

**NORTH CAROLINA STATE UNIVERSITY DEPARTMENT OF MECHANICAL &
AEROSPACE ENGINEERING**

Summer 2015

**MAE-405, Dynamics and Control Laboratory
2216 Engineering Building III**

Course Website: <http://moodle.wolfware.ncsu.edu>

Lab Teaching Assistants:

Sections 051: Nicole Wiswall (enwiswal@ncsu.edu)

Sections 052: Christopher Yoder (cdyode@ncsu.edu)

Lab Director:

Dr. James Kribs, (2212 Engineering Building III, jdkribs@ncsu.edu, (919-513-0315))

Office Hours:

By Appointment Only

Course Meeting Times

Table 1, Section Listing

Section	Time
208	Thursday 10:40-12:30
216	Thursday 14:55-16:45

Course Pre-requisites/Co-requisites:

Prerequisite:

MAE-306 or C- or better in MAE-253.

Co-requisite:

MAE-435 or MAE-461

Text:

- The MAE435/461 text will be used throughout the semester

Course Overview:

Dynamics and Controls Laboratory introduces the students to principles of dynamics and controls by applying classroom theory to experiments and comparing predictions with measured results. Students utilize experimental test rigs in conjunction with dynamic models to demonstrate the motion of dynamic systems and to design control systems to manage that motion. Concepts demonstrated include Newton's

laws, properties of mechanical vibrations including natural frequency, damping, mode shapes, etc., and fundamental PID control.

Student Learning Outcomes:

Throughout Dynamics and Controls Laboratory the application of the Scientific Method, (http://en.wikipedia.org/wiki/Scientific_method), is emphasized as it applies to engineering experimentation. At the conclusion of the course the student will be able to do the following:

- Perform an experiment and collect meaningful data;
- Analyze experimental data and draw engineering conclusions;
- Interpret the behavior of dynamic mechanical vibratory systems;
- Understand and build a fundamental analog PID controller using basic electronic components;
- Prepare a technical laboratory report

Course Structure:

The course will be comprised of the following elements:

- Pre-lab assignments including reading and problem sets;
- In-class experimental work;
- Laboratory reports and presentations.

There will be a pre-lab assignment for each lab. It will consist of a reading assignment, (handout, text and any other material deemed appropriate), and a problem set. These assignments will give the student the opportunity to become familiar with and understand the theoretical material that will be used in performing the experiment. Each student will be required to write 5 short format laboratory reports and 2 long format laboratory reports, (1 individual, 1 group). Details on the format of the reports will be given in a separate document. A technical poster, (or slide presentation), will be prepared by each group on which to give an oral presentation at the end of the semester. Details will be provided by your lab instructor.

Projected Weekly Schedule:

Table 2, Schedule

Week	Date	Lab	Title
1	5/21/2015	1	Introduction to MATLAB
2	5/24/2015	2	Analysis of Simple Circuits
3	6/4/2015	3	Operational Amplifiers

4	6/11/2015	4	1 Dimensional- Mass Spring Damper System
5	6/18/2015	5	Analog PID Controllers
6	6/25/2015	6	Analog PID Controllers
7	7/2/2015	-	Independence Day
8	7/9/2015	7	PID Control: Gain Tuning
9	7/16/2015	8	Cantilever Beam Deflection

*Please note that this schedule is subject to change with prior notice.

Laboratory Safety:

Laboratory safety is everyone's responsibility. No one should work with a piece of laboratory equipment on which they are unfamiliar. Instructors will point out the location of safety equipment in the laboratory and will discuss any required precautions necessary for conducting experiments in a safe manner. The laboratory is equipped with a Safety Plan Manual. This manual is a resource for personnel working in a laboratory to know what hazards are present. This manual will be pointed out to and discussed with the students during the first laboratory session. It is student's responsibility to read the Safety Plan Manual and understand the safety hazards present in the laboratory.

There are three specific safety rules that will be implemented and enforced in the laboratories:

- Safety glasses will be worn at all times while in the laboratory. The first pair will be provided by the University. If lost the student is responsible for purchasing another pair from an appropriate vendor.
- Closed-toe shoes are required to be worn, e.g., no flip-flops.
- No food or drink is permitted in the laboratory.

Violation of these safety rules will result in point deductions. (Details TBD, (To Be Determined))

Grading:

Grading will focus around the presentation of technical information in written or presentation formats. While most of the work will be conducted in groups, each member of the group will be expected to contribute to the assignment. Individual efforts will be assigned using the group reviews after each assignment. Please submit all lab reports with the following title MAE405 Section# Group#.docx (example MAE405_051_Group1), failure to do so will result in point deductions. All labs will be submitted through the course moodle site (moodle.wolfare.ncsu.edu).

The grading breakdown is as follows:

- Pre-lab Assignments–10%
- Short Format Laboratory Reports–50%
- Long Format Laboratory Reports–30%