Wiley & Sons, Inc., 2007, ISBN 978-0-471-74485-6.

If you are looking for a cheaper alternative to the hardcover book you may purchase it as an e-book from Wiley's website, [www.wiley.com/college/groover](http://www.wiley.com/college/groover), for around \$100 (possibly cheaper).

**DISABILITY ACCOMODATION:**

Students with disabilities who may need accommodations in this class are encouraged to talk to the instructor and to contact the Enhancement Program – Disability Services at 651-962-6315 as soon as possible. See <http://www.stthomas.edu/enhancementprog/> for more information.

**ACADEMIC INTEGRITY:**

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

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Integrity. These are described at:

[http://www.stthomas.edu/policies/student\\_policy\\_book/Academic\\_rights\\_and\\_procedures.asp](http://www.stthomas.edu/policies/student_policy_book/Academic_rights_and_procedures.asp).

Plagiarism, especially in regards to the semester project, will not be tolerated.

### ATTENDANCE:

Students are expected to attend all class sessions. All absences require that the instructor be informed in advance if at all possible. Circumstances that prevent attendance will be honored up to two instances. Contact the instructor when a special situation arises.

The University of St. Thomas is committed to a healthy campus community. During the 2009-2010 academic year, there will be ongoing concerns regarding the prevalence among university faculty, staff, and students of both the H1N1 virus and seasonal influenza. To help limit the spread of these illnesses, the Centers for Disease Control has provided college campuses the following recommendation: students, faculty, or staff with influenza like illnesses (temperature of 100.0 or greater, plus a cough or sore throat) are directed to self-isolate (or stay home) for at least 24 hours after their fever is gone without the use of fever-reducing medicine. In the event that students are unable to attend classes due to this self-isolation recommendation, they should consult the university's pandemic website <http://www.stthomas.edu/pandemic> and complete an on-line form informing professors of their absence. In accordance, faculty will provide opportunities for these students to participate in alternative educational delivery due to this illness.

### LEARNING OUTCOMES:

Upon successful completion of the course, the student will have:

- Gained factual knowledge (terminology, classifications, methods, trends) of:
  - Metal Casting
  - Polymer Processing
  - Forming
  - Machining Theory
  - Machine Tool Technology
  - Metalworking Fluid Use
  - Surface Treatments
  - Inspection and Sampling Techniques
  - Metrology
- Developed specific skills, competencies, and points of view needed by professionals in the field for:
  - Basic Statistical methods including hypothesis testing
  - Statistic based quality control including
    - Statistical Process Control
    - Capability Analysis
    - Loss Function
- Acquired skills in working with others as a member of a team conducting a research project on a specific aspect of manufacturing not covered heavily in lecture.
- Learned how to find and use resources for answering questions and solving problems in regards to the research project.

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### GRADING:

Midterm	= 20%
Final	= 20%
Homework	= 15%
Quizzes	= 5%
Group Project	= 20%
Lab Grade	= 20%

- Exams  
The midterm and final exams are non-cumulative. Questions will be both qualitative and quantitative and cover subjects presented in lecture.
- Homework  
Homework will consist of reading comprehension questions, quantitative problems, and reviews of factory tours. Homework is due at the start of the class period. Late homework will be accepted for 24 hours after the due date with a 20% penalty unless alternate arrangements are made earlier.
- Quizzes  
In-class quizzes will consist of questions taken directly from the Review Questions and Multiple Choice Quiz portions at the end of each chapter. Notes will be allowed.
- Group Project  
The project should investigate a specific topic related to manufacturing. Each group will hand in a comprehensive project report by the end of the semester. The project should be in the form of a review paper on the topic. As this project is worth 20% of your grade I will expect a decent amount of time to be put into it.

Some topic ideas (should be more specific than this):

- Hydroforming
- Machining issues in composites
- Micro-Nano scale manufacturing
- Biotech manufacturing
- Sustainability in manufacturing
- Minimum Quantity Lubrication

During your research about the topic of your choice, the questions you need to keep in mind are

- What is it?
- Why do we use it?
- Who uses it?
- What are the technologies involved?
- What are the products?
- What are the applications of the technologies?
- What are the problems?
- What are the areas of improvement?

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- Etc.

For the project, you will need to hand in a written report – The report should be a detailed description about the topic of your choice with conclusion containing your opinions about the topic. You can choose any referencing format, but you have to provide a bibliography. Remember, we can use Wikipedia as easily as you can, so dig a little deeper.

### TENTATIVE COURSE SCHEDULE

Date	Topics	Chapters	Activity
10-Sep	Introduction, Materials Review	1-5	
15-Sep	Metal Casting	10-11	
17-Sep	Polymer Processing	13	
22-Sep	Forming	18-19	
24-Sep	Forming	19-20	
29-Sep	Machining Theory	21	
1-Oct	Machining Operations	22	
6-Oct	No Class		
8-Oct	Machine Tool Technology	23	Project Proposals Due
13-Oct	Economics of Machining	24	
15-Oct	Machining Automation	39	Exam
20-Oct	Remmele Engr		Tour
22-Oct	Surface Treatments	27-28	
27-Oct	Surface Treatments	28-29	
29-Oct	Micro-manufacturing	37-38	
3-Nov	Rapid Prototyping	34	Project Progress Reports
5-Nov	Inspection/Sampling, Metrology	45	
10-Nov	Introduction to Statistics		
12-Nov	Tests for Significance		
17-Nov	Medtronic		Tour
19-Nov	Loss Function	44	
24-Nov	Statistical Process Control	44	
1-Dec	Statistical Process Control	44	
3-Dec	Taguchi Methods	44	
8-Dec	Project Presentations		Project Due
10-Dec	Project Presentations		
			Final Exam