PHYSICS 2302.1
Mechanics I, Fall 2020

Instructor:	David Clarke	AT 311, 420-5830, dclarke@ap.smu.ca
Lectures:	on-line	T, Θ: 4:00–5:15 pm
Office Hours:	on-line	M, W: 2:30–5:30 pm
Required text:	Fowles & Cassiday's *Analytical Mechanics* (any edition)	
Course website:	www.ap.smu.ca/~dclarke/PHYS2302	
Curriculum:	www.ap.smu.ca/~dclarke/smuap_curriculum/documents/PHYS2302.pdf	
Hand-outs:	various PDF files made available from the website	
Assignments:	Assigned on Tuesdays, due one week later; no late assignments accepted once solutions are posted on-line.	
Assessment:	eight assignments	15%
	two midterms	20% each
	final exam	45%

Outline

Part I: Introduction and Review (Ch. 1 & 2; 6 classes)

- vectors, coordinates
- Newton's laws, free-body diagrams
- separable first order ODEs
- position- and velocity-dependent forces

Part II: Oscillators (Chapter 3; 7 classes)

- second order ODEs, inhomogeneous ODEs
- simple harmonic motion

Midterm I: Thursday, October 15

- damped harmonic motion
- forced harmonic motion, resonance

Part III: Motion of a particle in 3-D (Chapter 4; 5 classes)

- elements of vector calculus
- Work-Kinetic theorem, conservation of mechanical energy
- constrained motion,
- projectiles, multi-dimensional oscillators, electromagnetic forces

Midterm II: Thursday, November 19

Part IV: Accelerating reference frames (Chapter 5; 4 classes)

- translational and rotational acceleration
- dynamics in accelerating frames
- effects of Earth's rotation

Special considerations for on-line delivery

In response to the continuing pandemic, Saint Mary's University announced in June that all fall semester courses would be delivered on-line. For virtually all courses previously offered in-person, this has required a significant re-organisation, this course being no exception.

PHYS 2302 classes will meet in the regularly scheduled time slots over *Zoom*. I do not rely on Brightspace for anything, including course content which is all available on the course website listed on the first page of this syllabus.

I have organised my lecture notes into 22 *lessons*, all of which you'll find in the document `lessons.pdf` available here and in the handouts segment of the course webpage. Each lesson is introduced by a *Lesson synopsis* and ends with a short tutorial.

When I teach the course in-person, I deliver my lecture notes by writing them on the board, explaining them and expecting students to take notes as I do, going over example problems, and occasionally demonstrating the physics with a demonstration. In that model, I normally delivered about five pages of my lecture notes per 75-minute class.

In this on-line version, the classes are "flipped". All lecture notes for the entire semester are available to you now, and my expectation is that students will *read* the relevant lecture notes and accompanying sections in the textbook (both indicated in the `lesson schedule`) *before* coming to each class with questions on what they read. This is critical for this type of delivery to work. If all students have read and, I hope, at least partially understood the notes before coming to class, my job as instructor is to review the notes focussing on the critical parts with students asking their questions along the way.

Without having to write notes on the board and with you only jotting down explanatory notes in the margins of the lecture notes you may have printed off, I can go through the same five pages often in 50 minutes rather than 75. To fill out the time slot, each lesson ends with a "mini-tutorial" consisting of one or two problems we'll work out together in the last 20–30 minutes of each class. These problems are designed to help firm up your understanding of the new material discussed that day, and to prepare you for doing the assignments.

There are eight tutorials altogether each corresponding to an assignment (*e.g.*, Tutorial 4 are problems related to Assignment 4), and each tutorial is broken up into 2–4 parts (*e.g.*, Tutorials 4.1, 4.2, and 4.3). One part goes with each lesson and once all parts of a tutorial have been completed, I shall post their solutions on the course webpage which you can use to help you with the accompanying assignment, due typically the week after.

All assignments require worked out problems with mathematical symbols and diagrams, and cannot be handled by on-line assignment formats like "multiple choice" or "true and false". Thus, your assignment solutions will be written out in long-hand on paper and, once complete, you will scan and then e-mail your assignments to the grader. Careless scanning

and formatting can make life miserable for the grader, and thus assignments will be accepted only if they meet a minimum standard, including:

1. Scans must be easy to read, and thus have high contrast, be scanned flat with no portion of the page cut off, and have correct "up-down" orientation. We shall not accept dark scans where the writing is only a slightly darker shade of dark grey as the background page.

2. Assignments must be submitted as *one file*. If your assignment is six pages long, do not submit six separate files! There are downloadable apps you can use for both scanning and assembling the separate jpgs, or whatever the format, into a single PDF.

3. No matter how careful your scan, if your writing style is sloppy and unorganised, this will also make the assignment difficult to grade. I will give the grader permission to reject any inscrutible assignments.

On assignments, you may work by yourself, in pairs, or in groups, you may use on-line solutions if you really must, and you may consult whatever resource you like including me during office hours. If you do work in pairs or groups, I ask that each person submit their own set of hand-written solutions, even if copied from a common solution set. No submitting a "group assignment" for more than one person please!

Word of caution: *You will not have access to each other or on-line resources for your exams, and so it is in your best interest to try your best to do the problems first before resorting to on-line hints or solutions.*

As for exams, these too shall be hand-written solutions requiring formulae and diagrams. However, these you will be required to do on your own and without on-line help. I shall be sending out an "honour code" for you all to agree to and thus promise to abide by. *Violation of the code will be tantamount to academic dishonesty, and shall be treated accordingly.*

Final point: while this class is listed as *synchronous* (with the expectation that all students gather at the same time for each class), students who cannot make some or even all of the classes may still get all the material since all lectures and tutorials are on-line. I would certainly recommend you make every effort to join the classes while they are in session; so often other students will ask questions you may not have thought of, or discussion may reveal to you that you did not understand what you thought you did. However, just know that if you do have to miss a class or two, "getting the notes" is pretty darn easy!

D. Clarke, Aug. 2020