

Physics 170 Mechanics I (for Engineers)

Prof. Thomas Mattison

Goals for Today

Learning goals for the course

Administrivia

Textbook

“Mastering Engineering”

Tutorials

Office Hours

Grading

Rules

Introduction to Static Equilibrium

Why Study Classical Mechanics?

UBC requires all engineering students to take classical mechanics (in fact, most universities require it for all science/engineering).

But why?

- Many engineering specialities use it every day (mech, civil)
- Nearly all specialities use some of it, sometimes everything (except software) is made out of something
- The foundation of scientific literacy
- It demonstrates the power of science+math
- It's practice in using the math you (should) have learned

The techniques of problem analysis, setup, solution, presentation, checking, and dealing with hard problems are applicable outside of mechanics, physics, or even engineering.

If you don't remember any of the physics, but do learn how to solve problems, and check your answer, I've done my job.

Is This Course Right For You?

Engineering students pretty much are required to take it.

We do more statics than typical 1st-year-mechanics-for-science, and also cover an unusual coordinate system in dynamics.

Differential calculus is a pre-requisite, and integral calculus is a co-requisite.

While the first few weeks don't use much calculus, don't let that fool you. (But the calculus isn't particularly complicated).

Physics 170 isn't a prerequisite for very many courses outside of engineering. If you're not in engineering and so could take Phys 100 or 101 instead, you should consider doing that. Phys 100 is non-calculus, and Phys 101 is considered somewhat easier.

Official Course Content

Statics of particles, equilibrium of rigid bodies, rigid body statics and internal forces, trusses;

Translation:

external forces and moments (torques)
add up to zero in equilibrium

kinematics: rectilinear motion; dynamics: Newton's second law, friction, impulse, momentum, work and energy.

Translation:

analysis of motion using calculus,

$F = ma$, momentum = $p = mv$

impulse = time-integral of force = momentum change

work = space-integral of force

kinetic energy = $1/2mv^2$

Problem Solving

Physics is a terrific environment for learning problem-solving.

If you recognize a problem as a simple variant of one you've done before, that's great. But that won't get you far in life (or 170!)

What do you do, when you don't know what to do?

There actually are a bunch of techniques that make it much more likely that you will be able to solve a problem that you haven't seen before.

There are also a bunch of techniques to check your answer (other than comparing to the back of the book or your friends).

Textbook

Engineering Mechanics: Statics and Dynamics, R.C. Hibbeler,

- Custom 12th edition in the bookstore
- 11th or 10th edition is tolerably close.

It's two books with one cover!!

- page numbers reset to 1 in middle
- index, appendices, problem solutions in the middle, as well as at the end

There is only one table of contents, at the front, and the chapter numbers don't reset at the midpoint

Most chapter problems have a solution (numerical only) at the midpoint or end of the book. Asterisk problems don't.

Chapters We Don't Cover

6: Structural Analysis

7: Internal Forces

(tedious geometry, calculus, covered in later courses)

9: Center of Gravity and Centroid

10: Moment of Inertia

11: Virtual Work

(calculus are us!)

16-19: Dynamics including rotation, but limited to a plane

(moment of inertia, tedious geometry, later courses)

20-21: Dynamics including rotation, not limited to a plane

(still more tedious and complicated, later courses)

22: Vibrations

(differential equations, and basics covered in P153)

Mastering Engineering

It's the online version of the problems in the book, but with real-time grading, re-tries allowed, and hints (yes!) and randomized numbers (bummer!)

The bookstore bundle has a packet with a login code.

Log in at <http://www.masteringengineering.com> and find course UBC PHYS 170 FALL 09

We may be able to get more of the (cheaper) paper packets at the bookstore in a few days, so while you can buy online access without a paper packet, **don't rush to do it!!**

Problems will be due on Wednesdays at Midnight

Electronic Textbook

You can get access to an electronic version of Hibbeler along with Mastering Engineering.

The good

- It's (supposed to be) cheaper than the printed version
- They don't run out of them at the bookstore
- It's much lighter (if you are carrying a laptop anyway)

The bad

- Many people prefer real books
- You can't scribble in the margins (or can you?)
- You lose access at the end of the course
- You can't sell it back at the end of the year
- What if the server crashes while you are studying??

I don't know (yet) if a stand-alone paper packet could be used to get the ebook, and still be cheaper than a paper textbook.

Textbook, Textbook, Who's Got the Textbook

How many bought the custom version from the bookstore?

How many already have a used 11th or 10th edition?

The bookstore can surely get some (full, expensive) 12th editions but I don't know (yet) how long it will take.

I don't know how long it would take to get (cheaper) custom 12th editions to the bookstore.

There are lots of other ways to find used or new textbooks.

Ebook access may be a better choice for you than paper.

Tutorials

Tuesdays, 1-2 in Math 104, 2-3 and 3-4 in Barber 261

A few of you have not signed up for a tutorial yet. The system will not give you credit for the course unless you do.

There will be a quiz in each tutorial about the previous week's material (a problem to be done in class) taking about $2/3$ the time.

The rest of the time is available for you to ask questions about the homework, and for the TA to go over the previous quiz and/or homework.

About half of the midterm and final problems will be variants of the tutorial quiz problems.

Office Hours & Bonus Points

Office Hours:

Tuesday 10:30 AM - 1 PM, Hennings 276

Corridor on South of Hennings, enter at E or W end

Knock on my door anytime, or email for an appointment

You will receive one (1) extra point for each time you come to scheduled office hours (or by appointment if you have a real course conflict) with an intelligent question (where you made an honest effort to do something or understand something before asking the question).

Your friends can come along and listen, but they don't also get points (unless they ask different intelligent questions).

Exception: no bonus points during the week before exams, the last week of the class, or after the end of classes.

Grading

60% from final exam

20% from midterm exam

Friday Oct. 23 ??

10% from homework problems (drop lowest 2 weeks)

several problems from the textbook each week

done online Mastering Physics

due Wednesdays

10% from tutorial quizzes (drop lowest 2)

bring calculator, ruler, and of course, show up for class!

You must pass the final (at least 50%) to pass the course.

Registration Stuff

The last date to drop courses with no record is September 22.

The last date to drop courses with a W is October 16.

Please make sure that the registrar's system has a valid email address for you, preferably one you check regularly.

Come to my office after class if you have registration issues.

Academic Honesty Agreement Phys 170 Lecture 1

<http://www.students.ubc.ca/calendar/index.cfm?tree=3,286,0,0>

Academic honesty is essential to the continued functioning of the University of British Columbia as an institution of higher learning and research. All UBC students are expected to behave as honest and responsible members of an academic community. Breach of those expectations or failure to follow the appropriate policies, principles, rules, and guidelines of the University with respect to academic honesty may result in disciplinary action.

<http://www.students.ubc.ca/calendar/index.cfm?tree=3,285,0,0>

Upon registering, a student has initiated a contract with the University and is bound by the following declaration:

"I hereby accept and submit myself to the statutes, rules and regulations, and ordinances (including bylaws, codes, and policies) of The University of British Columbia, and of the faculty or faculties in which I am registered, and to any amendments thereto which may be made while I am a student of the University, and I promise to observe the same."

The student declaration is important. It imposes obligations on students and affects rights and privileges including property rights. You must not enroll as a student at the University if you do not agree to become bound by the declaration above. By agreeing to become a student you make the declaration above and agree to be bound by it.

You Must Learn the Rules

<http://www.students.ubc.ca/calendar/index.cfm?tree=3,286,0,0>

It is the student's obligation to inform himself or herself of the applicable standards for academic honesty. Students must be aware that standards at the University of British Columbia may be different from those in secondary schools or at other institutions.

<http://www.vpacademic.ubc.ca/integrity/policies.htm>

Ignorance of the appropriate standard of academic honesty is no defence to an allegation of Academic Misconduct.

Inappropriate Conduct

<http://www.vpacademic.ubc.ca/integrity/policies.htm>

Plagiarism occurs where an individual submits or presents the work of another person as his or her own... Where collaborative work is permitted by the instructor, students must ensure they comply with the instructor's requirements for such collaboration.

Cheating includes, but is not limited to: falsifying any material subject to academic evaluation; having in an examination any materials other than those permitted by the examiner; and using unauthorized means to complete an examination (e.g. receiving unauthorized assistance from a fellow student).

Submitting the same, or substantially the same, essay, presentation, or assignment more than once (whether the earlier submission was at this or another institution), unless prior approval has been obtained from the instructor(s) to whom the assignment is to be submitted.

Other Rules

Turn off cell-phones during lecture.

You can return calls outside of class.

If you absolutely must be available, set cell-phone to vibrate, and leave lecture to answer.

No text messaging during lecture.

No open laptops during lecture.

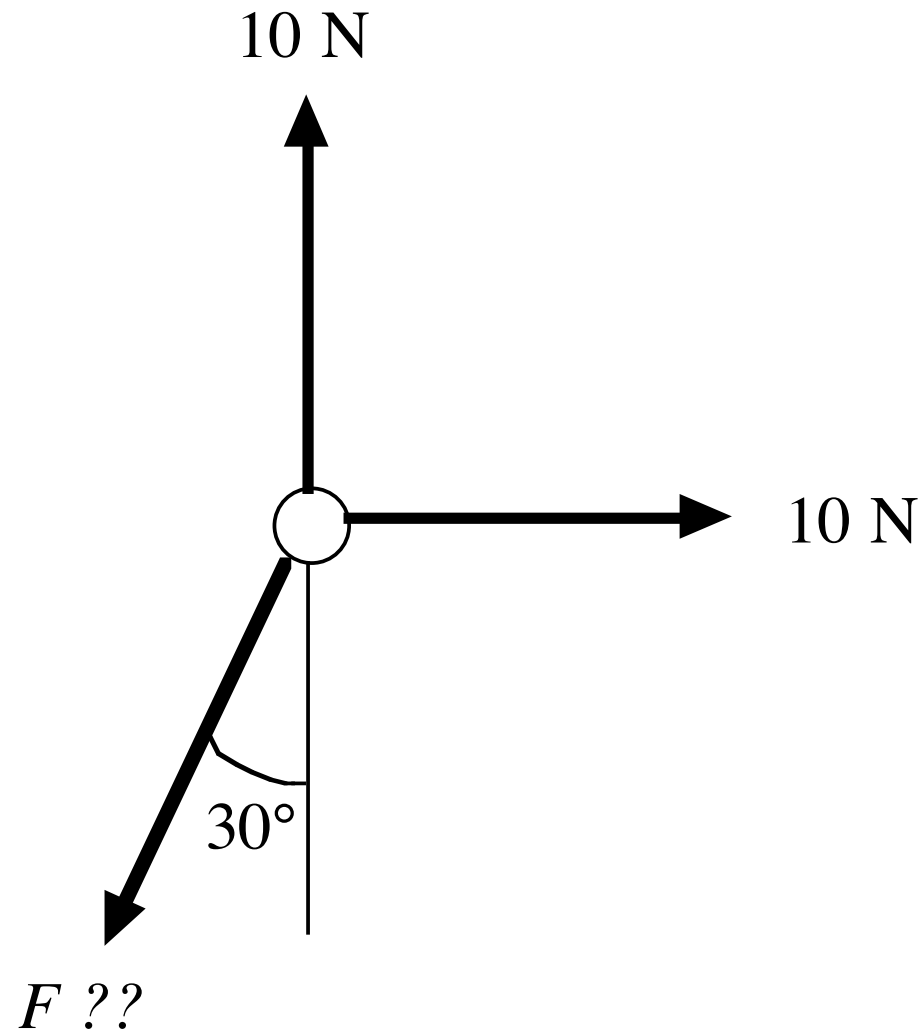
You can check your email outside of class.

One page of notes allowed for midterm and final.

Must be hand-written, by you, not printed or xeroxed.

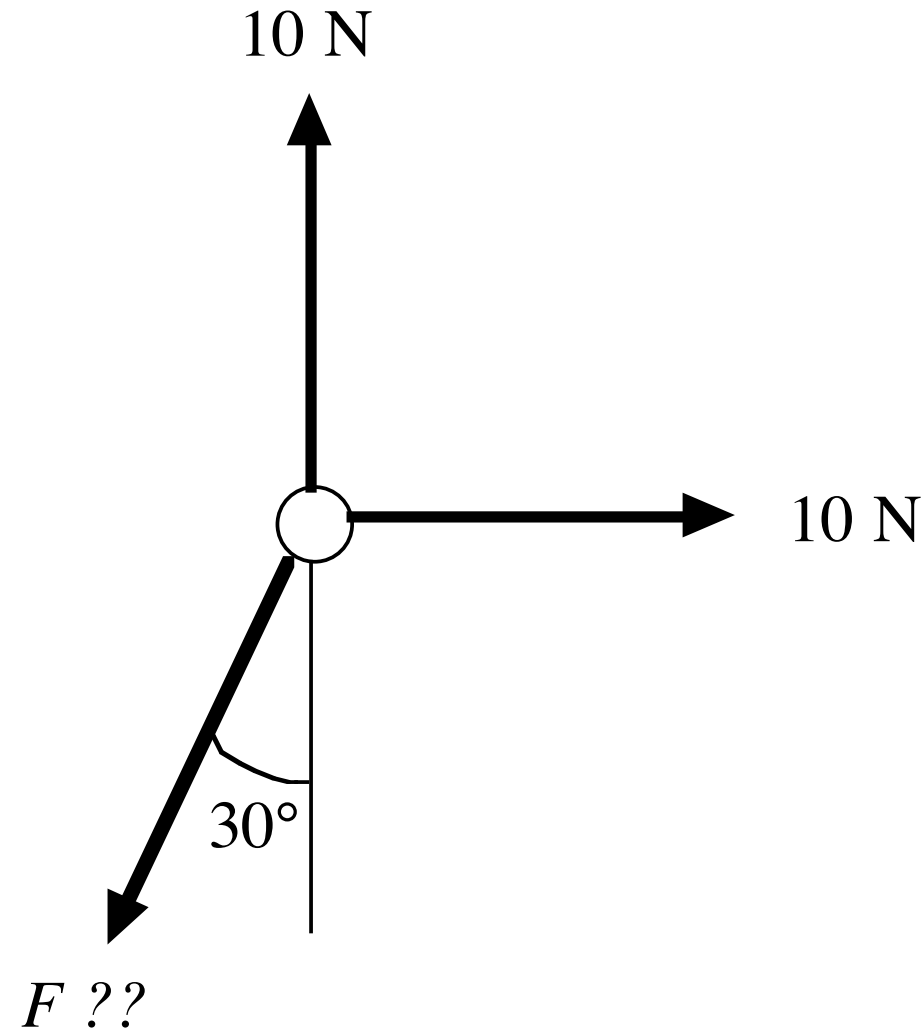
Static Equilibrium Demonstration

What is the force F required to get static equilibrium?



Static Equilibrium Demonstration (2)

Why can't we get this to work??



Administrivia

Lectures:

Monday, Wednesday, Friday 2:00 to 3:00, Hennings 200

Tutorials:

Tuesday 1-2 in Math 104, 2-3 & 3-4 in Barber 261

Web page

<http://www.vista.ubc.ca> Or <http://www.elearning.ubc.ca>

then CWL (campus-wide login) to your course list
(the Phys 170 page exists, but is still empty today)

Lecturer:

Prof. Thomas Mattison

Hennings 276 (south corridor, enter at E or W end of bldg)

mattison@physics.ubc.ca

Teaching Assistants:

Shuhang Yang, Namshik Kim

For Next Time

Find the UBC Vista website for the course
(these notes will appear there soon).

If you have a textbook, read Chapter 1 in Hibbeler.

If you don't have a book, borrow one for an evening to read Ch. 1

Don't rush to buy a book (or ebook) until I know more.

If you already have a Mastering Engineering packet,
log in and look for the course UBC PHYS 179 FALL 09.
(there won't be any problems there yet)

Don't rush to pay for Mastering Engineering online
until I know more.