

# Welcome to Physics 121

*My name is **Neil Alberding***

**This course covers electricity and magnetism —  
things like electric charges, magnets, DC and AC  
Circuits, electromagnetic waves and optics.**

# Lectures and Tutorials

There are three lectures a week, 1 hr each  
and one tutorial, 1 hr

no lab in this course. Physics 133 is a separate lab  
course that you may take along with Physics  
121.

If you like lab with course you can take Physics 141  
in Surrey

# Physics 121

- Electricity
- DC Circuits
- Magnetism
- AC Circuits
- Electromagnetic Waves
- Optics

# Schedule

## Physics 121 Schedule

Date 2019	week	topic
Mon May 6	1	Electrostatics
Wed May 8	1	Coulomb's Law
Fri May 10	1	Electric Fields
Mon May 13	2	Electric Flux and Field Lines
Wed May 15	2	Gauss' Law
Fri May 17	2	<i>Gauss' Law Calculations</i>
Mon May 20	3	Victoria Day
Wed May 22	3	Electric Potential Energy
Fri May 24	3	Electric Potential
Mon May 27	4	Conductors and Capacitance
Wed May 29	4	Capacitors
Fri May 31	4	Electric Current
Mon June 3	5	Kirchhoff's Rules
Wed June 5	5	Review
Fri June 7	5	Midterm 1
Mon June 10	6	RC Circuits
Wed June 12	6	Magnetism
Fri June 14	6	Forces and Torques on Currents
Mon June 17	7	Biot-Savart Law
Wed June 19	7	Ampere's Law
Fri June 21	7	Problems
Mon June 24	8	Motional EMF
Wed June 26	8	Faraday's Law
Fri June 28	8	Induction and RL Circuits
Mon July 1	9	Canada Day
Wed July 3	9	Review
Fri July 5	9	Midterm 2
Mon July 8	10	LRC Circuits
Wed July 10	10	AC Circuits
Fri July 12	10	AC Circuits: Resonance and Power
Mon July 15	11	Displacement Current and E-M Waves
Wed July 17	11	Properties of Electromagnetic Waves
Fri July 19	11	Problems
Mon July 22	12	Reflection and Refraction
Wed July 24	12	Lenses, Mirrors
Fri July 26	12	Polarization, Interference & Diffraction
Mon July 29	13	Wave particle Duality
Wed July 31	13	Particle Physics
Fri August 2	13	Review
Thu August 15		Final exam

## Electrostatics

## DC Circuits

## Magnetism

## AC Circuits

## Electromagnetic Waves

## Optics

# Welcome to Physics 121

***Your required course material:***

**FlitPhysics**

**[FlitPhysics.com](http://FlitPhysics.com)**

**by Gary Gladding, Mats Selen, and Tim Stelzer**

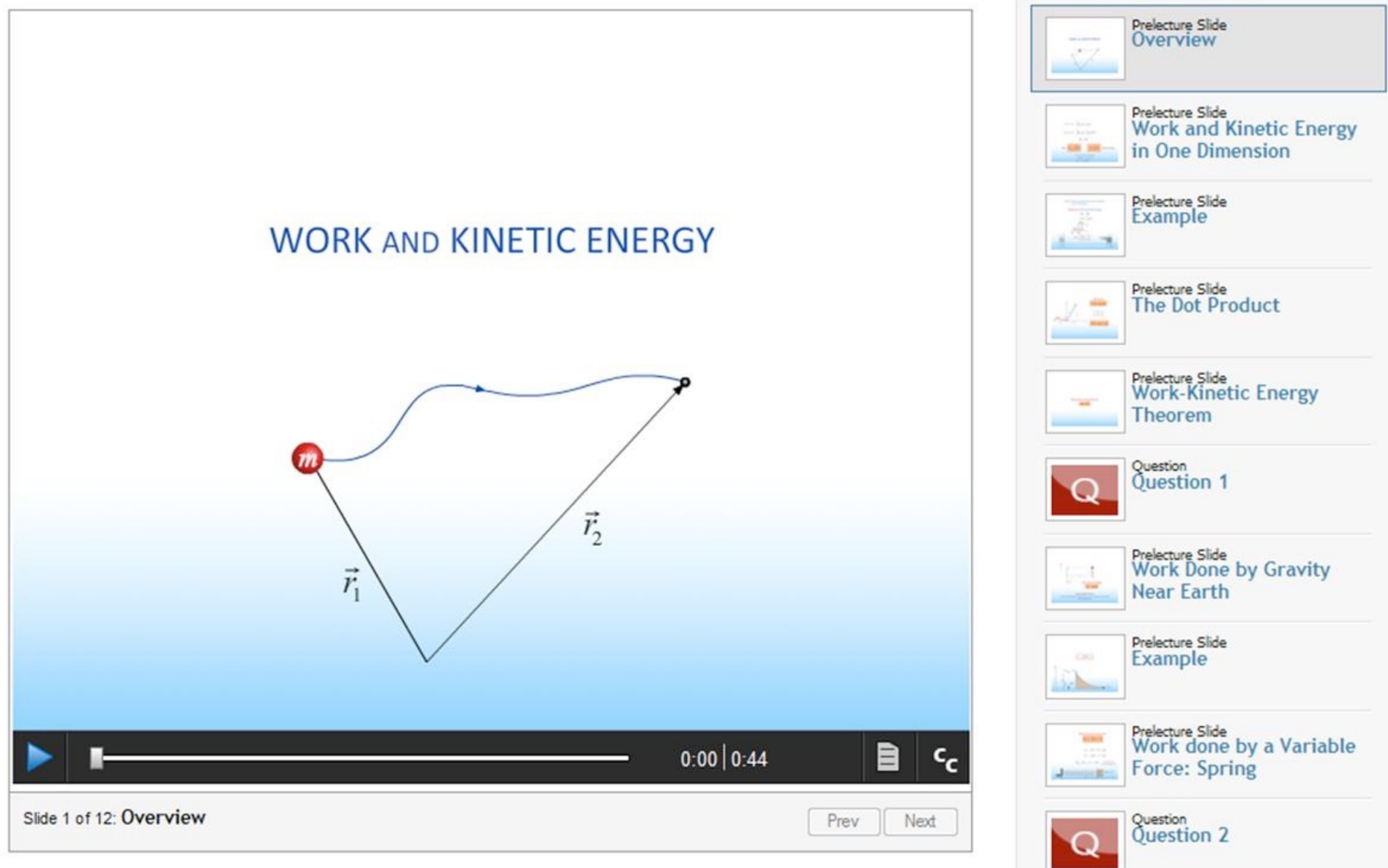
# FlipItPhysics Course Overview

## ***includes:***

1. Online PreLectures (animated lessons, completed before lecture)
2. Online CheckPoints (quizzes to check knowledge, completed before lecture)
3. Lectures (interactive, with clicker activities)
4. Online homework exercises
5. Printed textbook (reference, problems)

# How we'll use FlipItPhysics

You will **VIEW** PreLectures before class.



The screenshot displays the FlipItPhysics interface. The main video player shows a slide titled "WORK AND KINETIC ENERGY" with a diagram of a particle of mass  $m$  moving along a curved path from point 1 to point 2. The displacement vectors  $\vec{r}_1$  and  $\vec{r}_2$  are shown. The video player includes a play button, a progress bar, a timestamp of 0:00 / 0:44, and a Creative Commons license icon. Below the video player, it indicates "Slide 1 of 12: Overview" and provides "Prev" and "Next" navigation buttons.

Prelecture Slide	Overview
Prelecture Slide	Work and Kinetic Energy in One Dimension
Prelecture Slide	Example
Prelecture Slide	The Dot Product
Prelecture Slide	Work-Kinetic Energy Theorem
Question	Question 1
Prelecture Slide	Work Done by Gravity Near Earth
Prelecture Slide	Example
Prelecture Slide	Work done by a Variable Force: Spring
Question	Question 2

# How we'll use FlippedPhysics

Next, you'll complete a CheckPoint quiz before lecture to **CHECK** your understanding of the PreLecture.

## Checkpoint: Work And Kinetic Energy

Deadline: 100% until Tuesday, August 27 at 8:00 AM

### Work on Box in Accelerating Truck

1 2



A box sits on the horizontal bed of a truck accelerating to the left as shown. Static friction between the box and the truck keeps the box from sliding around as the truck drives.

1) The work done on the box by the static frictional force as the accelerating truck moves a distance  $D$  to the left is?

- ☐ Positive
- ☐ Zero
- ☐ Negative
- ☐ Depends on the speed of the truck.

Submit

Graph



# How we'll use FlitPhysics

**COME to Lecture!**

**The lecture will be more interactive because of the work you've done before class.**

## *Your comments:*

- I would appreciate some discussion on the ties between calculus and the three laws
- I felt very confident during most of the time while doing the prelecture and preflight, you can go over whatever you want as far as I'm concerned.
- I don't quite understand how the change of momentum relates to net force and acceleration.
- I knew all of these surprisingly well. Or at least I think I do.
- Why (in physics terms) wouldn't an object like a wall move according to Newton's Third Law if it does not have balanced forces on it (net force  $\neq 0$ , so shouldn't it accelerate per Newton's First Law?
- How does net force differ from other forces? Also, in relation to centripetal motion, in which directions are acceleration, momentum, and velocity.
- why the acceleration of the car is towards the center of the circle, yet the car's velocity is pointing directly forward from the car at any point in time.

# How we'll use FlippedPhysics

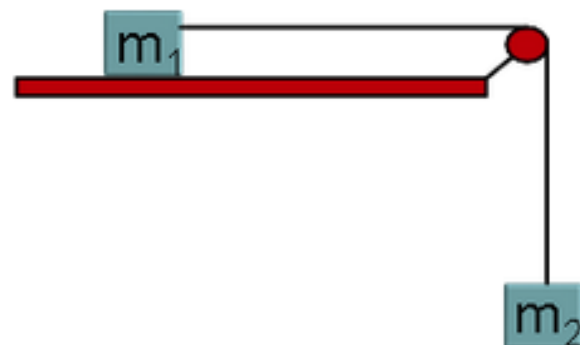
Next, you must **complete assigned homework problems.**

Homework: Work And Kinetic Energy

Deadline: 100% until Wednesday, August 28 at 8:00 AM

Work On Two Blocks

1 2 3 4 5 6 7 8



A mass  $m_1 = 5.6$  kg rests on a frictionless table and connected by a massless string over a massless pulley to another mass  $m_2 = 3.1$  kg which hangs freely from the string. When released, the hanging mass falls a distance  $d = 0.74$  m.

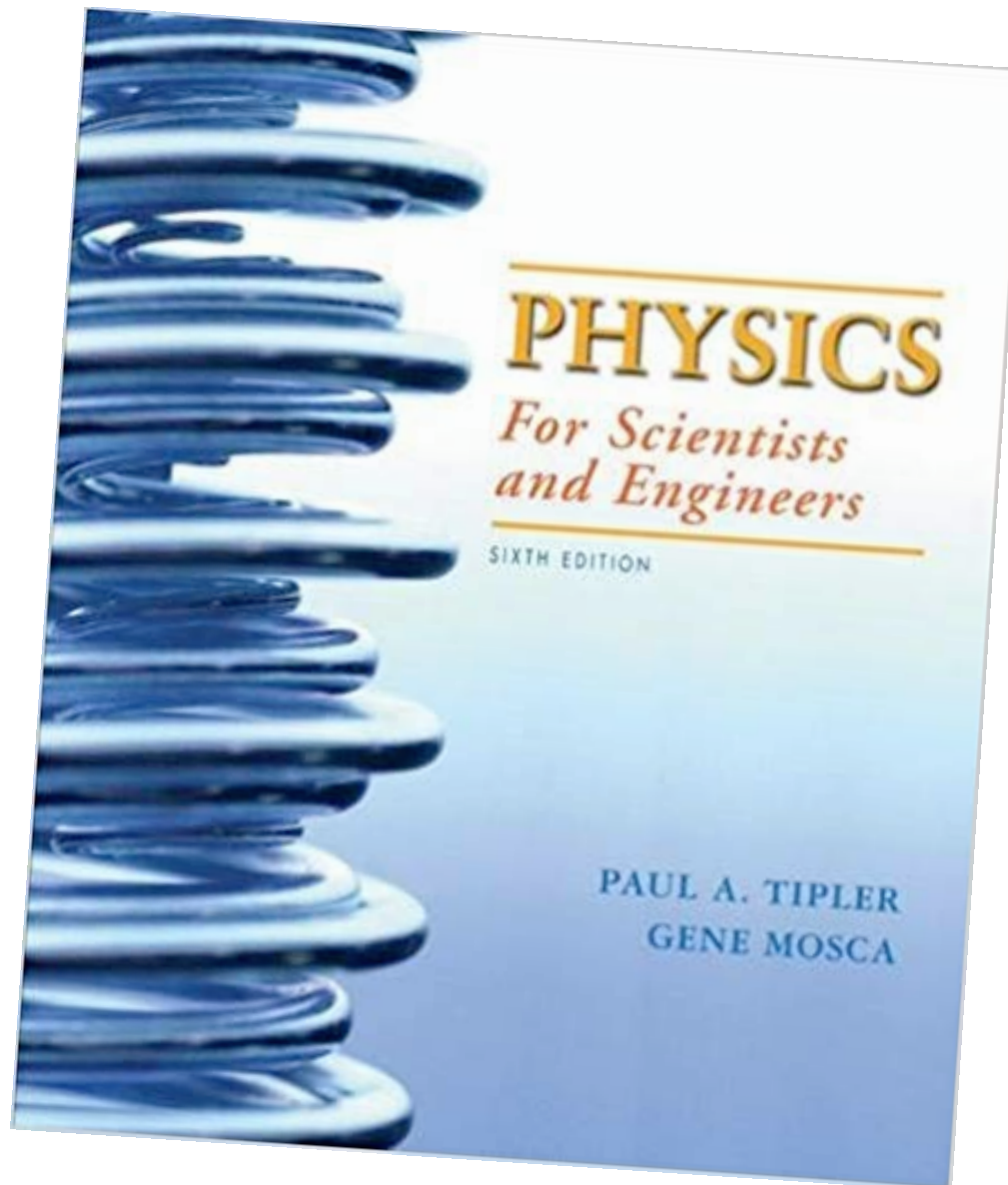
1) How much work is done by gravity on the two block system?

J

***\*A single assignment may contain multiple problems.***

# How we'll use FlippedPhysics

**READ** the Textbook as needed for review.

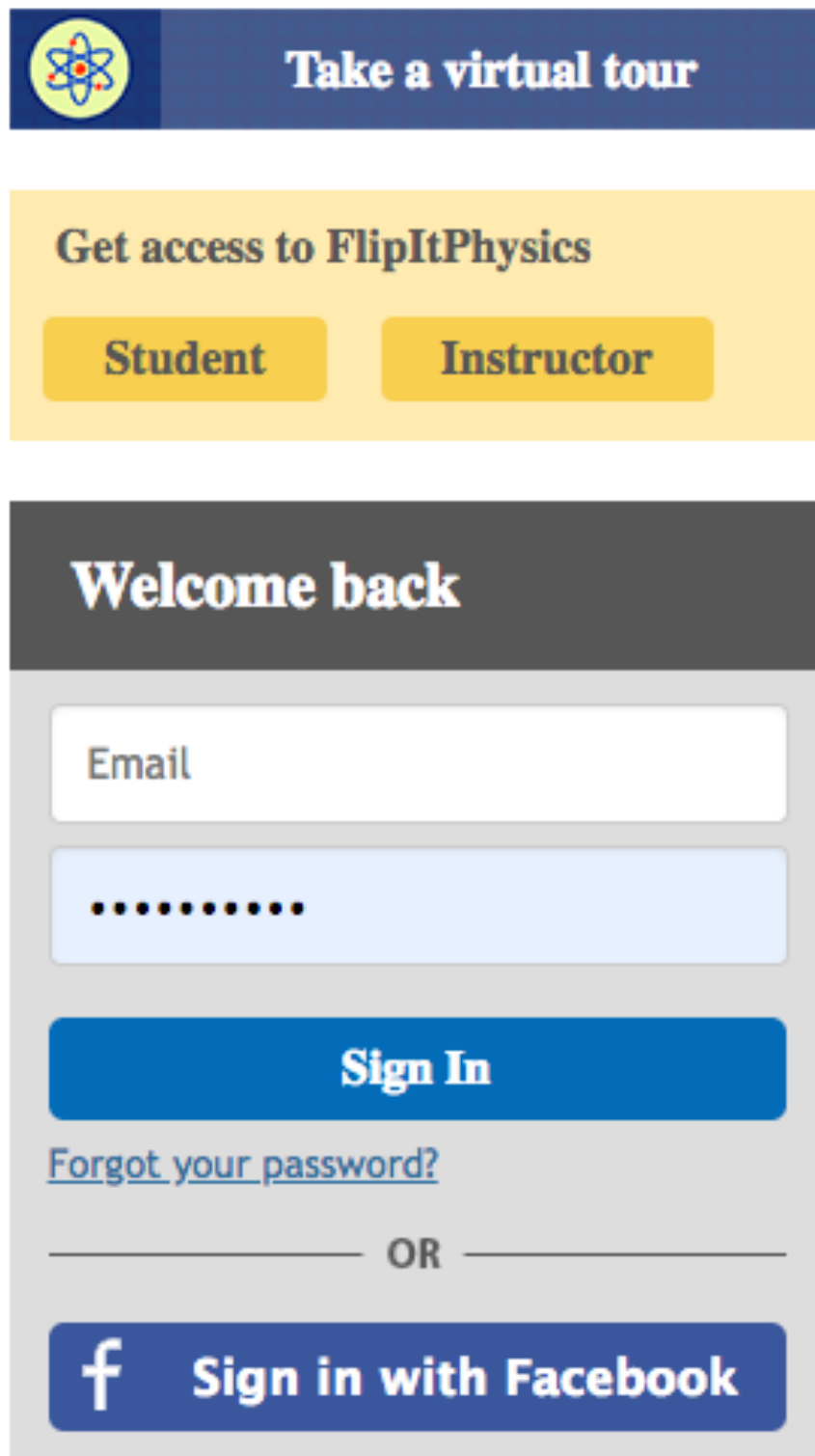


# So how do you get started?

## **To access to FlipltPhysics:**

- **Create an account**
- **Join my course so you can see my assignments and get credit for your work**      **Course id: SFUPhys121A**
- **Purchase access (by activating a printed activation code purchased through the bookstore or purchased online)**

# Create a FlipItPhysics Account



The screenshot shows the FlipItPhysics website interface. At the top, there is a dark blue banner with a logo on the left and the text "Take a virtual tour" on the right. Below this is a yellow banner with the text "Get access to FlipItPhysics" and two buttons: "Student" and "Instructor". Further down is a grey banner with the text "Welcome back". Below the banner are two input fields: "Email" and a password field represented by dots. A blue "Sign In" button is positioned below the password field. Below the button is a link that says "Forgot your password?". Below this is a horizontal line with the text "OR" in the center. At the bottom is a dark blue button with a Facebook logo and the text "Sign in with Facebook".

1. Go to [flipitphysics.com](http://flipitphysics.com)

2. Click the “Student” button to begin the registration process OR register using your Facebook account.

# Create an account

3. Begin the process of registering for the site. Enter your email address (your SFU email address) and choose a password.

4. Complete the Captcha Image

5. Click “Register”

## *Account Creation Page*

### Create a New Account


Please use the form below to create a new account.

Email Address

Confirm Email

Password  
(Minimum of 6 characters)

Confirm Password



Generate a new Captcha image

Enter the symbols you can read from the image:

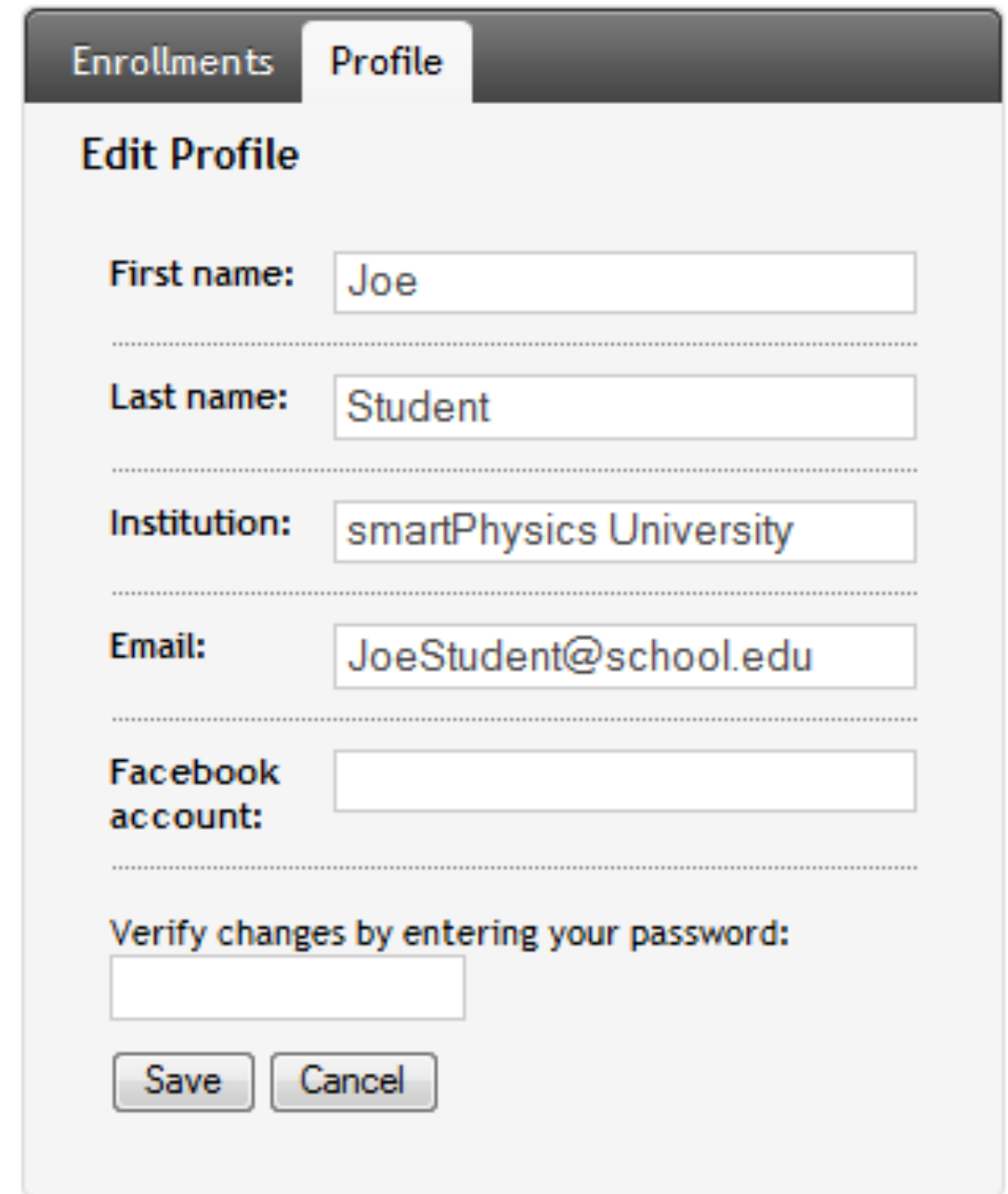
# Create an account

6. Set up your profile (first name, last name, institution)

(Connect your Facebook Account if you want)

7. Re-enter your password, then click “Save”

*Welcome JOE STUDENT*



The screenshot shows a user interface for editing a profile. At the top, there are two tabs: 'Enrollments' and 'Profile', with 'Profile' being the active tab. Below the tabs is the title 'Edit Profile'. The form contains several input fields, each preceded by a label and separated from the next by a dotted line. The fields are: 'First name:' with the value 'Joe', 'Last name:' with the value 'Student', 'Institution:' with the value 'smartPhysics University', 'Email:' with the value 'JoeStudent@school.edu', and 'Facebook account:' which is empty. Below these fields is a section titled 'Verify changes by entering your password:' followed by an empty password input field. At the bottom of the form are two buttons: 'Save' and 'Cancel'.

Enrollments	Profile
<b>Edit Profile</b>	
First name:	<input type="text" value="Joe"/>
.....	
Last name:	<input type="text" value="Student"/>
.....	
Institution:	<input type="text" value="smartPhysics University"/>
.....	
Email:	<input type="text" value="JoeStudent@school.edu"/>
.....	
Facebook account:	<input type="text"/>
.....	
Verify changes by entering your password:	
<input type="password"/>	
<input type="button" value="Save"/> <input type="button" value="Cancel"/>	



# Enroll in this course

8. Choose the “Enrollments” tab and enter the access key of this course.

**SFUPhys121A**

(this is CAsE SeNsiTlve! )

*Enroll in a Course*

Welcome *JOE STUDENT*

**Enrollments** Profile

Edit Profile

*Enroll in a Course*

Enter the access key of an existing course to enroll:

SFUPhys121A

Get Course

Physics University

ident@school.edu

Verify changes by entering your password:



# Course Access Key

The COURSE ACCESS KEY for this course is:

SFUPhys121A

(Case sensitive. **sfuphys121a** won't work.)

# Enroll in this course

## 9. Enter your Unique identifier:

*Enroll in a Course*

Enter the access key of an existing course to enroll:

SFUPhys121A

.....

You have selected the course: **SFU Phys121 Summer 2019**

Enter a Unique identifier: myid

Enroll Course

# To be sure: Unique Identifier Format

The UNIQUE IDENTIFIER you should use for this course is:

Your SFU email address without @sfu.ca.

# Access FlipItPhysics

**Congratulations! You are now enrolled in your course!**

**You will be given **21 days** before having to purchase access or redeem an access code. This will provide you with a grace period should you drop the course.**

*Welcome JOE STUDENT*

Enrollments Profile						
Current Enrollments						<a href="#">[Join a Course]</a>
Course Name	Date Joined	Start Date	Role	Status	Action	
			Student	Demo 30 days left	<a href="#">Purchase</a> <a href="#">Redeem</a>	

# Access FlipItPhysics

After the 21 days (or before, if you'd like), you must either buy access online with a credit card **OR** redeem an activation code (housed in a printed booklet purchased at the campus bookstore).

*Welcome JOE STUDENT*

Enrollments		Profile				
Current Enrollments						<a href="#">[Join a Course]</a>
Course Name	Date Joined	Start Date	Role	Status	Action	
			Student	Demo 30 days left	<a href="#">Purchase</a> <a href="#">Redeem</a>	

# Purchase Access (Online)

## From the “Purchase Access” link

1. Complete the billing information and click “Continue.”

### Purchase Access to Your Course

1 Join a course

2 Purchase access

3 Go to your course

Purchase access to a smartPhysics course: \$25.00

(some locations charge sales tax, which will be calculated after you enter your billing address.)

#### Billing Information:

First Name:

Last Name:

Billing Address

Billing Address (cont.)

City:

State:

Zip/Postal Code:

Country:

***\*\*This is the address in which your credit card bill is sent each month. This is often different than your school address, so please check before entering that information.***

Continue

# Purchase Access (Online)

**2. Complete the second portion of the online form (credit card information) and click “Purchase Access.”**

*\*\*Depending on your state of residence, you may be subjected to a tax for your online purchase. The system will determine your tax rate based on your billing address.*

## Credit Card Information:

Credit Card Type:

Visa ▼

Credit Card Number:

Expiration Date:

1 (Jan) ▼

2012 ▼

Card Verification Number:

## Price Information:

FlipitPhysics Access:

Tax:

Total:



Purchase Access

# Purchase Access (Online)

3. You'll be taken to a confirmation page with your purchase details. Click "Go to Course" to return to your course.

## Purchase Access to Your Course

1 Join a course

2 Purchase access

3 Go to your course

Thank you! Your purchase is complete.

### Your Receipt:

Billing Name:

Billing Address:

Country:

Card Type:

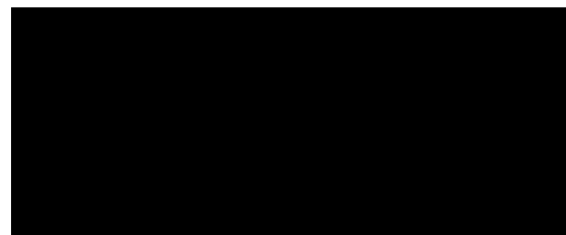
Card Number:

Card Expiration Date:

Amount:

Access Code:

Date of Purchase:



United States of America

Visa

Ending in 7209

4/2015



2KJD-LU2G-76JS-4822

Friday, August 24, 2012 at 5:27 PM

Go to your course

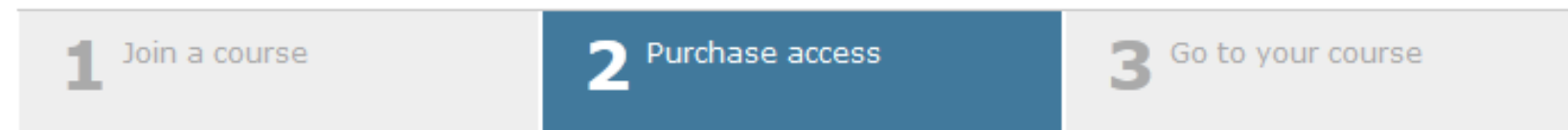


# Redeem Access (Activation Code)

Your activation code is located **inside the booklet**.

1. Scratch off your code (from your access card booklet) and enter it into the fields on the screen (Option 1 in image below)
2. Click “Submit Code” after you’ve entered the code. Once finished, you can return to your course.

## Purchase Access to Your Course



### Option 1: Enter your purchased access code

If you’ve already purchased a printed activation card, you can enter your access code below. (See sample booklet and code). If your instructor requires you to use smartPhysics for your course, you may have purchased the printed activation card with your smartPhysics textbook.

XXXX - XXXX - XXXX - XXXX

(Example: ABCD-EFGH-IJKL-MNOP)

Submit Code

OR

### Option 2: Purchase smartPhysics online

Buy Online

**\*\*Activation codes are valid for one use only and cannot be shared. They do allow you to switch courses or request a refund. Check the FAQs ([smartphysics.com](http://smartphysics.com) > Help > Student FAQs) for more information.**

# Need live help?

**The technical support team is ready and able to help you and  
is available 7 days a week by  
phone and email.**



Instant Technical Support  
1.800.936.6899

**<https://macmillan.force.com/macmillanlearning/s/contactsupport>**



Month View

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
28	29	30	May 1	2	3	4
5	6	7	8 8:00 AM Coulomb's Law 8:00 AM Coulomb's Law	9 11:59 AM Coulomb's Law	10 8:00 AM Electric Fields 8:00 AM Electric Fields	11
12 11:59 AM Electric Fields	13 8:00 AM Electric Flux and Field 8:00 AM Electric Flux and Field	14 11:59 AM Electric Flux and Field	15 8:00 AM Gauss' Law 8:00 AM Gauss' Law	16 11:59 AM Gauss' Law	17 	18
19	20  Victoria Day	21	22 8:00 AM Electric Potential Energy 8:00 AM Electric Potential Energy	23 11:59 AM Electric Potential Energy	24 8:00 AM Electric Potential 8:00 AM Electric Potential	25
26 11:59 AM Electric Potential	27 8:00 AM Conductors and	28 11:59 AM Conductors and	29 8:00 AM Capacitors 8:00 AM Capacitors	30 11:59 AM Capacitors	31 8:00 AM Electric Current	June 1

# advice

You are encouraged to do the homework **well before** the due date and time.

Emails received by the instructors or TAs received just before the deadline will be ignored.

Keep a **notebook** of your homework solutions for review.

# Gradebook of Jane Test

## Unit

☐ Score Bar ☒ Number ☐ Both

## PreLectures

## CheckPoints

## Homework

1) 1-D Kinematics	0%	0%	0%
2) Vectors and 2-D Kinematics	0%	0%	0%
3) Relative and Circular Motion	0%	0%	0%
4) Newton's Laws	0%	0%	0%
5) Forces and Free-Body Diagrams	0%	0%	0%
6) Friction	0%	0%	0%
7) Work and Energy	0%	0%	0%
8) Conservative Forces and Potential Energy	0%	0%	0%
9) Work and Potential Energy: Part II	0%	0%	0%
10) Center of Mass	0%	0%	0%
11) Conservation of Momentum	0%	0%	0%
12) Elastic Collisions	0%	0%	0%
13) Collisions, Impulse, & Reference Frames	0%	0%	0%
14) Rotational Kinematics & Moment of Inertia	0%	0%	0%
15) Parallel-Axis Theorem and Torque	0%	0%	0%
16) Rotational Dynamics	0%	0%	0%
17) Rotational Statics	0%	0%	0%
18) Rotational Statics: Part II	0%	0%	0%
19) Angular Momentum	0%	0%	0%
20) Angular Momentum Vector and Precession	0%	0%	0%

# Deadlines

## Prelectures

8 am day of lecture  
up to 7 days late: 80%

### Prelectures

Open each assignment:	14 days before deadline
Default due time:	8:00 AM
Make delayed feedback available:	On the day of the deadline at 10:00 AM
Additional deadlines:	Deadline #2: 7 days, 0 hours, and 0 minutes after the previous deadline worth 80% credit.

## Checkpoints

8 am day of lecture  
no late credit

### Checkpoints

Open each assignment:	14 days before deadline
Default due time:	8:00 AM
Make delayed feedback available:	On the day of the deadline at 10:00 AM
Additional deadlines:	None

## Homework

Midnight day after lecture  
up to 7 days late: 95%  
up to 14 days late: 80%

### Homework

Open each assignment:	14 days before deadline
Default due time:	11:59 PM
Make delayed feedback available:	On the day of the deadline at 1:59 PM
Additional deadlines:	Deadline #2: 7 days, 0 hours, and 0 minutes after the previous deadline worth 95% credit. Deadline #3: 14 days, 0 hours, and 0 minutes after the previous deadline worth 80% credit.

# Tutorials

Wednesday or Thursday

There are 6 sections: D101–D104, D105–D107

Start **this week**. (AQ 5037 or AQ 5008)

Tutorial Activities (problems etc.) count 8% of  
your mark.

TAs are Cristina Cordoba and Ali Nezhadasafavi.

Office hours in P9416, W 14:30 – 15:20, Th 16:30 – 17:20



# Lectures

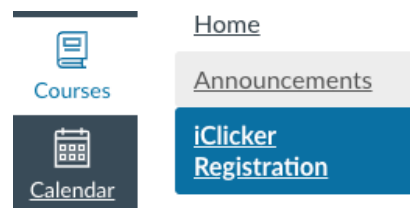
50 min of uninterrupted excitement

Mon, Wed, Fri.

Bring an iClicker: any model, a used one is ok

An extra set of batteries is a good idea.

Register yours in Canvas with its serial number.



registration is retroactive – you'll get the marks you earned from before you registered.

You can also use a smartphone app: iClicker REEF  
android, iOS





# Midterms

2 of them (June 7, July 5)

90 min long

combo of multiple choice (10) & problems (3)

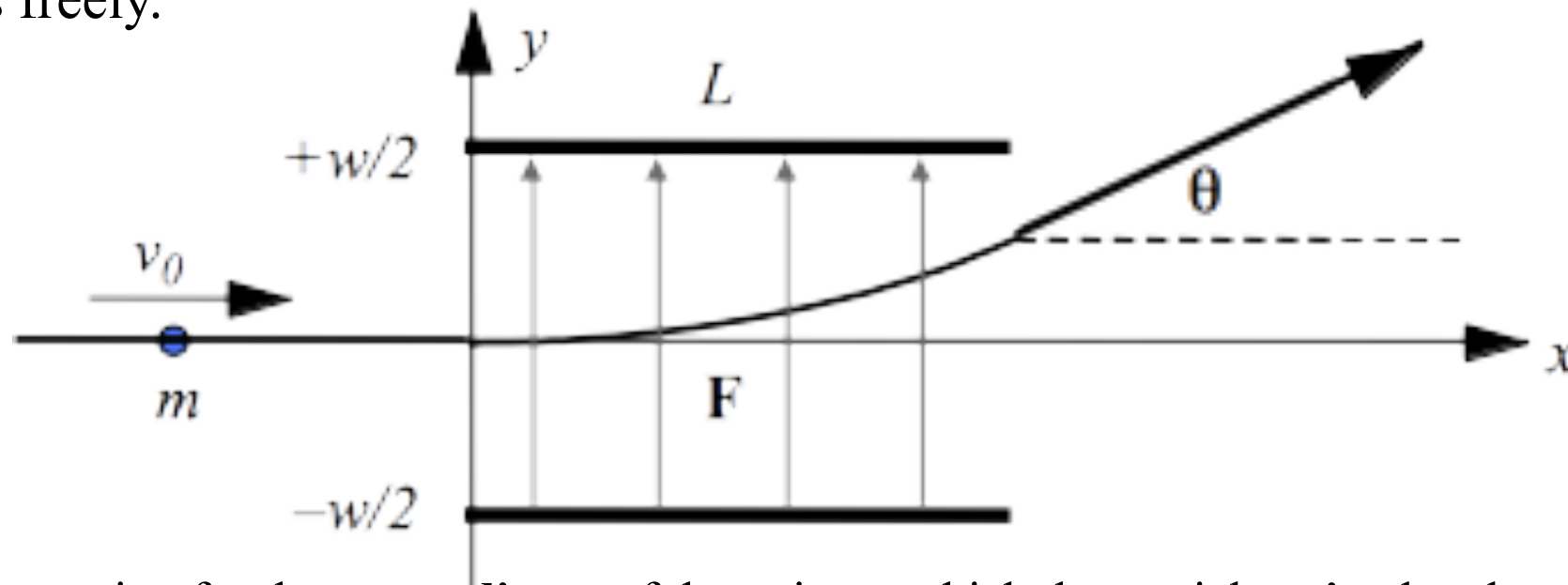
cumulative (ie, stuff we did before midterm 1

might be needed for midterm 2—don't wipe  
your brain after each midterm!)

# Grading Scheme

WHAT	HOW MUCH
Tutorials	8%
FlipIt (pre lectures/homework)	10%
inclass iClicker questions	2%
Midterm Exams (20% each)	40%
Final Exam	40%
TOTAL	100%

A point particle of mass  $m$  travels freely in the  $x$ -direction with uniform velocity  $v_0$ . At  $x = 0$ , it enters a region between two plates oriented perpendicular to the  $y$ -axis; the plate spacing is  $w$ , and then plate length in the  $x$ -direction is  $L$ . The particle enters on the mid-plane  $y = 0$ . While between the plates, it experiences a constant, spatially uniform force  $F$  in the  $+y$ -direction. After exiting the plates the particle again moves freely.



Obtain an expression for the  **$y$ -coordinate** of the point at which the particle **exits** the plates. We will assume that the plate spacing is wide enough that the particle never strikes either plate. But before we start, consider these possible solutions:

**A)**  $y = \frac{F}{m(v_0 + L)}$

**B)**  $y = \frac{FL}{mv_0}$

**C)**  $y = \frac{Fw^2}{mv_0^2}$

Could any of them be correct? Why or why not?  
Remember, **units** and **limiting behavior** !