Make It Real Physics

Introduction

For this assignment, we created the “Make it Real Physics” course by applying a more constructive and holistic approach. The course is conducted in a blended learning environment, which allows students an opportunity to collaborate with their peers online and face to face. For instance, the assignments are situated in each student’s environment and through peer consideration of each other’s videos, students are exposed to the interests of their peers and the environments in which their peers operate. To start off the course, we included an online icebreaker activity featuring students sharing things about themselves that are outside the normal sphere of topics covered in a typical physics courses. One of the main outcomes of this course, is for students to see the conceptual connections that everyone can share, even though the nature of motion can appear completely different in different environments and contexts. We hope that this course would allow students to explore motion concepts in a more comfortable and familiar space, since sometimes physics can be scary to students who have not felt successful in this discipline in the past.

COURSE OUTLINE

Background

This course is suitable for anyone who is interested in learning about some of the physics behind everyday occurrences. A basic understanding of algebra is suggested but not required. Collaboration with peers is a great way to learn and it will be encouraged throughout this course.

Purpose

This course is intended to consider the concepts associated with the motion of all things. It will review some of the historical ideas of motion, Newton's Laws of motion, and ask the questions, "How do things move?" and, "Why do things move?".

While this course is intended for people with only a passing familiarity with physics, it lays a foundation for students planning to continue their study in physics at the university level. It is intended to help develop a keen sense of appreciation for the beauty of physics which is all around us.

A balance between observational content and scientific process will be discussed. Through hands-on activities and discussion, students will come to understand how physics concepts are developed.

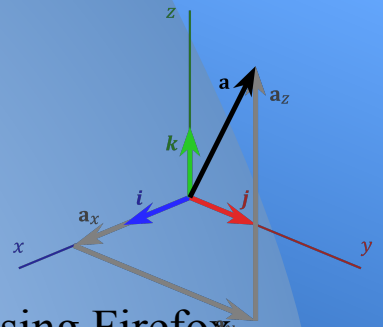
Learning Objectives

- Develop a keen sense of appreciation that the study of motion is a relevant human endeavour which can be directed towards useful and positive purposes.
- Many technologies that utilize the principles of kinematics and dynamics have societal and environmental implications.
- To develop the skills and strategies required for scientific inquiry and communication.
- Learning and applying Physics in a more collaborative and community based approach.
- The interactions of an object with other objects can be described by forces.
- The changes that result from force interactions are constrained by conservation laws.
- To reexpress key elements of natural phenomenon across multiple representations.
- To evaluate the evidence provided by video analysis in relation to particular scientific questions.
- To make and justify claims and predictions about natural phenomenon based on scientific models constructed by peers.

Course Design

This 6-week course will operate in a blended learning environment. We will have weekly assignments that will be completed in an online collaborative space. Also, there will be three face–to-face (F2F) classes where we will meet in person.

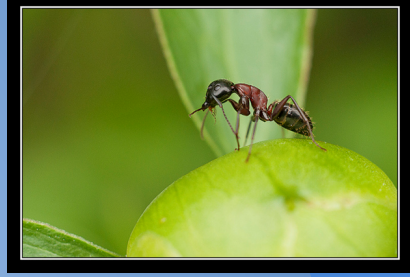
Required Materials



For this course you will need:

- To access the internet regularly through a PC or MAC computer. Our course learning ware works well with most browsers, however using Firefox or Chrome is recommended. (You may also wish to have regular access to the internet through a mobile device.)
- A mobile device capable of capturing images, and capturing videos. Throughout this course, you will be capturing pictures and short videos of things that you observe around you. (These observations are integral to our online and face-to-face discussions of every-day physics and concepts related to forces and motion.)
- Access to video editing software. If you do not have access to video editing software, we can recommend a few that are either i) free to download, or ii) free to use, online.

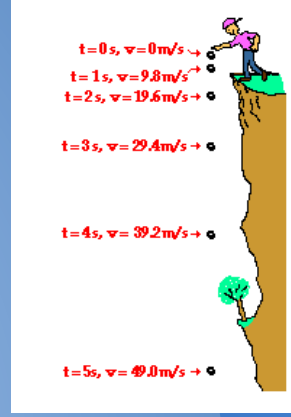
Week 1(Online + F2F)



Introduction - Natural motion

1. Upload an introductory video about yourself (do not include any details regarding your history or prior experiences with physics) –Prior to our first scheduled F2F class. (Online)
2. Ice-breaker activity and introduction to course-ware “PLACE” (Physics Learning Across Contexts & Environments) (F2F)
3. Read the Week #1 notes and answer questions. (Online)

Week 2 (Online)

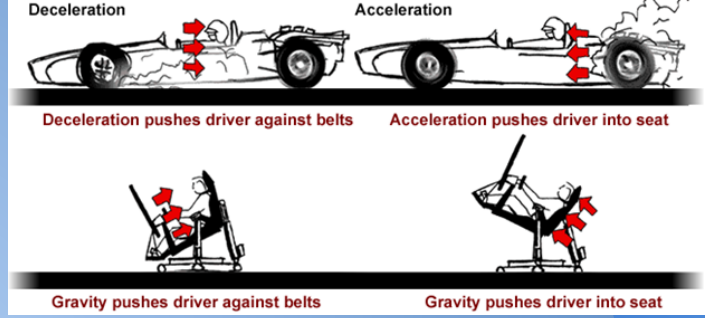


<u>What does motion *look* like?</u>

How do objects move?

1. Read the Week #2 notes and answer questions.
2. Upload video of an object exhibiting ‘natural motion’ as described by Aristotle.
3. Tag your video with key ideas and concepts that describe what appears in your uploaded video.
4. Comment on other’s videos (both their video and their ‘tag’ choices).
5. A short online tutorial on doing voice over for your final educational project.

Week 3 (Online)



<u>Are you Pushing me or Pulling me?</u>

What causes motion?

1. Read the Week #3 notes and answer questions.
2. Upload a video of an object exhibiting <to be announced> motion.
3. Tag your video with key ideas and concepts that describe what appears in your uploaded video.
4. Comment on other's videos (both their video and their 'tag' choices).
5. A short online tutorial on factors to consider when designing your educational video.

**Starting thinking about your final project and be ready to discuss your initial ideas with the class next week.*

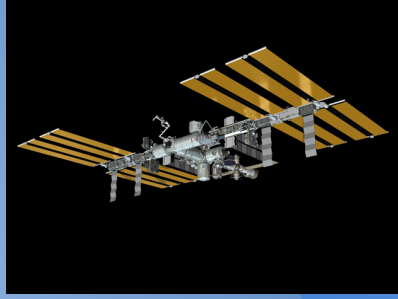
Week 4 (Online)

Who wins?

How can we use motion? How is it currently used?

1. Read the Week #3 notes and answer questions. (Online)
2. Second F2F class.
3. Discuss your initial ideas for final project with the class and receive feedback. (F2F)
4. Upload a video of an object exhibiting <to be announced> motion. (Online)
5. Tag your video with key ideas and concepts that describe what appears in your uploaded video. (Online)
6. Comment on other's videos (both their video and their 'tag' choices). (Online)

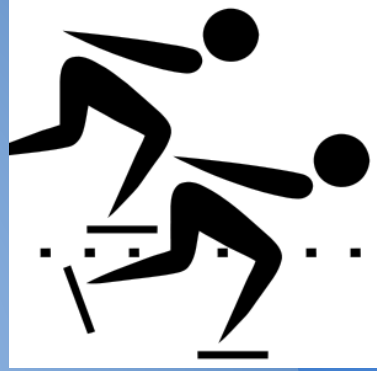
Week 5 (Online)



Video Creation

1. A final short online tutorial on creating, and editing and videos. Specifically touching on time management (How long you think it will take to edit video vs. how long it will actually take you).
2. Read the Week #5 notes and answer questions.
3. Completion of you filming and editing of educational video project.

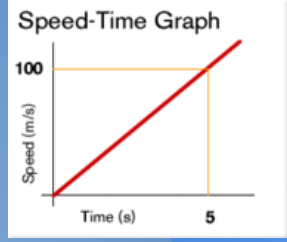
Week 6 (Online +F2F)



Showcase and Exam

1. Upload your final video project to the course website before the start of week 6's class. (Online)
2. Final Exam to be completed 'live' on classroom computers. (F2F)
3. Presentation of your final video projects in a film-festival atmosphere. (F2F)

Evaluation + Assessments



Assessment	Description	Due Date	Weight
Participation	Participation on the online forum (e.g. the posting of videos and comments). Participation will also be assess during the F2F classes	On-going	**20%**
End of the week questions	Weekly assigned questions	Submitted at end of each week (Sunday night by 5pm)	**20%**
Final Video Project (Educational Video)	Creation of a 8 to 10 minute educational video about a physics topic	Submitted before the last day of the course	**30%**
Final exam (1 hr)	Short answer based exam (concept-focused rather than equation-focused)	Completed on the last day of the course	**30%**

SUMMARY

Shawn

Putting this course together, I contributed little bits and pieces of what I have learned in OISE courses and at conferences that I have attended. The idea is to connect the course content to each student's natural environment as much as is possible. For the introductory topics covered, we have created many opportunities for the students to identify key concepts and key similarities between each of their examples of motion. The 'tagging' and commenting on each other's uploaded video samples is way to help the students think as experts do in terms of reducing the examples of captured motion to the key elements necessary to make predictions. The opportunity for students to create and use their own unique examples of motion is a way to give them flexibility in sharing their ideas with others that is situated and grounded in their own meaningful spaces. It should help to make the physics real to them. The face-to-face meetings between the students and instructor should assist in building a sense of community between all the people involved.

It is my expectation that the students will enjoy the process of collaboratively constructing their new understanding of forces and motion using their own video analyses.

Rabia

Before this activity, my knowledge on applying the constructivist approach in creating a course was quite limited. I was quite unaware of the potential benefits it reaps, especially in a higher education setting. From reading the chapter, it was obvious that the approach is even more enhanced by integrating technology. As a teacher assistant at a university, I don't particularly have control over the course outline but I do have control over the way I conduct my tutorials and labs. Initially, when I started as a TA, I would always include a technology aspect in my tutorials and labs, but at times thought that they were not making a difference.

Another important aspect that I took away from this activity is that when it comes to integrating technology, "simplicity" is key. For instance, in our course, students are to record a video of a physics concept (e.g. motion) every week, which can be done simplify by using a cell-phone. For technology to serve its purpose, it doesn't have to be "fancy". Something as simple as a starting an online discussion board can be very beneficial and can truly enhance the learning process.

QUESTIONS

Question #1

What are the advantages and the drawbacks of implementing constructivist principles in a course?

Advantages	Drawbacks
Student-centred approach Collaborative learning environment The teacher is more of a facilitator or mentor, but has to find ways to engage the students in constructing their own knowledge.	Not enough “hand-holding” that some students might crave Students might fall-behind, especially if they are more use to the traditional approach. This could lead to some frustration as well Intensive workload for the faculty member

Question #2

What are some foreseeable problems if you were to follow the same principles in your course?

One possible problem that could arise is keeping students motivated and focused on their objectives. Especially, since bulk of the work is completed online. In addition, mentoring and advice would need to be consistently provided throughout the course in both the online and face-to-face environments.

Question #3

What are the benefits and challenges in integrating technology into a conventional course in higher education?

Benefits	Challenges
Chance to learn something new for the student and the professor Fostering creative expression in the students Course content is enhanced by integrating technology, such as using virtual manipulatives Students might be more interested and engaged in the course material, since it deviates from the traditional method	Budget constraints-Institution and student's budget Class size- might be more difficult for large class sizes If it is an online course, some students might not have an "online" personality, and might not thrive in those conditions

Question #4

How can you ensure that students have a valuable learning experience?

One way a valuable learning experience can be achieved is by being mindful of what technology is being integrated into the course and whether it serve its purpose. For example, in our physics course, the technology integrated should facilitate student's construction of physical models of motion more accessible to them. Moreover, the technology integrated used should be user-friendly and have simple and clear tutorials to help students. Lastly, the students should be able to demonstrate what they have learned outside the classroom, and inside the classroom, and 'made it real' for themselves and for others.

References

Ontario Ministry of Education. (2008). *The Ontario Curriculum Grades 11 and 12 Sciences*. Toronto, ON: Queen's Printer for Ontario.