Syllabus

Lecture Hudson Hall 125, WF 8:30–9:45 am

Laboratory Hudson Hall 154

Th 11:45 am–1:00 pm	F 11:45 am–1:00 pm	F 4:40 pm–5:55 pm
Th 1:25 pm–2:40 pm	F 3:05 pm–4:20 pm	

Instructor Dr. Genevieve Lipp, *Office:* Hudson 058, *Email:* genevieve.lipp@duke.edu
Office hours are Monday 9:00 am–10:00 am or by appointment.

Course description In this class you will develop skills for analyzing the motion of bodies. You will learn indispensible tools for determining the position and velocity of an object subject to forces, which help practicing engineers design bridges, planes, and engines, as well as explain important physical phenomena. We will begin with the motion of particles, then rigid bodies, followed by an introduction to vibrations and other advanced topics.

Textbook *Engineering Dynamics: A Comprehensive Introduction*, by N. Jeremy Kasdin and Derek A. Paley

Learning objectives By the end of this course, you will be able to:

- Select and define appropriate reference frames and coordinate systems for particle and rigid body problems and determine the unknowns among position, velocity, and acceleration, given a set of constraints on the kinematics of a particle or body.
- Derive differential equations of motion for a particle or rigid body in plane motion, using a variety of force models, such as gravity, Coulomb friction, viscous damping, and spring stiffness, and solve the equations using appropriate analytical or numerical techniques.
- Choose and apply the appropriate work-energy and impulse-momentum relations to find relationships between dynamic states of a particle or rigid body, and solve for the dynamic states in selected problems.
- Use Lagrange's Equations in a variety of settings to derive equations of motion.
- Derive linear mathematical models for and analyze single and multiple degree of freedom vibratory systems.
- Design and test experimental models that demonstrate dynamic phenomena and compare with theoretical and numerical predictions.

Grading scheme

Homework	5%
Participation	5%
Laboratories	30%
Test 1	20%
Test 2	20%
Test 3	20%

Much of your learning in this course will happen as you work through ten **homework** assignments. These will be graded for completion, since the primary purpose is to give you a chance to practice the skills introduced in your reading and in lecture. You are welcome to work with classmates, but be mindful of whether *you* are developing each skill. You will turn in your homework assignments by scanning an image of your work and attaching it to the corresponding assignment in Sakai.

Participation in the course can take many forms, but some expectations are that you come to class prepared, engage with the content during class, and make use of instructor and TA office hours. Your grade for participation will be based on reading quizzes, attending and being involved in class, and minute papers at the end of class.

There are three **laboratory exercises**, for which you will perform experiments, analyze experimental data, and write a report of your findings. You will be allowed to work in groups of three and turn in one copy, but the role of "first author" must rotate.

Three **tests** will be given to assess your progress in the course, for which you will make your own notecard as a reference. Prior to each test, the instructor will provide a list of learning objectives you can use as a study guide. An optional final will be available to anyone who would like to replace their lowest test grade with their final score. If you need to miss a test or require other accommodations, please inform the instructor at least two weeks in advance.

The instructor reserves the right to adjust class test grades (never lower) as she deems appropriate. Your final letter grade will correspond to your weighted average according to the usual scheme:

	$X-$	X	$X+$
A	90–92.99	93–96.99	97–100
B	80–82.99	83–86.99	87–89.99
C	70–72.99	73–76.99	77–79.99
D	60–62.99	63–66.99	67–69.99
F		< 60	

Class teaching assistants

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Conduct expectations It is the expectation that students, TAs, and the instructor will regard each other with mutual respect.

Students will abide by the Duke Community Standard:
I will not lie, cheat, or steal in my academic endeavors;
I will conduct myself honorably in all my endeavors; and
I will act if the Standard is compromised.

Support Dynamics is a challenging discipline, but you have many options for getting help. Instructor and TA office hours are great places to get help with something you didn't understand in class or a homework problem you're stuck on. You can ask questions of your colleages and instructor on Piazza. TAs and the lab manager will be available during your lab sections. While you are responsible for your own learning, you have many people and resources to support you in this challenge.