ME4842 Mechanical Systems Laboratory

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Ph: 341-4084

Wednesday, January 21, 2015
Overview

1. Prerequisites
2. Switching Sections
3. ME4842 goals
4. Bonus outcomes
5. Format and points distribution
6. Where to find course information
7. GTA information
8. Lab schedules
9. Guidelines for formation of groups
10. 4th (final) lab requirements
11. Poster example and additional info.
Prerequisites

- ME4840
- ME3131
- ME3521
- ME3525
- ME3313

MANDATORY – NO EXCEPTIONS!

Our current policy allows enrollment in ME4842 if you are missing ONLY ONE of the last three prerequisites, and CONCURRENT ENROLLMENT IN THE SINGLE MISSING PREREQISITE IS MANDATORY!
## Switching Sections

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Sections</th>
<th>Days</th>
<th>Time</th>
<th>Location</th>
<th>Dates</th>
</tr>
</thead>
<tbody>
<tr>
<td>4ECH ENG</td>
<td>Mechanical Engr Systems (Laboratory)</td>
<td>16</td>
<td>Mo</td>
<td>2:00PM - 3:50PM</td>
<td>Toomey Hall 00316</td>
<td>Jan 20, 2015 - May 8, 2015</td>
</tr>
<tr>
<td>4ECH ENG</td>
<td>Mechanical Engr Systems (Laboratory)</td>
<td>13</td>
<td>Tu</td>
<td>9:00AM - 10:50AM</td>
<td>Toomey Hall 00316</td>
<td>Jan 20, 2015 - May 8, 2015</td>
</tr>
<tr>
<td>4ECH ENG</td>
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<td>16</td>
<td>Tu</td>
<td>2:00PM - 3:50PM</td>
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<tr>
<td>4ECH ENG</td>
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<tr>
<td>4ECH ENG</td>
<td>Mechanical Engr Systems (Laboratory)</td>
<td>16</td>
<td>We</td>
<td>1:00PM - 2:50PM</td>
<td>Toomey Hall 00316</td>
<td>Jan 20, 2015 - May 8, 2015</td>
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<td>4ECH ENG</td>
<td>Mechanical Engr Systems (Laboratory)</td>
<td>11</td>
<td>We</td>
<td>3:00PM - 3:50PM</td>
<td>Toomey Hall 00199</td>
<td>Jan 20, 2015 - May 8, 2015</td>
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Goals of ME4842 Lab

• Gain the ability to propose, plan, execute, and present results of an experiment.
  – Hands-on experience with various equipment
  – Practice in writing technical memos and proposals
  – Practice making oral presentations: seminar and poster symposium formats
Bonus Outcomes

• Professional organization conference papers and presentations: Midwest ASEE Conference – ME4842 earned best paper award for their 4th lab report.

• Professional organization student competitions: Student placed 2nd in the 2003 ASME Midwest Regional Old Guard competition.

• Undergrad Research Symposium
Assignments and Points Distribution

<table>
<thead>
<tr>
<th>ME4842 Quizzes and Assignments</th>
<th>Points Distribution</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Tests</td>
</tr>
<tr>
<td>Memo 1 (individual)</td>
<td>20 6%</td>
</tr>
<tr>
<td>Oral Presentation on 2nd Experiment</td>
<td></td>
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<tr>
<td>(Group, Power Point tag-team presentation)</td>
<td>50 16%</td>
</tr>
<tr>
<td>Memo 2 (individual)</td>
<td>20 6%</td>
</tr>
<tr>
<td>Proposal for 4th Lab (Group)</td>
<td>20 6%</td>
</tr>
<tr>
<td>Quiz 1</td>
<td>20 6%</td>
</tr>
<tr>
<td>Quiz 2</td>
<td>20 6%</td>
</tr>
<tr>
<td>Quiz 3</td>
<td>20 6%</td>
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<tr>
<td>Final Report on 4th Lab (Group Report)</td>
<td>60 19%</td>
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<tr>
<td>Final Presentation</td>
<td>60 19%</td>
</tr>
<tr>
<td>(Group, table top poster symposium)</td>
<td></td>
</tr>
<tr>
<td>Peer Evaluation for Final Lab Report and Presentation</td>
<td>20 6%</td>
</tr>
<tr>
<td>Totals</td>
<td>310 100%</td>
</tr>
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</table>

* Note that a pre-lab quiz counting as much as 2% may be given!
Where to find ME4842 Manuals and Other Materials and Information

• Course Calendar Found on Canvas: https://mst.instruture.com/courses/170

• Additional announcements and materials will be posted on Canvas
Spring Semester GTAs

<table>
<thead>
<tr>
<th>Day &amp; Time</th>
<th>Section</th>
<th>GTA</th>
<th>E-mail</th>
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<tbody>
<tr>
<td>Monday 2:00 PM - 3:50 PM</td>
<td>Section B</td>
<td>Mahati Guntupalli</td>
<td><a href="mailto:mgpdf@mst.edu">mgpdf@mst.edu</a></td>
</tr>
<tr>
<td>Tuesday 9:00 AM - 10:50 AM</td>
<td>Section A</td>
<td>Yiyu Shen</td>
<td><a href="mailto:ys4f2@mst.edu">ys4f2@mst.edu</a></td>
</tr>
<tr>
<td>Tuesday 2:00 PM - 3:50 PM</td>
<td>Section C</td>
<td>Daniel Penn</td>
<td><a href="mailto:dp24d@mst.edu">dp24d@mst.edu</a></td>
</tr>
<tr>
<td>Wednesday 1:00 PM - 2:50 PM</td>
<td>Section F</td>
<td>Abdulhakim Agll</td>
<td><a href="mailto:aaa7w2@mst.edu">aaa7w2@mst.edu</a></td>
</tr>
<tr>
<td>Thursday 9:00 AM - 10:50 AM</td>
<td>Section D</td>
<td>Yao Cheng</td>
<td><a href="mailto:ycbm7@mst.edu">ycbm7@mst.edu</a></td>
</tr>
<tr>
<td>Thursday 2:00 PM - 3:50 PM</td>
<td>Section E</td>
<td>Huixux Deng</td>
<td><a href="mailto:hddg5@mst.edu">hddg5@mst.edu</a></td>
</tr>
<tr>
<td>Friday 1:00 PM - 2:50 PM</td>
<td>Section G</td>
<td>Gurjot Dhaliwal</td>
<td><a href="mailto:gsdzq7@mst.edu">gsdzq7@mst.edu</a></td>
</tr>
</tbody>
</table>
Formation of Groups

• Rules:
  1. No more than four members
  2. No less than two

• Guidelines for Consideration
  1. Choose partners with complimentary talents and personalities when possible
  2. Choose partners with similar technical interests – important for choosing 4\textsuperscript{th} lab topic
Some Technical Abilities to Consider

- Mathematical skills
- Programming
- Hands-on fabrication abilities
- Experience and skills with electronic instrumentation
- Electronics experience
- Unusual academic strength in a particular area or areas: dynamics, control, heat transfer, etc.
Personality Traits – Natural Characteristics

• Communications abilities
• Idea generation abilities
• Detail orientation and precision
• Organizing and managing abilities
• Determination and follow through
• Ability to lead effectively

These traits are not usually found in one person!
Basic Requirements for 4th Lab

1. Must contain an experimental component – i.e. measurement of a system property or properties

2. Must be based on sound physical principles
   A. Must test a hypothesis (statistically)
   B. Or must validate a mathematical model – best if all experimental hypotheses can be reduced to mathematical models. This is usually easier than option A.
4th Lab Proposal Requirements

1. You should submit your proposal to your GTA by the published deadline to allow time to modify it. **It must be in PDF format!**

2. Must include enough detail for a technically trained, non-specialist to determine feasibility and rationale for performing the experiment.
   - Must explain specific goals for the study – what you hope to determine

3. Must include a literature review citing relevant background information.
   - **Must include at least one source from the primary literature** – i.e. archival journals, or conference proceedings. These may be found in our library or ordered via ILL (order early!). See:
     [http://library.mst.edu/resources/databases/dblist/index.html](http://library.mst.edu/resources/databases/dblist/index.html)

4. Must include a detailed budget estimate. All purchases MUST be approved by Dr. Stutts!

5. Example proposal here:
Budgetary Limitations

1. The total budget for each group is $100
2. The university does not pay tax, so you should use a university purchasing card with the tax exempt number on it
3. The department will not reimburse for food
4. No firearms or live ammunition are allowed on campus
5. Publication and duplication costs will not be reimbursed in excess of $25.
6. All purchases are made by the ME department purchasing agent, Ms. Tammy Vena:

   Phone: (573) 341-4614
   Address: 194J Toomey Hall
   Email: venat@mst.edu
Example Poster

Missouri University of Science and Technology

Transient 1D Heat Conduction Temperature Control with Transport Delay

Experiments Performed By:
Richard Barley, David Most, Anavel Taylor, McKenzie Galle, Robert Naeper, Logan Wesley
Faculty Advisor: Dr. Daniel E. Shillito

Objectives
- Determine the maximum allowable distance from the heat source to the control sensor before transport delay-induced instability results, when in fully insulated conditions.
- Compare theoretical model to experimental results.

Experimental Approach

To find the experimental transfer function of the system:
Open loop: 1 Volt Output
Time: 0.42 Seconds

Theoretical Approach

Experimental Data Results

Proportional Controller

Experimental Setup

Results Comparison

Theoretical and Experimental Comparison: Time Delay = External Port (base)

Conclusions
- Experimental time delay data is similar to the expected theoretical time.
- Time delay changes the dynamics of the controlled system.
- There is a critical time delay at which the system becomes marginally stable.
- Marginal stability occurs in the experimental system when a gain of 1.009 is used with a time delay of 11 seconds. The system is in B / 2.337, which is 0.257 seconds, and the controller is using proportional control.
10th Annual
Undergraduate Research Conference

~ April 16, 2014 ~
Missouri S&T Havener Center
Click here to Register for the 2014
Undergraduate Research Conference

Registration opens January 2014!

Registration Deadline April 1, 2014

Download the registration materials at:

http://ugs.mst.edu/undergraduate/ugrc/
Support Staff

- **Purchasing**
  - Tammy Vena in Office 194J Toomey Hall
  - [http://mae.mst.edu/facultyandstaff/staffvena.html](http://mae.mst.edu/facultyandstaff/staffvena.html)

- **Technical Support: Mechanical**
  - Ken Schmidt in Office 180 Toomey Hall
  - [http://mae.mst.edu/facultyandstaff/facultyacadprofschmid/index.html](http://mae.mst.edu/facultyandstaff/facultyacadprofschmid/index.html)

- **Technical Support: Electrical**
  - Mitch Cottrell in Office 148 Toomey Hall
  - [http://mae.mst.edu/facultyandstaff/staffcottrell/](http://mae.mst.edu/facultyandstaff/staffcottrell/)