



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

1. **Course:** PHYS 609 Advanced Classical Mechanics

Instructor: Dr. Sean Stotyn | SA 101C | (403) 210-7594 | sean.stotyn@ucalgary.ca
Lecture Section: LEC 01 | TR 9:30-10:45 | SS 117 | Office Hours: Tuesdays 11:00-12:00

Course Website: d2l.ucalgary.ca
Departmental Office: SB 605, 403-220-5385, phasugrd@ucalgary.ca

2. **Prerequisites:** Background should include Physics 343 or equivalent.
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 in sections [F.1](#) and [F.2](#) of the online University Calendar. In determining an overall percentage grade in the course, the following weights will be used;

Worksheets:	6%
Assignments (6):	24%
Term Project:	25%
Midterm Exams (2):	20% (Take-home)
Final Exam:	25% (Take-home)

The conversion from overall course percentage grade to course letter grade follows this mapping:

95% – 100%	A+	80% – 84%	B+	66% – 69%	C+	50% – 59%	D
90% – 94%	A	75% – 79%	B	63% – 65%	C	< 50%	F
85% – 89%	A-	70% – 74%	B-	60% – 62%	C-		

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:** none

6. **Course Materials:** "Classical Mechanics" (3rd Edition), Goldstein, Poole, and Safko, Addison Wesley.

7. **Examination Policy:** All exams in the course will be open book, open resource, take-home examinations. Students should also read the Calendar, [Section G](#), on Examinations.

8. Course fees: none

9. Writing across the curriculum: In this course, the quality of the student's writing will be a factor in the evaluation. 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 (FOIPPA). 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@ucalgary.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

An advanced treatment of classical mechanics, which includes the variational principle, Lagrangian and Hamiltonian formalisms, Noether's theorem, and rigid body motion.

(b) Course Learning Incomes

Students taking PHYS 609 are expected to have Phys 343 or an equivalent course in classical mechanics where Lagrangians are discussed.

(c) Course Learning Outcomes

1. Construct Lagrangians for both time-independent (no dissipation) and time-dependent (driven and/or dissipative) systems.
2. Identify symmetries and use Noether's theorem to find the corresponding conserved currents.
3. Use Legendre transformations to construct a system's Hamiltonian from its Lagrangian, and vice versa.
4. Apply canonical transformations and Hamilton-Jacobi theory to solve a variety of mechanical systems.
5. Employ the Lagrangian and Hamiltonian formalisms for continuous systems and fields.

(d) Topics Covered

1. Review of Newtonian mechanics
2. Lagrangian formalism
3. Action principle and Lagrange's equations
4. Noether's theorem
5. Rigid body motion
6. Hamiltonian formalism
7. Hamilton-Jacobi theory
8. Classical field theory

(e) Term Project

Students will team up in groups of 3 or 4 (at the discretion of the instructor, depending on course registration numbers) to prepare and deliver one interactive lecture on a topic chosen from a list of pre-set topics. Each group will be responsible for and evaluated on:

- Preparing a lesson plan for their lecture
- Providing lecture notes and/or PowerPoint slides to post to D2L
- Producing one homework/exam style problem with a full solution on the lecture topic
- Delivering a lecture with some interactive element incorporated in it

In addition to the above, each student will be responsible for providing feedback on the lectures of other groups, as well as providing self-feedback on their own lecture after having watched a video recording of it.

Department Approval _____ Date _____