UNIVERSITY OF CALGARY
FACULTY OF SCIENCE
DEPARTMENT OF PHYSICS AND ASTRONOMY
COURSE OUTLINE

1. **Course:** PHYS 227 Classical Physics FALL 2017

   Instructor: Dr. David Feder | SA 101A | (403) 220-3638 | dfeder@ucalgary.ca | Office Hours: M 10:00-12:00

   Lecture Sections: LEC 1 | Lectures MWF 09:00-09:50 | Tutorials W 14:00-15:50 | ST 139

   Course Website: d2l.ucalgary.ca

   Departmental Office: SB 605, 403-220-5385, phasugrd@ucalgary.ca

2. **Prerequisites:** A grade of 75 per cent or higher in PHYS 30; 60 per cent or higher in MATH 31; and 75 per cent or higher in MATH 30-1 or PMAT 30 or a grade of "B" or 70 per cent or higher in MATH II (offered by Cont Ed) and admission to PHYS, ASPH, CHPH, CHEM, or NTSC.
   Note: The Faculty of Science policy on pre- and co-requisite checking is outlined in the 2016-2017 Calendar. A student may not register in a course unless a grade at least "C-" has been obtained in each pre-requisite course; it is the responsibility of students to ensure that their registrations are in order.
   See http://www.ucalgary.ca/pubs/calendar/current/sc-3-5.html for details.

3. **Grading:** The University policy on grading and related matters is described sections F.1 and F.2 of the online University Calendar. In determining the overall grade in the course the following weights will be used:

   Online Assignments: 10%
   Labs: 18%
   Top Hat quizzes: 10%
   Previews: 12%
   In-class midterm tests (2): 20% (10% each: October 13th and November 17th)
   Final examination: 30% (To be scheduled by the Registrar)

   Percentage grades will be given for all elements of term work and examinations. A weighted course percentage will be calculated to the nearest whole number for each student after the final exam is written.

   Percentage to letter grade conversion scale:

> = 94 %	A +	> = 82 %	B +	> = 70 %	C +	> = 58 %	D +
> = 90%	A	> = 78 %	B	> = 66 %	C	> = 54 %	D
> = 86 %	A -	> = 74 %	B -	> = 62 %	C -	< 54 %	F

4. **Missed Components of Term Work:** The regulations of the Faculty of Science pertaining to this matter are found in the Faculty of Science area of the Calendar in Section 3.6. It is the student's responsibility to familiarize himself/herself with these regulations. See also Section E.6 of the University Calendar.

5. **Scheduled out-of-class activities:** There are no approved class activities held outside of class hours.

REGULARLY SCHEDULED CLASSES HAVE PRECEDENCE OVER ANY OUT-OF-CLASS-TIME-ACTIVITY. If you have a clash with this out-of-class-time-activity, please inform your instructor as soon as possible so that alternative arrangements may be made for you.

6. Course Materials: *Matter and Interactions,* 4th edition, Chabay & Sherwood (Wiley)

   Online Course Components: WileyPLUS will be used for homework for this class. A free version is provided to students for on-campus use.

7. Examination Policy: Calculators are allowed, but no networked devices. Students should also read the Calendar, Section G, on Examinations.

8. Approved Mandatory and Optional Course Supplemental Fees: None

9. Writing across the curriculum statement: In this course, the quality of the student's writing in laboratory reports will be a factor in the evaluation of those reports. See also Section E.2 of the University Calendar.

10. Human studies statement: Students in this course are not expected to participate as subjects or researchers. See also Section E.5 of the University Calendar.

11. OTHER IMPORTANT INFORMATION FOR STUDENTS:

   (a) Misconduct: Academic misconduct (cheating, plagiarism, or any other form) is a very serious offence that will be dealt with rigorously in all cases. A single offence may lead to disciplinary probation or suspension or expulsion. The Faculty of Science follows a zero tolerance policy regarding dishonesty. Please read the sections of the University Calendar under Section K. Student Misconduct to inform yourself of definitions, processes and penalties.

   (b) Assembly Points: In case of emergency during class time, be sure to FAMILIARIZE YOURSELF with the information on assembly points.

   (c) Academic Accommodation Policy: Students needing an Accommodation because of a Disability or medical condition should contact Student Accessibility Services in accordance with the Procedure for Accommodations for Students with Disabilities available at http://www.ucalgary.ca/policies/files/policies/procedure-for-accommodations-for-students-with-disabilities_0.pdf. Students needing an Accommodation in relation to their coursework or to fulfill requirements for a graduate degree, based on a Protected Ground other than Disability, should communicate this need, preferably in writing, to the Associate Head of the Department of Physics and Astronomy, Dr. David Feder, by email (dfeder@ucalgary.ca) or by phone (403.220.3638).

   (d) Safewalk: Campus Security will escort individuals day or night (http://www.ucalgary.ca/security/safewalk/). Call 220-5333 for assistance. Use any campus phone, emergency phone or the yellow phones located at most parking lot pay booths.

   (e) Freedom of Information and Privacy: This course is conducted in accordance with the Freedom of Information and Protection of Privacy Act (FOIPP). As one consequence, students should identify themselves on all written work by placing their name on the front page and their ID number on each subsequent page. For more information see also http://www.ucalgary.ca/secretariat/privacy.

   (f) Student Union Information: VP Academic Phone: 220-3911 Email: suvpaca@ucagary.ca.
   SU Faculty Rep: Phone: 220-3913
   Email: science1@su.ucalgary.ca, science2@su.ucalgary.ca and science3@su.ucalgary.ca

Student Ombuds Office: 403 220-6420
Email: ombuds@ucalgary.ca; http://ucalgary.ca/provost/students/ombuds

(g) **Internet and Electronic Device Information:** You can assume that in all classes that you attend, your cell phone should be turned off unless instructed otherwise. Also, communication with other individuals, via laptop computers, Blackberries or other devices connectable to the Internet is not allowed in class time unless specifically permitted by the instructor. If you violate this policy you may be asked to leave the classroom. Repeated abuse may result in a charge of misconduct.

(h) **U.S.R.I.:** At the University of Calgary, feedback provided by students through the Universal Student Ratings of Instruction (USRI) survey provides valuable information to help with evaluating instruction, enhancing learning and teaching, and selecting courses (www.ucalgary.ca/usri). Your responses make a difference - please participate in USRI Surveys.

12. OTHER COURSE RELATED INFORMATION:

(a) Course Description

- This is the first course in classical physics for astrophysics and physics majors. We will have lively discussions about all aspects of mechanics. We will explore fundamental physical models that govern how we mathematically interpret motion. These models will be explored mathematically, experimentally and with computer simulations. Students will work closely with other students, solving problems that build the fundamental understanding of motion in the physical universe.

(b) Course Learning Incomes

Coming into this course, students should be familiar with:

- Trigonometry, algebra, and basic calculus, and high-school-level physics
- Basic laboratory methods and protocols, including significant digits and error analysis
- Basic data plotting tools
- Basic understanding of a computer / smart device and the ability to negotiate its operating system

(c) Course Learning Outcomes

Mechanics is the study of motion. By the end of the course, students should be able to:

- Explain how interactions between particles and systems affect motion
- Catalog and discuss fundamental and emergent interactions
- Make mathematical predictions about collisions using the principle of momentum conservation
- Calculate the behaviour of systems using the principle of energy conservation
- Derive mathematical equations based on simple physical principles
- Predict the behaviour of rotating systems using angular momentum, torque and rotational kinetic energy
- Perform simple laboratory experiments and interpret their results
- Express fundamental concepts in written form using LaTeX
- Conceive, develop, and execute simple computer simulations based on VPython

(d) Syllabus

Interactions. Newton's 1st law of motion. Vectors. Velocity and momentum. Systems and surroundings. The momentum principle. Iterative prediction of motion. Fundamental interactions: Gravitation, electric force, strong interaction. Conservation of momentum. Collisions. Contact interactions: Tension forces, and compression normal forces. The role of interatomic bonds. Friction. Rate of change of momentum, in magnitude and in direction. The energy principle. Potential energy, gravitational and electric. Internal energy and thermal energy. Multiparticle systems: Centre of mass, rotational kinetic energy. Elastic and inelastic collisions. Angular momentum: Translational and rotational. The angular momentum principle. Torque.

(e) Detailed information:

On-Line Assignments:

There will be ten assignments over the course of the term, approximately one per week (except for weeks with a midterm exam), together constituting 10% of the final grade. Each assignment covers one chapter of the textbook (so you can infer that we will be moving through the material very quickly). Assignments are completed using WileyPLUS. The WileyPLUS system is free to access if you are using a campus computer (for example at the Taylor Digital Library). This will give you no access to the on-line textbook, however. If you wish to also have access to an e-text, then you can purchase WileyPLUS + textbook as a bundle. Instructions for accessing WileyPLUS can be found on the course D2L page. The assignments are all multiple choice. You are expected to work on assignments on your own. You can keep returning to the assignment as long as it is posted, and it will remember your previous responses, which can be changed up until the due date. Assignments will not be accessible after the due date.

Labs:

Most weeks (not including the first and last weeks, or weeks with a midterm exam), you will perform a labatorial on the Tuesday, in Science Theatres (ST) 037. You will have registered in one of the four lab sections, each 110 minutes. A labatorial is a cross between a laboratory (like you might be familiar with from high school) and a tutorial. This lab period will give you an opportunity to work in small groups to practice what you are learning during the lectures; there are no lab write-ups; you should be completely finished within the allotted time. When your group is finished, you're welcome to work on your WileyPLUS homework, a preview (see below), or to leave. Note that these labs will be a combination of experiments and computer simulations.

If you miss a lab for some reason, please contact Peter Gimby at 220-5403 or Wesley Ernst at 220-7401 to schedule a makeup lab. There are no labs on October 10 or November 14 (midterm weeks), and these dates can be used for makeup labs. Likewise there are no labs during the final week of classes, so makeup labs can be performed on December 5.

Top Hat quizzes:

At the beginning and end of almost every class (and sometimes during!), you will answer questions that explore your understanding of one or more concepts explored in that class. The mark breakdown for this 10% component is as follows. Pre-quizzes will add to 3% (2% participation and 1% response accuracy), post- and mid-quizzes will add to 7% (2% participation and 5% accuracy). The quizzes are all performed using the TopHat classroom response system. You must bring an electronic device (cell phone, smart phone, tablet, laptop computer, etc.) to class in order to take the quizzes.

Previews:

Approximately every two weeks (six total), you will be asked to write a preview of at most one page each, using the LaTeX typesetting software. This software can be installed on computers running linux, Mac, or Windows. Previews will summarize one or two important conceptual points to be covered in the following weeks. These don't have to be long, often a paragraph or two is sufficient. In fact, I won't read beyond a single double-spaced page, and I will deduct marks for unnecessarily long previews. The previews are to be submitted at the beginning of the first lecture of the week they are due (i.e. at 09:00 on Monday mornings), and no late previews will be accepted. The emphasis is on understanding rather than on the formalism. Part of the motivation for these previews is to give you practice expressing yourself clearly in writing, and I will mark for clarity as well as grammar. Bonus marks for humour! Traditionally, I would deduct marks for the use of mathematics so that you can focus on the concepts. That said, part of the motivation for these previews is so that you can learn LaTeX, which is a powerful package for writing mathematics. So I encourage the limited use of mathematics as a way to complement the writing, but please remember that the written expression of your understanding is key.

Original artistic contributions are also encouraged, including but not limited to poetry, lyrics, song recordings, raps, movies, interpretive dance, comics, paintings, weavings, etc. If you decide to submit a preview in one of these ways, then I will be grading you on your ability to convey the central concepts in an artistic way. You can be oblique, but if I

don't understand it at all then your grade will suffer. You can submit all of your previews in these alternative ways, but you won't learn LaTeX this way.

Midterm exams:

There will be two midterm exams during class time. The first is on Friday the 13th of October and the other is on Friday the 17th of November. The second might not have as scary-sounding a date but actually in Italian culture the 17th is a much worse number than the 13th. So these dates are nicely balanced for maximum scariness. Each midterm is worth 10% of the total grade. The first covers Chapters 1-4, while the second covers Chapters 5-9 (we're skipping Chapter 8 of the textbook).

Final exam:

The final exam is worth 30% of the total grade, and will cover all of the course content (Chapters 1-11 excluding Chapter 8). This will be a three-hour registrar-scheduled exam. Do not book any travel until you know the date and time: please note that non-essential travel is not a valid excuse for missing the final exam. Usually the exam date gets posted sometime in mid to late November.

Schedule for 227:

The following is the schedule of topics we'll be covering. Dates given are the Mondays of the week.

11/9	Chapter 1: Interactions and Motion No labs: lab time for downloading / validating WileyPLUS, TopHat, VPython, LaTeX, etc.
18/9	Chapter 2: The Momentum Principle Lab 1: Introduction to Computation using VPython
25/9	Chapter 3: The Fundamental interactions Lab 2: Computing Motion
2/10	Chapter 4: Contact Interactions Lab 3: Modeling Motion
9/10	Thanksgiving Monday, Midterm 1 on Friday the 13th No labs. Makeups for Labs 1-3
16/10	Chapter 5: Determining Forces from Motion Lab 4: Macroscopic Springs
23/10	Chapter 6: The Energy Principle Lab 5: Gravitational Force, Part 1
30/10	Chapter 7: Internal Energy Lab 6: Gravitational Force, Part 2
6/11	Chapter 9: Translational, Rotational, and Vibrational Energy Lab 7: Energy and Momentum
13/11	Remembrance Day (observed) on Monday, Midterm 2 on Friday the 17th no labs. Makeups for Labs 4-7
20/11	Chapter 10: Collisions Lab 8: Drag and Stairs
27/11	Chapter 11: Angular momentum

Lab 9: Jumping Up

4/12 Finish Chapter 11, Review for final exam, last day of classes on Friday the 8th
no labs. Makeups for Labs 8,9

Department Approval_____Date_____