

**ENGR 361 ENGINEERING MATERIALS LABORATORY**  
**Fall 2009**

- Instructors:** Dr. Dennis Stephens
- Time:** Section 51: Tuesday 8:30-11:30AM  
Section 52: Thursday 8:30-11:30AM
- Location:** OWS LL54 Lecture, OSS LL09 Lab
- Contact Information:** Office: OSS 100  
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- Required Text:** Engineering Materials Laboratory Manual – See Blackboard
- Optional Text:** Web Resources TBA
- Course Objectives:** ENGR 361 laboratory students will perform hands-on tests to better understand materials behavior. We will tour a commercial testing facility and “reverse-engineer” a familiar tool or small appliance.
- Learning Outcomes:**
1. Develop the ability to effectively communicate knowledge and decisions regarding materials engineering issues to others **as demonstrated by laboratory reports, trip reports and reverse engineering project.** (ME12)
  2. Develop the ability to design an innovative solution to a real materials problem **as demonstrated by solution of open-ended materials design problems.** (ME2, ME3, ME4, ME8)
  3. Develop the ability to design and conduct fundamental materials engineering laboratory procedures, gather and analyze data, draw conclusions and make engineering decisions **as demonstrated by materials engineering laboratory reports.** (ME6, ME11)
  4. Develop the ability to work in teams **as demonstrated by team performance in reverse engineering project.** (ME5)
  5. Demonstrate an understanding of ethical issues regarding engineering materials. (ME 13)
- Course Methodology:** Conduct experiments, tour a commercial testing lab and perform a reverse engineering design project.
- Major Assignments:** Individual work includes several lab reports and a trip report. Team efforts include two lab exercises and an oral (PowerPoint) presentation that details a “reverse-engineering” investigation.

Lab experiments & reports	Team (2)	23 pts.
	Individual (3)	34 pts.
Trip report	Individual	8 pts.
Reverse engineering project	Team	35 pts.
<b>Total Lab Grade</b>		<b>100 pts.</b>

**Lab Attendance:**

Students are expected to attend scheduled sessions. Circumstances that preclude 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 if any special situation arises. All absences require that the instructor be informed in advance.

**Instructor  
Biography:**

Dennis Stephens holds a PhD in Metallurgical Engineering from Michigan Tech. His career began as a project engineer with Simonds Cutting Tools in Fitchburg, Mass. He then worked as a specialty wire metallurgist at National-Standard in Niles, MI. before returning to Minnesota. The next 19 years were spent with Honeywell (now Alliant Techsystems) in materials and process engineering. Most recently he served as Director of Failure Analysis at Stork Twin City Testing in St. Paul.

**Notes:**

1. Variations in course content or timing may be dictated by circumstances; updates will be provided during the term.
2. Reports are due at the beginning of the lab period.
3. Reports are graded on both technical content and grammar; guidelines will be posted on Blackboard.
4. Each student is expected to contribute in an enthusiastic, timely and professional manner to group success.

**Tuesday Lab Schedule (Section 51)**

Thursday		Discussion 8:30-9:00	Laboratory Presentation 9:00-10:00	Lab Experiments or Project Work 10:00-11:00	Balance of time until 11:30	Deliverables <i>Reverse-Engineering Project in red</i>
1	9/15	Choose teams of 3	Overview; Lab safety	Lab 1: Heat treating & hardness testing of aluminum alloys (informal report)		<i>Choose lab teams</i>
2	9/22		Tour <b>Stork Twin City Testing</b> ; directions will be provided. Arrange your own transportation.			<i>Aluminum hardness data submitted as Excel file</i>
3	9/29	Introduce tensile test	Lab 2: Tensile Testing of Metals & Polymers			<i>Stork Trip Report</i>
4	10/6	Thermal Analysis	Lab 3: Phase Diagrams by Thermal Analysis			<i>Lab 2: Draft tensile report</i>
5	10/13	Jominy test	Lab 4: Hardenability of Steel and the Jominy Test			<i>Lab 2: Final tensile report</i>
6	10/20	Ashby-Granta System: material selection database		Introduce Reverse Engineering Project Open lab and lecture recitation		<i>Lab 3: Pb-Sn report</i>
7	10/27	Midterms- no scheduled lab; <b>choose reverse engineering project</b>				<i>Deadline to register by e-mail Reverse Eng. project</i>
8	11/3	Identify polymers	Lab 5: Polymers Testing			<i>Lab 4: Jominy report Photos before disassembly</i>
9	11/10	Reverse Engineering Project: disassemble & document components; “harvest” metal & polymer samples for Stork Twin City Testing				<i>Lab 5: Plastics report Submit chemistry samples</i>
10	11/17	Organize project tasks... who does what? Revisit the PP template.				<i>Photos should be complete</i>
11	11/24	Simple tests to identify metals and polymers		Web research, perform simple tests to screen materials		<i>Goal: Preliminary ID of materials</i>
12	12/1	Web resources		Create, edit PowerPoint presentation		<i>Goal: Draft presentation</i>
13	12/8	Reverse-Engineering Design Project <b>Final Presentations</b>				<i>Electronic file of your presentation</i>
14	12/15	No Class: Finals Week				

General Schedule each lab session:

8:30 Discussion: OSS LL54

9:00 Lectures, presentations: OWS LL54 or OSS LL09, as appropriate

10:00 Lab experiments, project work time: OSS LL09 or other labs

## Thursday Lab Schedule (Section 52)

Thursday		Discussion 8:30-9:00	Laboratory Presentation 9:00-10:00	Lab Experiments or Project Work 10:00-11:00	Balance of time until 11:30	Deliverables <i>Reverse-Engineering Project in red</i>
1	9/17	Choose teams of 3	Overview; Lab safety	Lab 1: Heat treating & hardness testing of aluminum alloys (informal report)		<i>Choose lab teams</i>
2	9/24		Tour <b>Stork Twin City Testing</b> ; directions will be provided. Arrange your own transportation.			<i>Aluminum hardness data submitted as Excel file</i>
3	10/1	Introduce tensile test	Lab 2: Tensile Testing of Metals & Polymers			<i>Stork Trip Report</i>
4	10/8	Thermal Analysis	Lab 3: Phase Diagrams by Thermal Analysis			<i>Lab 2: Draft tensile report</i>
5	10/15	Jominy test	Lab 4: Hardenability of Steel and the Jominy Test			<i>Lab 2: Final tensile report</i>
6	10/22	Ashby-Granta System: material selection database		Introduce Reverse Engineering Project Open lab and lecture recitation		<i>Lab 3 Pb-Sn report due</i>
7	10/29	Midterms- no scheduled lab; <b>choose reverse engineering project</b>				<i>Deadline to register by e-mail Reverse Eng. project</i>
8	11/5	Identify polymers	Lab 5: Polymers Testing			<i>Lab 4: Jominy report Photos before disassembly</i>
9	11/12	Reverse Engineering Project: disassemble & document components; “harvest” metal & polymer samples for Stork Twin City Testing				<i>Lab 5: Plastics report Submit chemistry samples</i>
10	11/19	Organize project tasks... who does what? Revisit the PP template.				<i>Photos should be complete</i>
11	11/26	No class...Happy Thanksgiving! Schedule a team meeting this week- keep making progress!				
12	12/3	Simple tests to identify metals and polymers	Web resources; identify materials & draft PowerPoint presentations			<i>Goals: Preliminary ID of materials; draft PP</i>
13	12/10	Reverse-Engineering Design Project <b>Final Presentations</b>				<i>Electronic file of your presentation</i>
14	12/17	No Class: Finals Week				

General Schedule each lab session:

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