

PHYS 5306-001, CLASSICAL MECHANICS Fall 2013
Monday/Wednesday 4:00 PM - 5:20PM, SH 315

Dr. Ramon Lopez

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<https://www.uta.edu/mentis/public/#profile/profile/view/id/1926/>

Office Hours: 2-4, Monday or by appointment Email is the best way to communicate with me.

Content - We will cover a variety of topics in classical mechanics: Lagrangian and Hamiltonian dynamics, central forces (particularly gravity) and orbits, canonical transformations, Hamilton-Jacobi integrals, and special relativity.

Student Learning Outcomes - Your learning outcomes include an understanding of the theoretical basis of classical mechanics as evidenced by the ability to solve a variety of problems in the area listed above, the ability to describe what fundamental principles are involved in solving these problems, and the ability to describe in simple physical terms the basic features of a system that evolves according to an arbitrary, specified Lagrangian. In addition, your studies of canonical transformations and Poisson brackets will allow you to describe in your own words the role of symmetry and conservation laws in classical dynamics, including the relationship between time and energy.

Textbook- Goldstein, Poole and Safko, Classical Mechanics, 3rd Ed.

Grading - Homework will be assigned each class from the book. It will not be graded. Instead you will present it in class, discussing problems at the board. You will do better if you work in study groups. At the end of each class you will be required to submit an index card with a question based on class that day. Exams are 80% of the grade (2 total, lowest exam grade dropped, F on any exam gives a C (max) in the course). Class participation (homework discussion in class and index cards) is 20% of the grade.

Attendance is expected. If you will miss class, let me know ahead of time.

Schedule: As the instructor for this course, I reserve the right to adjust this schedule in any way that serves the educational needs of the students enrolled in this course. -Ramon E Lopez

Ch1 - 8/26 and 8/27 - Reviews of Newton's Laws, review Lagrangians, sample Qual Exam problems

Ch2 - 9/2 Labor Day, 9/4 Hamilton's principle, 9/9 Conservation

Ch3 - 9/11 reduction to 1-D problem, Virial theorem, 9/16 Orbits, 9/18 Kepler problem, 9/23 scattering

Ch8 - 9/25 and 9/30 Hamiltonian as a Legendre transformation, 10/2 Cyclic coordinates and conservation,

Ch7 - 10/7 Basic Special Relativity, 10/9 Tensor notation, metric, forces, 10/14 relativistic Lagrangian, 10/16 Relativistic Hamiltonian (Ch8.4)

10/21 - REVIEW for MIDTERM,

10/23 - MIDTERM EXAM (Drop Date is 10/30)

Ch9 - 10/28 Canonical transformations and generating functions, 10/30 Symplectic approach, 11/4 Problem solving, 11/6 Poisson brackets, 11/11 Infinitesimal canonical transformations, Liouville's Theorem

Ch10 - 11/13 Hamilton-Jacobi Eq., 11/18 SHO, 11/20 Characteristic function, Kepler problem, 11/25 Action-angle variables

Ch12 - 11/27 Time-independent perturbation theory, Adiabatic invariants

Ch11 - 12/2 Chaos overview

12/4 - REVIEW for FINAL EXAM, LAST DAY OF CLASSES

FINAL EXAM 12/11 from 2-4:30 (It will be a take home exam, delivered by email at 2:00 on 12/11)

Drop Policy: Students may drop or swap (adding and dropping a class concurrently) classes through self-service in MyMav from the beginning of the registration period through the late registration period. After the late registration period, students must see their academic advisor to drop a class or withdraw. Undeclared students must see an advisor in the University Advising Center. Drops can continue through a point two-thirds of the way through the term or session. It is the student's responsibility to officially withdraw if they do not plan to attend after registering. **Students will not be automatically dropped for non-attendance.** Repayment of certain types of financial aid administered through the University may be required as the result of dropping classes or withdrawing. For more information, contact the Office of Financial Aid and Scholarships (<http://www.uta.edu/aao/fao/>).

Americans with Disabilities Act: The University of Texas at Arlington is on record as being committed to both the spirit and letter of all federal equal opportunity legislation, including the *Americans with Disabilities Act (ADA)*. All instructors at UT Arlington are required by law to provide "reasonable accommodations" to students with disabilities, so as not to discriminate on the basis of that disability. Any student requiring an accommodation for this course must provide the instructor with official documentation in the form of a letter certified by the staff in the Office for Students with Disabilities, University Hall 102. Only those students who have officially documented a need for an accommodation will have their request honored. Information regarding diagnostic criteria and policies for obtaining disability-based academic accommodations can be found at www.uta.edu/disability or by calling the Office for Students with Disabilities at (817) 272-3364.

Academic Integrity: Students enrolled in this course are expected to adhere to the UT Arlington Honor Code:

I pledge, on my honor, to uphold UT Arlington's tradition of academic integrity, a tradition that values hard work and honest effort in the pursuit of academic excellence.

I promise that I will submit only work that I personally create or contribute to group collaborations, and I will appropriately reference any work from other sources. I will follow the highest standards of integrity and uphold the spirit of the Honor Code.

UT Arlington faculty members may employ the Honor Code as they see fit in their courses, including (but not limited to) having students acknowledge the honor code as part of an examination or requiring students to incorporate the honor code into any work submitted. Per UT System *Regents' Rule* 50101, §2.2, suspected violations of university's standards for academic integrity (including the Honor Code) will be referred to the Office of Student Conduct. Violators will be disciplined in accordance with University policy, which may result in the student's suspension or expulsion from the University.

Student Support Services: UT Arlington provides a variety of resources and programs designed to help students develop academic skills, deal with personal situations, and better understand concepts and information related to their courses. Resources include tutoring, major-based learning centers, developmental education, advising and mentoring, personal counseling, and federally funded programs. For individualized referrals, students may visit the reception desk at University College (Ransom Hall), call the Maverick Resource Hotline at 817-272-6107, send a message to resources@uta.edu, or view the information at www.uta.edu/resources.

Electronic Communication: UT Arlington has adopted MavMail as its official means to communicate with students about important deadlines and events, as well as to transact university-related business regarding financial aid, tuition, grades, graduation, etc. All students are assigned a MavMail account and are responsible for checking the inbox regularly. There is no additional charge to students for using this account, which remains active even after graduation. Information about activating and using MavMail is available at <http://www.uta.edu/oit/cs/email/mavmail.php>.

Student Feedback Survey: At the end of each term, students enrolled in classes categorized as "lecture," "seminar," or "laboratory" shall be directed to complete an online Student Feedback Survey (SFS). Instructions on how to access the SFS for this course will be sent directly to each student through MavMail approximately 10 days before the end of the term. Each student's feedback enters the SFS

database anonymously and is aggregated with that of other students enrolled in the course. UT Arlington's effort to solicit, gather, tabulate, and publish student feedback is required by state law; students are strongly urged to participate. For more information, visit <http://www.uta.edu/sfs>.

Final Review Week: A period of five class days prior to the first day of final examinations in the long sessions shall be designated as Final Review Week. The purpose of this week is to allow students sufficient time to prepare for final examinations. During this week, there shall be no scheduled activities such as required field trips or performances; and no instructor shall assign any themes, research problems or exercises of similar scope that have a completion date during or following this week *unless specified in the class syllabus*. During Final Review Week, an instructor shall not give any examinations constituting 10% or more of the final grade, except makeup tests and laboratory examinations. In addition, no instructor shall give any portion of the final examination during Final Review Week. During this week, classes are held as scheduled. In addition, instructors are not required to limit content to topics that have been previously covered; they may introduce new concepts as appropriate.

Emergency Exit Procedures: Should we experience an emergency event that requires us to vacate the building, students should exit the room, turn left, walk to the stairwell, and exit the building on the first floor next to the Physics Department Office. In case of tornados, continue to the basement and enter room 010, which is my lab. When exiting the building during an emergency, one should never take an elevator but should use the stairwells. Faculty members and instructional staff will assist students in selecting the safest route for evacuation and will make arrangements to assist handicapped individuals.