

# SYLLABUS – PHYSICS 206 - UP: Mechanics

## Spring 2021

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### Course Information

<b>Course Number:</b>	PHYS 206
<b>Course Title:</b>	Newtonian Mechanics for Engineering and Science
<b>Sections:</b>	467 - 472
<b>Lecture Times:</b>	Tue and Thu 1:30 – 2:45 pm
<b>Location:</b>	Online only
<b>Credit Hours:</b>	3 SCH
<b>Zoom meeting ID:</b>	925 2740 0437 for attending lectures remotely

### Instructor Information

<b>Name:</b>	Prof. Rupak Mahapatra
<b>Teaching web page:</b>	<a href="http://people.physics.tamu.edu/mahapatra/teaching.html">http://people.physics.tamu.edu/mahapatra/teaching.html</a>
<b>Office:</b>	<a href="#">MIST</a> 417
<b>Telephone:</b>	(979) 229-4196 (email is better)
<b>E-mail:</b>	<a href="mailto:mahapatra@tamu.edu">mahapatra@tamu.edu</a> (please start the subject line with <b>PHYS206</b> )
<b>Office Hours:</b>	TBD and/or by appointment. Office hours will be held online using Zoom.

**Course Description:** This is a calculus-based course on introductory Newtonian mechanics. It is the first semester of a two-semester sequence in introductory physics primarily intended for students pursuing degrees in STEM fields. By the end of the course students will understand, describe and apply the laws of physical motion to the solution of science and engineering problems.

**Course Pre-requisite:** **MATH 151 or 171.** You must have a working knowledge of plane geometry, trigonometry, and algebra. As the semester progresses you will also be expected to have a working knowledge of derivatives and integrals, and be proficient in the use of vectors (addition, subtraction, dot and cross products).

### Learning Outcomes:

#### Conceptual knowledge to gain:

- Understanding of the physical laws of motion, static and dynamical Newtonian mechanics, and harmonic motion.
- To think more critically/scientifically, and develop the skills needed to solve difficult multi-step problems.

#### Upon successful completion of this course, students will be able to:

- Produce a mathematical description of movement in 1, 2, and 3 dimensions.
- Transform positions, velocities, and accelerations from one coordinate system to another system in relative motion with respect to the first one.
- Identify a basic set of forces, their origin, and their points of application in specific problems.
- Identify and isolate bodies and pictorially represent the direction and location of forces acting on the bodies.
- Compute the position of the center of mass and moment of inertia for different basic shapes in simple conditions.
- Apply Newton's Laws to quantitatively predict linear and rotational motion.
- Apply conservation laws to quantitatively describe linear and rotational motion.
- Understand the conditions for static equilibrium and quantitatively deduce the forces involved.

- Identify systems undergoing simple harmonic motion, describe that movement, and compute the frequencies of oscillation.

## Textbook and required materials

- **Primary textbook:** *Physics for Scientists and Engineers*, by Mosca and Tipler, Vol. 1, 6<sup>th</sup> edition, published by MacMillan. The TAMU bookstore has a custom package (ISBN: 978-1319334420) for \$80 (your cheapest option) which is a loose-leaf version with access to the eBook and Sapling Learning for one semester. If you buy the textbook elsewhere without access to Sapling Learning, you may purchase access online.
- **Homework:** All PHYS 206-UP sections use the [Sapling Learning](#) system for the on-line homework. **You do not need a course access code;** you should go to [eCampus](#), login with your NetID and password, and click the link on the left menu under "Sapling Learning", which will be linked with the correct course automatically.
- **Clicker:** In-class and remote participation and conceptual testing will be made using the [iClicker](#) system. We will utilize the iClicker Cloud Reef polling using smartphones or laptops rather than physical clickers to allow remote students to participate synchronously with the online lectures. To encourage class participation, credit for iClickers will be predominantly based on simply answering, regardless of whether your answer is correct or not. To sign up, you must first sign up for Sapling Learning. From the main page of Sapling, you will find a link to "Purchase iClicker Reef HERE" which will prompt you for the \$5.99 payment for 6-month access. Please direct all technical issues with the support team at [iclicker.com](#).
- **Pre-Lectures:** You are required to view the pre-lecture videos on Sapling Learning prior to attending lectures to help prepare you for what we will cover in class. There are also follow-up "bridge assignments" which are short quizzes on the pre-lecture material to check that you have gained a basic understanding of what was covered in the pre-lectures.

## Course Web Pages:

- [mechanics.physics.tamu.edu](http://mechanics.physics.tamu.edu) – website with information common to all PHYS 206 sections using the 'Physics for Scientists and Engineers' textbook.
- [ecampus.tamu.edu](http://ecampus.tamu.edu) – site for this class will have lecture notes and grades, and to sign up for Sapling Learning.
- [www.saplinglearning.com](http://www.saplinglearning.com) – the online system for homework submission, and to view pre-lectures with follow-up bridge assignments (register through [ecampus.tamu.edu](http://ecampus.tamu.edu)).
- [freshman.physics.tamu.edu/p218](http://freshman.physics.tamu.edu/p218) – to check your status on achieved learning objectives.

## Course Policies

**COVID-19 safety precautions:** Not applicable as the course is online only.

**Recitations:** Information regarding the format and grading of the recitations may be found on the common webpage at <https://mechanics.physics.tamu.edu/recitations.shtml>. Note that you must attend the recitation each week. The [policy for absences](#) in recitations is the same as for the exams, and you must first consult with your TA in the case that you have an excused absence.

**Homework:** The weekly online homework assignments from [Sapling Learning](#) may be accessed through eCampus. You are responsible for completing and understanding these problems in preparation for the exams. By the end of the first week you should complete the first homework assignment.

You must work the online problems on your own, and keep up with the weekly deadlines — see the activity deadlines on the [Sapling Learning](#) site for posted due dates. Late submissions of homework **are** accepted; however full credit will not be given. The penalty is 10% per day after the deadline. You have 10 attempts to get

the correct answer for each question, with a 3% penalty for each incorrect response. You will be able to see the solution only after the due date for a given problem set has passed.

**Exams:** We will have 3 midterm exams and one comprehensive exam, all of which are common to all PHYS 206 sections. Exams generally consist of problems similar in content and difficulty to the end-of-chapter questions in the textbook. They will all be online multiple-choice exams using eCampus under and proctored via Zoom. [Formula sheets](#) will be provided for each exam. Any contestations regarding the grading of an exam must be brought to my attention within **1 week** of their being returned to you.

**Absences:** If you miss an exam due to an [authorized excused absence](#) as outlined in the University Regulations, Rule 7 (<http://student-rules.tamu.edu/rule07>), you should attempt to **contact me prior to the exam but no later than the end of the week of the missed exam**. A make-up exam will only be offered if you miss the comprehensive exam due to a university-excused absence. If you miss a non-comprehensive midterm exam due to an excused absence, your final cumulative exam grade will be based on the set of tested objectives in the other exams (including the comprehensive exam). **Note:** Few conditions qualify as an authorized excused absence, so you must avoid missing exams except for extremely serious circumstances.

## Course Grade

The final letter grade on the course is based upon the final numerical course score as detailed in the table below:

Course Score	Final Letter Grade
$\geq 90\%$	A
$\geq 80\%$	B
$\geq 65\%$	C
$\geq 50\%$	D
$< 50\%$	F

The numerical score (left column) is computed as a weighted average over all the different components of the course, with the weights as specified in the table below. With the exception of the clicker quizzes, all components of the course (*i.e.* the exams, recitations, homework and pre-lectures) are common across all sections of PHYS 206-UP.

Course Component	Fraction of final grade
Exams (three midterms + the comprehensive exam)	80%
Recitations	5%
Online homework	5%
Pre-lectures and bridge assignments	5%
In-class clicker quizzes	5%
<b>Total:</b>	<b>100%</b>

The “Exams” portion includes the three midterm exams as well as the comprehensive exam. Exams are graded in terms of learning objectives. The complete list of learning objectives that a student is supposed to master by the end of the semester is posted at [mechanics.physics.tamu.edu/los.html](http://mechanics.physics.tamu.edu/los.html).

Each exam tests several different learning objectives and could test the same learning objective multiple times. During the grading we keep track of every instance in which a learning objective is tested and whether in that particular instance the objective was marked as passed or failed. Learning objectives will also be tested multiple times across exams. You may view your status on your achieved learning objectives throughout the semester by logging on with your NetID at <https://freshman.physics.tamu.edu/p218>.

At the end of the semester we call achieved objectives as those who pass either of the criteria below:

- were marked as passing  $\geq 60\%$  of the tested times in the comprehensive exam.
- were marked as passing  $\geq 60\%$  of the tested times in all exams in which they were tested, including the comprehensive exam.

The fraction of achieved objectives at the end of the semester out of the number of tested objectives gives the numerical grade in the “Exams” portion of the table above. As an example, if a student has achieved 43 objectives out of the total of 50 objectives tested, he/she has earned 86% of the exams portion of the course grade.

## Course Topics and Calendar of Activities

The schedule of topics is shown in the table below, although this is subject to change depending on the pace of your class. All exams will be online:

- Midterm Exam I: Fri Feb 12, 6:00 – 8:00 pm, covering Chapters 1 – 3.
- Midterm Exam II: Fri Mar 12, 6:00 – 8:00 pm, covering Chapters 4 – 7.
- Midterm Exam III: Fri Apr 9, 6:00 – 8:00 pm, covering Chapters 8 – 10, 12.
- Comprehensive Exam: Fri Apr 23, 6:00 – 9:00 pm, covering Chapters 1 – 12, 14.

Weekly homework and prelecture assignments will be due according to the schedule in Sapling Learning.

**Note: Week 5 was lost due to the winter storms.**

Week	Lecture Topic
1	Introduction to the course; units
1	Vectors, Pythagoras and math review
2	Motion along a straight line
3	Motion in 2 and 3 dimensions
4	Newton's laws of motion
6	Further application of Newton's laws
7	Work, kinetic energy and the work-energy theorem
8	Conservative forces, energy and conservation of energy
9	Centre of mass, (conservation of) momentum and collisions
10	Rotation of rigid bodies, moments of inertia
11	Newton's 2 <sup>nd</sup> law for rotation, torque, and angular momentum
12	Conservation of angular momentum; static equilibrium
13	Gravitation, satellite motion and Kepler's Laws
14	Contingency and/or review
15	Simple harmonic motion, pendula

## University Policies

**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.

**Title IX and Statement on Limits to Confidentiality:** 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](#).

**Statement on Mental Health and Wellness:** Texas A&M University recognizes that mental health and wellness are critical factors that influence a student’s academic success and overall wellbeing. Students are encouraged to engage in proper self-care by utilizing the resources and services available from Counseling & Psychological Services (CAPS). Students who need someone to talk to can call the TAMU Helpline (979-845-2700) from 4:00 p.m. to 8:00 a.m. weekdays and 24 hours on weekends. 24-hour emergency help is also available through the National Suicide Prevention Hotline (800-273-8255) or at [suicidepreventionlifeline.org](http://suicidepreventionlifeline.org).