ME451: Control Systems Laboratory

Lab Coordinator: Professor Clark Radcliffe
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Laboratory Location: 1532EB
Website: http://www.egr.msu.edu/classes/me451/radcliff/lab

Objectives:

- Learn to simulate dynamic systems in the Matlab environment,
- Familiarize the student with theoretical and practical aspects of making physical measurements,
- Introduce the student to a variety of transducers and instrumentation used by mechanical engineers,
- Familiarize students with the behavior of control systems and enable them to understand the role the system parameters in control system response,
- Develop skills in writing technical reports.

Experiments:

1	1st Order Time Response Model: DC Servo Motor
2	2nd Order Time Response Model: Mass-Spring-Damper System
3	Frequency Response Model: Operational Amplifier Circuit
4	1st Order Frequency Response Model: DC Servo Motor
5	2nd Order Frequency Response Model: Torsional Mass-Spring-Damper System
6	Air Temperature Control with Process Delay

Laboratory Grading:

Short Forms (9) 60%

Matlab Workshop, (6) Experiments, (2) Design Projects

Formal Reports (2) 40%

To pass the ME451 course, you must pass the ME451 laboratory component.

Laboratory Schedule:

Each section will be divided into three groups: Groups A, B, and C. The group assignments will be posted outside room 1532EB before the second week of the semester. All groups of a particular section will attend the laboratory at their scheduled time, and perform experiments as per the schedule shown:

Laboratory Reports:

Wk	Date	Group A	Group B	Group C
1	9/2	No Lab	No Lab	No Lab
2	9/7 Mon: Labor Day	Writing Workshop (any Tu-Th Lab)	Writing Workshop (any Tu-Th Lab)	Writing Workshop (any Tu-Th Lab)
3	9/14	Math & Matlab	Math & Matlab	Math & Matlab
4	9/21	1st Order Time Response Modeling	No Lab	2nd Order Time Response Modeling
5	9/28	2nd Order Time Response Modeling	1st Order Time Response Modeling	No Lab
6	10/5	No Lab	2nd Order Time Response Modeling	1st Order Time Response Modeling
7	10/12	Op Amp Frequency Response Modeling	No Lab	1st Order Frequency Response Modeling
8	10/19	1st Order Frequency Response Modeling	Op Amp Frequency Response Modeling	No Lab
9	10/26	No Lab	1st Order Frequency Response Modeling	Op Amp Frequency Response Modeling
10	11/2	2nd Order Frequency Response Modeling	No Lab	Air Temperature Control Response
11	11/9	Air Temperature Control Response	2nd Order Frequency Response Modeling	No Lab
12	11/16	No Lab	Air Temperature Control Response	2nd Order Frequency Response Modeling
13	11/23 Thanksgiving	No Lab	No Lab	No Lab
14	11/30	**Design Project 1**	**Design Project 1**	**Design Project 1**
15	12/7	**Design Project 2**	**Design Project 2**	**Design Project 2**
16	12/15	Finals Week	Finals Week	Finals Week

Short Forms: After performing each experiment, students should complete and turn in their respective short forms to the laboratory TA. These forms will be graded and returned in the next class. The short forms are included in the laboratory handout at the end of each experiment description.

Formal Reports: Each student will have to write two formal reports during the semester. Students writing their report will turn in their rough draft one week after completing the lab (For example, a week 5 lab report is due at the beginning of the lab in week 6). The draft reports will be reviewed by your laboratory TA and Craig Gunn, and suggestions for improvement will be provided to the student at the following week's lab

period. The revised, final, version of the report is then due at the beginning of the lab period 3 weeks after the lab. The final version of the report will be graded.

Draft: Two copies of the report must be submitted

Final: One final report copy, two marked up drafts and electronic copy (emailed to TA)

Notes:

(1) 100% laboratory attendance is mandatory.

(2) Laboratory work accounts for 25% of the overall grade for ME451

(3) Students can reschedule their laboratory time only in special situations, through PRIOR arrangements made with TA' s. If a laboratory is missed without prior arrangement, the student will receive a zero.

(4) Short forms have to be submitted at the end of the laboratory

(5) Late formal reports will not be accepted unless PRIOR arrangements have been made with the laboratory coordinator.

(6) Laboratory handouts are available in the course web pages

(7) Read the laboratory handout for each week's lab BEFORE coming to the laboratory. You may otherwise face difficulty completing your experiment.