**ME 482 Machining Processes**

**Fall 2015**

**Instructor:** Albert Shih, Office: 3001E EECS, e-mail: shiha@umich.edu

**Graduate Student instructor:** Lei Chen, 1062 HH Dow e-mail: leichan@umich.edu

**Lecture:** Tu and Th, 9 – 10:30 Chrysler

Office Hours: 10:30-11:30 Tu/Th (after lecture)

**Prerequisite:** ME382 and ME350

**Textbook:** No textbook. Course pack manuscript in chapter format of a pre-publication of textbook *Machining and Machine Tools* will be provided in CTools.

**Lab:** 1100 HH Dow (Integrated Manufacturing Lab/Wu Manufacturing Research Center)

**Course Content:**

Traditional machining processes

* Single point, multiple point and abrasive machining processes and surface generation
* Machine tools – components, accuracy and metrology
* Cutting mechanics – chip formation, forces, and energy
* Cutting temperatures – thermal modeling and measurements
* Cutting tools – materials, coatings, and tool geometry, tool wear and tool life
* Machining dynamics

Non-traditional machining processes

* Electrical discharge machining
* Chemical-based machining
* Energy-based machining
* Biomedical machining

This course provide students an in-depth understanding of the machining processes, the machine tools designed for machining, the mechanics of chip removal and heat generation, temperatures in the workpiece and cutting tool, tool wear and tool life, and dynamics of machining. The non-traditional machining processes on electrical discharge machining, chemical-based machining, and energy-based machining, and frontier topics in machining, such as biomachining, will also be presented.

**Project:** One term project will be carried out throughout the semester. This project is the in-depth studying and research of a machining process. A sponsor is assigned to lead each project. It is important that the project matches your research needs and/or personal interests. The report needs to include both the experimental and analytical analysis part. Projects will be presented and a report has to be submitted during the mid-term as well as at the end of the term. For distance student, the in-depth study of the machining line in your plant or supplier is the ideal project.

**Distance Learning:** We will record the course and lab for future offering via distance learning. If you missed the lecture, you may request to watch the replay of the tape.

**Homework and Exams:** Two in-class mid-term exams. No final exam.

**Honor Code:** <http://www.engin.umich.edu/students/honorcode/code/coursepolicy.html>

**Grading:**

Term Project 25%

 Presentation and report #1 (10%)

 Presentation and report #2 (15%)

Two Mid-term Exams 50%

Homework and trip report 25%

**Plant visit:**

American Broach and Machine Company, 575 S Mansfield St., Ypsilanti, MI 48197 Phone: (734) 961-0300 [www.americanbroach.com](http://www.americanbroach.com)

**Class schedule: x**

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| Sep 8 | Syllabus and project section, Introduction (Chap. 1) |
| Sep 10 | Single point cutting process (Chap 2)  |
| Sep 15 | Multipoint cutting process (Chap 3) |
| Sep 17 | Multipoint cutting process (Chap 3) |
| Sep 22 | Abrasive cutting process (Chap 4) |
| Sep 23 | Machine components (Chap 5) |
| Sep 29 | Machine components (Chap 5) |
| Oct 1 | Machine tool accuracy and metrology (Chap 6) |
| Oct 6 | Mechanics of machining (Chap 7)  |
| Oct 8 | **Mid-term exam #1** |
| Oct 10 | Mechanics of machining (Chap 7) |
| Oct 13 | Shear in cutting (Chap 8) |
| Oct 15 | Cutting temperature (Chap 9) |
| Oct 20 | No class (Fall break) |
| **Oct 22** | **Term project mid-term presentation** |
| Oct 27 | Cutting temperature (Chap 9) |
| Oct 29 | **Plant visit – American Broach and Machine** |
| Nov 3 | Machining dynamics (Chap 10) |
| Nov 5 | EDM (Chap 11) |
| Nov 10 | Energy-based machining (Chap 12) |
| Nov 12 | Chemical-based machining (Chap 13) |
| Nov 17 | Biomedical machining (Chap 14) |
| Nov 19 | Biomedical machining (Chap 14) |
| Nov 24 | Review the progress of your project |
| Nov 26 | No class (Thanksgiving break) |
| Dec 1 | **Mid-term exam #2** |
| Dec 3 | Project presentation  |
| Dec 8 | Project presentation  |
| Dec 10 | **Final report due at 5 pm** |