

## Advanced Mechanics. Fall 2020

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**Web page:** <http://people.physics.tamu.edu/abanov/courses/P302/index302.php>

**Office:** MPHY 415, **Office Hours:** On Zoom

**Text:** Required book: John R. Taylor, Classical Mechanics, University Science Books, ISBN-10: 189138922X | ISBN-13: 978-1891389221, Any edition.

Recommended book: L.D. Landau and E.M. Lifshitz, Mechanics, Any edition

Grading:		Exams:
1 exam	30%	Exam: <b>October 7; Take home.</b> Final exam: <b>December 2, Wednesday, 8-10:30 a.m., ZOOM</b>
Final (comprehensive)	30%	
Homework (weekly)	40%	

**Prerequisites and Co-requisites:** freshman mechanics, e.g. PHYS 218 or equivalent, calculus, and differential equations

### Syllabus:

Block 1: Review of Newton's laws

Vectors, scalar product, vector product. Einstein notations. Kronecker delta. Levi-Civita symbol.  
 Frames of reference. Principle of relativity. Newton's first law.  
 Concepts of mass and force. Newton's second law. Newton's third law.  
 Oscillations. Oscillations with friction and external force. Resonance.  
 Conservation of momentum. Rocket motion.  
 Air resistance, charged particles in electric and magnetic fields  
 Kinematics in cylindrical coordinates. Angular momentum  
 Work-energy theorem. Energy conservation  
 Potential energy  
 One-dimensional motion  
 Central forces. Effective potential  
 Kepler orbits.  
 Virial theorem

Block 2: Lagrangian mechanics

Calculus of variations  
 Hamilton's principle  
 Lagrange's equations  
 Generalized coordinates  
 Ignorable coordinates and conservation laws  
 Constrained systems

Block 3: Hamiltonian mechanics. Taylor Ch. 13, Landau Ch. 7.

Hamilton's equations  
 Phase space  
 Canonical transformations  
 Poisson brackets

### Academic Integrity Statement and Policy

“An Aggie does not lie, cheat or steal, or tolerate those who do.”

“Texas A&M University students are responsible for authenticating all work submitted to an instructor. If asked, students must be able to produce proof that the item submitted is indeed the work of that student. Students must keep appropriate records at all times. The inability to authenticate one’s work, should the instructor request it, may be sufficient grounds to initiate an academic misconduct case” (**Section 20.1.2.3, Student Rule 20**).

You can learn more about the Aggie Honor System Office Rules and Procedures, academic integrity, and your rights and responsibilities at [aggiehonor.tamu.edu](http://aggiehonor.tamu.edu).

### Americans with Disabilities Act (ADA) Policy

Texas A&M University is committed to providing equitable access to learning opportunities for all students. If you experience barriers to your education due to a disability or think you may have a disability, please contact Disability Resources in the Student Services Building or at (979) 845-1637 or visit [disability.tamu.edu](http://disability.tamu.edu). Disabilities may include, but are not limited to attentional, learning, mental health, sensory, physical, or chronic health conditions. All students are encouraged to discuss their disability related needs with Disability Resources and their instructors as soon as possible.

**NOTE:** Faculty associated with the main campus in College Station should use this Americans with Disabilities Act Policy statement. Faculty not on the main campus should use the appropriate language and location at their site.

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Texas A&M University is committed to fostering a learning environment that is safe and productive for all. University policies and federal and state laws prohibit gender-based discrimination and sexual harassment, including sexual assault, sexual exploitation, domestic violence, dating violence, and stalking.

With the exception of some medical and mental health providers, all university employees (including full and part-time faculty, staff, paid graduate assistants, student workers, etc.) are Mandatory Reporters and must report to the Title IX Office if the employee experiences, observes, or becomes aware of an incident that meets the following conditions (see **University Rule 08.01.01.M1**):

- The incident is reasonably believed to be discrimination or harassment.
- The incident is alleged to have been committed by or against a person who, at the time of the incident, was (1) a student enrolled at the University or (2) an employee of the University.

Mandatory Reporters must file a report regardless of how the information comes to their attention – including but not limited to face-to-face conversations, a written class assignment or paper, class discussion, email, text, or social media post. Although Mandatory Reporters must file a report, in most instances, you will be able to control how the report is handled, including whether or not to pursue a formal investigation. The University’s goal is to make sure you are aware of the range of options available to you and to ensure access to the resources you need.

Students wishing to discuss concerns in a confidential setting are encouraged to make an appointment with **Counseling and Psychological Services** (CAPS).

Students can learn more about filing a report, accessing supportive resources, and navigating the Title IX investigation and resolution process on the University’s **Title IX webpage**.