

PHYS 5306-001, CLASSICAL MECHANICS Fall 2015  
Monday/Wednesday 1:00 PM - 2:20 PM, SH 129

**Instructor(s):** Dr. Ramon Lopez

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

**Office Hours:** 10-12, Monday or by appointment. Email is the best way to communicate with me.

**Section Information:** PHYS 5306-001

**Time and Place of Class Meetings:** Science Hall 105, Mon/Wed 1:00-2:20

**Description of Course 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. Success in the course will also prepare you to pass the Graduate Qualifying Exam in Classical Mechanics. In the past 4 years, every student who passed this class also passed the Classical Mechanics qualifying exam.

**Required Textbook:** Goldstein, Poole and Safko, Classical Mechanics, 3rd Ed.

**Descriptions of major assignments and examinations:** There will be three exams (you must pass them all). Homework will be assigned and presented in class as described in the grading.

**Attendance:** Attendance is not required, but if you are going to miss class, you should let me know since a part of your grade is based in class participation.

**Grading:** There will be two mid terms and a final exam. The top two exams will count for 80% of your grade. Classroom participation in homework presentation will count for the other 20%.

**Expectations for Out-of-Class Study:** Beyond the time required to attend each class meeting, students enrolled in this course should expect to spend at least an additional 8 hours per week of their own time in course-related activities, including reading required materials, completing assignments, preparing for exams, etc. This class will be taught as a partially "flipped" class. You are expected to go through the chapters on your own time before class, using the short lectures that are available online. You have to first register for the course. **DO THIS NOW.**

**Go to the following link and sign up:**

<https://www.educrations.com/sr/XCVCHMY>

**Grade Grievances:** Any appeal of a grade in this course must follow the procedures and deadlines for grade-related grievances as published in the current University Catalog.

<http://catalog.uta.edu/academicregulations/grades/#graduatetext>.

**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://web.uta.edu/aao/fao/>).

**Disability Accommodations:** UT 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)*, *The Americans with Disabilities Amendments Act (ADAAA)*, and *Section 504 of the Rehabilitation Act*. 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 disability. Students are responsible for providing the instructor with official notification in the form of a letter certified by the **Office for Students with Disabilities (OSD)**. Students experiencing a range of conditions (Physical, Learning, Chronic Health, Mental Health, and Sensory) that may cause diminished academic performance or other barriers to learning may seek services and/or accommodations by contacting: **The Office for Students with Disabilities, (OSD)** [www.uta.edu/disability](http://www.uta.edu/disability) or calling 817-272-3364.

**Counseling and Psychological Services, (CAPS)** [www.uta.edu/caps/](http://www.uta.edu/caps/) or calling 817-272-3671.

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](http://www.uta.edu/disability) or by calling the Office for Students with Disabilities at (817) 272-3364.

**Title IX Policy:** The University of Texas at Arlington ("University") is committed to maintaining a learning and working environment that is free from discrimination based on sex in accordance with Title IX of the Higher Education Amendments of 1972 (Title IX), which prohibits discrimination on the basis of sex in educational programs or activities; Title VII of the Civil Rights Act of 1964 (Title VII), which prohibits sex discrimination in employment; and the Campus Sexual Violence Elimination Act (SaVE Act). Sexual misconduct is a form of sex discrimination and will not be tolerated. For information regarding Title IX, visit [www.uta.edu/titleIX](http://www.uta.edu/titleIX) or contact Ms. Jean Hood, Vice President and Title IX Coordinator at (817) 272-7091 or [jmhood@uta.edu](mailto:jmhood@uta.edu).

**Academic Integrity:** Students enrolled all UT Arlington courses 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. Violation of this policy will result in a failing grade in the course.

**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>.

**Campus Carry:** Effective August 1, 2016, the Campus Carry law (Senate Bill 11) allows those licensed individuals to carry a concealed handgun in buildings on public university campuses, except in locations the University establishes as prohibited. Under the new law, openly carrying handguns is not allowed on college campuses. For more information, visit <http://www.uta.edu/news/info/campus-carry/>

**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 and move toward the nearest exit located next to the Physics department office. 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 individuals with disabilities.

(<http://www.uta.edu/police/EvacuationProcedures.pdf>)

## Course Schedule

Ch1 - 8/28, 8/30 - Reviews of Newton's Laws, review Lagrangians,

Ch2 - 9/6, 9/11 sample Qual Exam problems, Hamilton's principle, Conservation

Ch3 - 9/13 reduction to 1-D problem, Virial theorem, Orbits, 9/18 Kepler problem, scattering

**9/20 - REVIEW for MIDTERM, Take home exam**

Ch8 - 9/25, 9/27, 10/2 Hamiltonian as a Legendre transformation, Cyclic coordinates and conservation

Ch7 - 10/4 10/9 Basic Special Relativity, Tensor notation, metric, forces, 10/11, 10/16 relativistic Lagrangian, Relativistic Hamiltonian (Ch8.4)

**10/18 - REVIEW for MIDTERM, Take home exam**

Ch9 - 10/23, 10/25 Canonical transformations and generating functions, Symplectic approach, 10/30, 11/1 Poisson brackets, Infinitesimal canonical transformations, Liouville's Theorem

Ch10 - 11/6, 11/8 Hamilton-Jacobi Eq., SHO, Characteristic function, Kepler problem, 11/13, 11/15 Action-angle variables

Ch12 - 11/20, 11/22, 11/27 Time-independent perturbation theory, Adiabatic invariants

Ch11 - 11/30 Chaos overview, 11/29 Topic TBD

**12/4, 12/6 - REVIEW for FINAL EXAM, take home exam**

**Emergency Phone Numbers:** In case of an on-campus emergency, call the UT Arlington Police Department at **817-272-3003** (non-campus phone), **2-3003** (campus phone). You may also dial 911. Non-emergency number 817-272-3381