

## Course Syllabus

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### Course Information

**Title:** PHYS 3312 Classical Mechanics

**Time:** Monday & Wednesday 11:30 am – 12:45 pm

**Room:** PHY 1.202

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**Instructor:** Dr. Michael Kesden

**Office:** PHY 1.908

**E-mail:** [kesden@utdallas.edu](mailto:kesden@utdallas.edu)

**Office hours:** Friday 1 – 3 pm

**Teaching assistant:** Fatemeh Khashami

**Office:** PHY 1.104 (Desk 18)

**E-mail:** [fxk160330@utdallas.edu](mailto:fxk160330@utdallas.edu)

**Office hours:** Monday 4 – 6 pm

**Prerequisite:** PHYS 3411 Theoretical Physics

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### Course Description:

PHYS 3312 Classical Mechanics (3 semester hours) Newton's laws; collisions; two-body problems and trajectories; Lagrangian formulation; rotational dynamics and the inertia tensor; rotating coordinate systems; gravitation, special relativity

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### Student Learning Objectives/Outcomes:

By the end of the course, students are expected to demonstrate proficiency in the topics included in the course syllabus. In particular they should be able to solve problems based on the following concepts:

- advanced Newtonian mechanics
- oscillations
- gravitational and central-force motion
- calculus of variations
- Lagrangian dynamics
- Hamiltonian dynamics
- dynamics of rigid bodies
- special relativity

### Assessment:

Student achievement of the above objectives will be assessed by performance on reading quizzes on course material, problem sets covering each of the topics, and 3 non-cumulative exams given throughout the semester.

## Required Textbook:

*Classical dynamics of particles and systems* by Jerry Marion and Stephen Thornton, **any edition**.

This course will closely follow the presentation of the above topics in Marion and Thornton. I have the 4<sup>th</sup> edition of this book myself, which I used as an undergraduate when taking a classical mechanics course many moons ago. A 5<sup>th</sup> edition has since been published. The book has been a valuable resource to me in my research throughout the years, but I appreciate that purchasing a new addition may be too expensive for some students (currently \$314 new on Amazon). Students are welcome to rent the book if they prefer, and used editions of the book (available for under \$20 on Amazon in paperback) are also acceptable.

*Mechanics, Course of Theoretical Physics, Volume 1* by L. D. Landau and E. M. Lifshitz

This is the first of a classic 10-volume series on theoretical physics composed by Russian Nobel laureate Lev Landau in his head during the 1930's while serving in a NKVD (precursor to the KGB) prison. This material formed the basis of the "Theoretical Minimum" that Landau felt all theoretical physics should master. Only 43 candidates ever passed this exam in the history of the Soviet Union.

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## Readings:

Students are *required* to read assigned sections in Marion and Thornton prior to lecture. Completion of reading assignments will be assessed by pop reading quizzes throughout the semester. These reading quizzes will consist of several multiple-choice questions and will take 10 minutes at the beginning of lecture. I plan to devote considerable time in lecture to developing problem solving skills and group lecture tutorials, so we will not be able to discuss all of the material covered in the textbook. This material *can* appear on homework assignments and exams nonetheless, so complete your reading!!!

## Homework:

Homework assignments will be announced in class and due the following week. There will be problem sets associated with each topic in the syllabus, so expect about 7 problem sets throughout the semester. Each assignment will consist of about 4 problems. Students are encouraged to discuss problems with each other, but each student is responsible for preparing and submitting his/her own solutions. I am aware that that some solutions are probably available on the Internet, but students that make use of these solutions are only robbing themselves of important practice for material that will be covered on the exams. Evidence of academic dishonesty such as copying of homework assignments will be reported to the Dean of Students.

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**Grading Policy:**

The reading quizzes described above will count for 16% of your final grade. Homework assignments will count for 21% of your final grade and exams will count for the remaining 63% (21% for each of 3 exams). The first exam will cover Newtonian mechanics, oscillations, gravitation, and central-force motion and will take place around the 3<sup>rd</sup> week in February. The 2<sup>nd</sup> exams will cover the calculus of variations and Lagrangian and Hamiltonian dynamics and will take place around the 1<sup>st</sup> week in April. The 3<sup>rd</sup> exam will cover the dynamics of rigid bodies and relativity. It will be scheduled in May at the time set by the registrar for the final exam.

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**Exam Policy:**

Students must bring a valid picture ID to the exam. No graphing or programmable calculators are allowed in the exams. Students can prepare a single two-sided sheet of notes that will be collected with the exam, and I will include some useful formulae as well. Any student caught cheating will be reported to the Dean of Students.

**Syllabus**

<b>Topic Anticipated</b>	<b>Schedule</b>	<b>Assigned Reading</b>
• Introduction	1/9	none
• Newtonian mechanics	1/11 – 1/18	Ch. 2
• Oscillations	1/23 – 1/30	Ch. 3
• Gravitation	2/1 – 2/6	Ch. 5
• Central-force motion	2/8 – 2/15	Ch. 8
• Calculus of Variations	2/20 – 2/22	Ch. 6
• Exam #1	2/27	
• Guest Lecture	3/1	none
• Lagrangian dynamics	3/6 – 3/8	Ch. 7
• Spring break	3/13 – 3/15	
• Hamiltonian dynamics	3/20 – 3/27	Ch. 7
• Exam #2	3/29	
• Dynamics of Rigid Bodies	4/3 – 4/12	Ch. 11
• Special Relativity	4/17 – 4/26	Ch. 14

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**Course policies:**

- Turn your cell phone ringers off before class.
- Laptops may be used during class to take notes, but not for other purposes.

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**Student Conduct & Discipline**

The University of Texas System and The University of Texas at Dallas have rules and regulations for the orderly and efficient conduct of their business. It is the responsibility of each student and each student organization to be knowledgeable about the rules and regulations which govern student conduct and activities. General information on student

conduct and discipline is contained in the UTD publication, A to Z Guide, which is provided to all registered students each academic year.

The University of Texas at Dallas administers student discipline within the procedures of recognized and established due process. Procedures are defined and described in the Rules and Regulations, Board of Regents, The University of Texas System, Part 1, Chapter VI, Section 3, and in Title V, Rules on Student Services and Activities of the university's Handbook of Operating Procedures. Copies of these rules and regulations are available to students in the Office of the Dean of Students, where staff members are available to assist students in interpreting the rules and regulations (SU 1.602, 972/883-6391).

A student at the university neither loses the rights nor escapes the responsibilities of citizenship. He or she is expected to obey federal, state, and local laws as well as the Regents' Rules, university regulations, and administrative rules. Students are subject to discipline for violating the standards of conduct whether such conduct takes place on or off campus, or whether civil or criminal penalties are also imposed for such conduct.

### **Academic Integrity**

The faculty expects from its students a high level of responsibility and academic honesty. Because the value of an academic degree depends upon the absolute integrity of the work done by the student for that degree, it is imperative that a student demonstrate a high standard of individual honor in his or her scholastic work.

Scholastic dishonesty includes, but is not limited to, statements, acts or omissions related to applications for enrollment or the award of a degree, and/or the submission as one's own work or material that is not one's own. As a general rule, scholastic dishonesty involves one of the following acts: cheating, plagiarism, collusion and/or falsifying academic records. Students suspected of academic dishonesty are subject to disciplinary proceedings.

Plagiarism, especially from the web, from portions of papers for other classes, and from any other source is unacceptable and will be dealt with under the university's policy on plagiarism (see general catalog for details). This course will use the resources of turnitin.com, which searches the web for possible plagiarism and is over 90% effective.

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### **E-mail Use**

The University of Texas at Dallas recognizes the value and efficiency of communication between faculty/staff and students through electronic mail. At the same time, E-mail raises some issues concerning security and the identity of each individual in an email exchange.

The university encourages all official student E-mail correspondence be sent only to a student's U.T. Dallas E-mail address and that faculty and staff consider email from students official only if it originates from a UTD student account. This allows the university to maintain a high degree of confidence in the identity of all individual corresponding and the security of the transmitted information. UTD furnishes each student with a free E-mail account that is to be used in all communication with university personnel. The Department of Information Resources at U.T. Dallas provides a method for students to have their U.T. Dallas mail forwarded to other accounts.

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### **Withdrawal from Class**

The administration of this institution has set deadlines for withdrawal of any college-level courses. These dates and times are published in that semester's course catalog. Administration procedures must be followed. It is the student's responsibility to handle withdrawal requirements from any class. In other words, I cannot drop or withdraw any student. You must do the proper paperwork to ensure that you will not receive a final grade of "F" in a course if you choose not to attend the class once you are enrolled.

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### **Student Grievance Procedures**

Procedures for student grievances are found in Title V, Rules on Student Services and Activities, of the university's Handbook of Operating Procedures.

In attempting to resolve any student grievance regarding grades, evaluations, or other fulfillments of academic responsibility, it is the obligation of the student first to make a serious effort to resolve the matter with the instructor, supervisor, administrator, or committee with whom the grievance originates (hereafter called "the respondent"). Individual faculty members retain primary responsibility for assigning grades and evaluations. If the matter cannot be resolved at that level, the grievance must be submitted in writing to the respondent with a copy of the respondent's School Dean. If the matter is not resolved by the written response provided by the respondent, the student may submit a written appeal to the School Dean. If the grievance is not resolved by the School Dean's decision, the student may make a written appeal to the Dean of Graduate or Undergraduate Education, and the dean will appoint and convene an Academic Appeals Panel. The decision of the Academic Appeals Panel is final. The results of the academic appeals process will be distributed to all involved parties.

Copies of these rules and regulations are available to students in the Office of the Dean of Students, where staff members are available to assist students in interpreting the rules and regulations.

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### **Incomplete Grade Policy**

As per university policy, incomplete grades will be granted only for work unavoidably missed at the semester's end and only if 70% of the course work has been completed. An incomplete grade must be resolved within eight (8) weeks from the first day of the subsequent long semester. If the required work to complete the course and to remove the incomplete grade is not submitted by the specified deadline, the incomplete grade is changed automatically to a grade of F.

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### **Disability Services**

The goal of Disability Services is to provide students with disabilities educational opportunities equal to those of their non-disabled peers. Disability Services is located in room 1.610 in the Student Union. Office hours are Monday and Thursday, 8:30 a.m. to 6:30 p.m.; Tuesday and Wednesday, 8:30 a.m. to 7:30 p.m.; and Friday, 8:30 a.m. to 5:30 p.m. The contact information for the Office of Disability Services is: The University of Texas at Dallas, SU 22 PO Box 830688 Richardson, Texas 75083-0688 (972) 883-2098 (voice or TTY)

Essentially, the law requires that colleges and universities make those reasonable adjustments necessary to eliminate discrimination on the basis of disability. For example, it may be necessary to remove classroom prohibitions against tape recorders or animals (in

the case of dog guides) for students who are blind. Occasionally an assignment requirement may be substituted (for example, a research paper versus an oral presentation for a student who is hearing impaired). Classes enrolled students with mobility impairments may have to be rescheduled in accessible facilities. The college or university may need to provide special services such as registration, note-taking, or mobility assistance.

It is the student's responsibility to notify his or her professors of the need for such an accommodation. Disability Services provides students with letters to present to faculty members to verify that the student has a disability and needs accommodations. Individuals requiring special accommodation should contact the professor after class or during office hours.

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### **Religious Holy Days**

The University of Texas at Dallas will excuse a student from class or other required activities for the travel to and observance of a religious holy day for a religion whose places of worship are exempt from property tax under Section 11.20, Tax Code, Texas Code Annotated.

The student is encouraged to notify the instructor or activity sponsor as soon as possible regarding the absence, preferably in advance of the assignment. The student, so excused, will be allowed to take the exam or complete the assignment within a reasonable time after the absence: a period equal to the length of the absence, up to a maximum of one week. A student who notifies the instructor and completes any missed exam or assignment may not be penalized for the absence. A student who fails to complete the exam or assignment within the prescribed period may receive a failing grade for that exam or assignment. If a student or an instructor disagrees about the nature of the absence [i.e., for the purpose of observing a religious holy day] or if there is similar disagreement about whether the student has been given a reasonable time to complete any missed assignments or examinations, either the student or the instructor may request a ruling from the chief executive officer of the institution, or his or her designee. The chief executive officer or designee must take into account the legislative intent of TEC 51.911(b), and the student and instructor will abide by the decision of the chief executive officer or designee.

***These descriptions and timelines are subject to change at the discretion of the Professor.***