Physics 131/03 Lecture Schedule Spring 2018

Date	Topics Discussed	Chapter: Section	Problem Set
Jan. 22	Welcome & Introduction	Ch. 1:1-6	
Jan. 24	1D Kinematics & Vectors	Ch. 1:7-8	HW #1
Jan. 26	Vector Manipulations in 2D/3D	Ch. 1:9-10	
Jan. 29	Key Motional Vectors	Ch. 2:1-3	
Jan. 31	Constant Acceleration in 1D	Ch. 2:4	HW #2
Feb. 02	Free Fall Motion & Integration	Ch. 2:5-6	
Feb. 05	Acceleration in 2D	Ch. 3:1-2	
Feb. 07	Projectile Motion	Ch. 3:3-4	HW #3
Feb. 09	Circular and Relative Motion	Ch. 3:5-6	
Feb. 12	Newton's Laws of Motion	Ch. 4:1-5	
Feb. 14	Free-Body Diagrams	Ch. 4:6	HW #4
Feb. 16	Newton's Laws with Friction	Ch. 5:1-3	
Feb. 19	Dynamics of Circular Motion	Ch. 5:4	
Feb. 21	Fundamental Forces/Problems	Ch. 5:5	
Feb. 23	**Hour Exam I**	Chapters (1-4)	
Feb. 26	Work and Kinetic Energy	Ch. 6:1-2	
Feb. 28	Work - Energy Theorem & Power	Ch. 6:3-4	HW #5
March 02	Calculating Potential Energy & Work	Ch. 7:1-2	
March 05	Conservative/Non-conservative Forces	Ch. 7:3-4	
March 07	Law of Conservation of Energy	Ch. 7:4-5	HW #6
March 09	Conservation of Momentum	Ch. 8:1-2	
March 12	**Spring Break**		
March 14	**Spring Break**		
March 16	**Spring Break**		
March 19	Collisions in 1D	Ch. 8:3	
March 21	Collisions in 2D	Ch. 8:4	HW #7
March 23	Center of Mass	Ch. 8:5-6	
March 26	Rotational Kinematics	Ch.9:1-3	
March 28	Moment of Inertia and Energy	Ch. 9:4-6	
March 30	**Hour Exam II**	Chapters (5-8)	
April 02	Torque	Ch. 10:1-2	
April 04	Rolling Motion & Angular Momentum	Ch. 10:3-5	HW #8
April 06	Conservation of Angular Momentum	Ch. 10:6	
April 09	Newton's Law of Gravity	Ch. 13:1-3	
April 11	Orbits/Energy/Angular Momentum	Ch. 13:4-6	HW #9
April 13	Simple Harmonic Motion	Ch. 14:1-3	
April 16	Energy Approach/Applications	Ch. 14:4-6	
April 18	Damped and Forced Oscillations	Ch. 14:7-8	HW # 10
April 20	Mechanical Waves (Types)	Ch. 15:1-2	
April 23	Wave Functions and Equation	Ch. 15:3-4	
April 25	Energy/Power/Intensity	Ch. 15:5	
April 27	**Hour Exam III**	Chapters (9-10, 13-14)	
April 30	Interference and Superposition	Ch. 15:6-7	
May 02	Standing Waves and Normal Modes	Ch. 15:7-8	HW #11
May 04	Wrap-up and Final Review		
	Final Exam (Scheduled by Registrar)	Cumulative	

Physics 131/03 – Physics I: Classical Mechanics
Course Description – Spring 2018

Instructor: Brad Antanaitis (Dr. A)
Office: HSC 024 610-330-5209
Biophysics Lab: HSC 021 (no phone)
NMR Lab: HSC 301
E-mail: antanaib/@lafayette.edu

Course Website: We will use Moodle – http://moodle.lafayette.edu. "PHYS 131.03 Spring 2018 Mechanics" should be in your list of current courses. Handouts, homework assignments/solutions, supplemental articles, etc., can be downloaded from this site. Taking a few moments to explore the site at the beginning of the semester is highly recommended.

Course Location and Times:

Class: Hugel Science Center 100
Monday, Wednesday, Friday; 10:00 – 10:50 AM

Labs: Hugel Hall of Science 123

Section	Lab Time
1	Monday Afternoon, 1:10-4:00 pm
2	Monday Evening, 7:00-9:50 pm
3	Tuesday Morning, 8:00-10:50 am
4	Tuesday Afternoon, 1:10-4:00 pm
5	Tuesday Evening, 7:00-9:50 pm
6	Wednesday Afternoon, 1:10-4:00 pm
7	Wednesday Evening, 7:00-9:50 pm
8	Thursday Morning, 8:00-10:50 am
9	Thursday Afternoon, 1:10-4:00 pm
10	Thursday Evening, 7:00-9:50 pm

Office Hours: Our SI, Keith Vreeland, as well as SI's for other sections, Samantha Miller-Brown and Joaquin Font, will regularly schedule help sessions/review sessions and be available for consultation during the week. Alternatively, you may drop in any time you see a free period in my

schedule. So, don't be shy, just call, e-mail or stop by whenever a question arises or you wish to discuss material in greater depth than we have had time for in class. If I'm not in my office, look across the hall in the Biophysics Research lab or upstairs in the NMR lab. If that fails, talk to Debbie, our secretary, upstairs in room 124 – she usually knows where I am.

Classes on Snow Days and Other Emergencies: If I am unable to make it to class (I live in Morrisville, PA, about 55 miles from Easton), I will send the class an email message via Moodle. I typically arrive on campus around 6:30 AM.

Description: This course is a calculus-based introduction to classical mechanics designed primarily for science and engineering majors, but appealing to anyone who is curious about the structure of the universe and how things work. We will study kinematics and dynamics with an emphasis on conservation laws for linear momentum, angular momentum and energy. We will also explore certain force laws for example, Hooke's law and Newtonian gravity, taking full advantage of the power and economy of vector algebra.

Goals: This course will enable you to understand, identify and apply the fundamental principles of classical mechanics to a wide variety of situations, from solving simple end-of-chapter problems to tackling the knotty, multi-faceted real world problems. It will emphasize both qualitative reasoning and quantitative problem-solving. A secondary goal is to introduce the student to the process of doing physics, *vid.*, developing and testing models, solving problems and communicating results in a clear and coherent way. Many of the skills developed in this course will be readily transferable to other fields of study, especially biology, chemistry, engineering, geology, medicine, neuroscience and environmental studies.

Student Learning Outcomes:

- Students will be able to apply the laws of mechanics to a wide variety of situations, including those encountered in everyday life.
- Will develop a Newtonian intuition about motion, describing it mathematically and understanding its causes.
- Will be able to modify a simple physical model, e.g., a simple harmonic oscillator to include realistic effects like damping.

- Will acquire or sharpen the mathematical skills necessary to write and solve equations of motion for a number of simple systems.
- Will sharpen critical thinking skills and continue developing their analytical skills as they study ever more complicated physical systems.
- Will acquire an impressive array of problem-solving tools and cultivate a mindset of rational exploration
- Will appreciate the foundational nature of Physics and its relationship to other related disciplines as well as its connection with the solution of real-world problems.

Co/Prerequisites: Math 161 is a prerequisite for this course. It can be waived by permission of the instructor.

Texts: The following text is required and is available at the college bookstore: Young and Freedman, *University Physics with Modern Physics, 14th edition.* If you did not purchase Mastering Physics with the text, you can buy it online at http://www.MasteringPhysics.com/.

Physics 131 - Laboratory Manual is available in the bookstore.

Lab Notebook: Please use a black, bound lab notebook available at the bookstore. You and your lab partner will share a notebook, so coordinate this purchase with you lab partner.

Your Responsibilities: Your textbook is a critical resource for this class – it is a source of definitions, facts, concepts, explanations, derivations and worked examples. I do not intend to waste your time simply by parroting exactly what is in the text. Instead, I will devote class time to discussing key ideas, answering questions, giving demos and practicing the application of those ideas to richly varied physical situations. Many of these explorations will be interdisciplinary in nature, e.g. biophysical or bioengineering, while others will be practically oriented.

Accordingly, you should read the text prior to coming to class. You can anticipate topics for discussion by appealing to the course syllabus.

Attendance: Regular class attendance is expected and is beneficial. Witnessing demos, student-student and student-instructor interactions cannot be duplicated outside of class. All too often irregular or spotty attendance

and poor performance seem to go hand-in-hand and further diminish the value of this course. If you miss class, you are responsible for the material you missed. Because this course has a vertical architecture, i.e., later chapters assume a mastery of material covered in previous chapters, it behooves you not to fall far behind.

Ask questions. If you are confused, feel free to interrupt the class and ask a question. Chances are good that your confusion is shared by others and they will welcome your question.

Do all assigned work. A useful rule of thumb for any college course is that you should spend approximately two hours out of class for every hour in class. For this course that means devoting an average of six hours per week outside of class (not including lab). Do yourself a favor and plan ahead! Start homework assignments long before they are due and review course material well in advance of an exam.

Participate in class. Class time will be used to go beyond what can be gleaned from reading your text alone. Active engagement during class can and should play an important role in helping you master the material. To encourage your active involvement, I will often initiate discussion of the physics behind a demo or a toy brought to class. Class time will also be used to announce changes to the syllabus**.** It will be your responsibility to keep up.

Tests: There will be three hour-long in-class tests on the dates marked on the syllabus. There will also be a cumulative final exam on a date to be determined by the registrar, *vide infra*.

Equation Sheet: An equation sheet will accompany each test. A copy is available under the "documents" category of Moodle and has also been included with the course description packet so that you can use it as you study and do homework problems. The idea is that you will use your study time to focus on the fundamental ideas and practice doing physics rather than just memorizing formulas.

Homework Problems: Homework assignments will be due at the **beginning** of class on the dates indicated in the syllabus (typically Friday mornings). Homework problems will usually be graded by student graders. Your lowest homework grade will be dropped at the end of the semester. All

assignments and other relevant course information will be available on the course website. Note: The Mastering Physics course site name is –to be determined.

- Problems will be due at the beginning of class. **Late homework will normally not be accepted**, since solutions will posted on Moodle after the assignment is due.

- For written homework, please staple your pages together. This assures they won't get separated or lost.

- **Illegible papers will not be accepted.** If I or the graders can't read or follow your work, it may be returned to you ungraded for resubmission. You may resubmit a legible version (along with the original) by the next class meeting, but that version must not have any new content – it must simply be a legible version of the original.

- Please look at the homework problems ahead of time and ask questions about them either in or out of class. I will be happy to give you whatever help you need, but eventually you must learn to solve these problems on your own. After all, that is precisely what you will be expected to do on exams and more importantly, later in life.

Academic Honesty: Working with others is often a helpful way to learn physics. I encourage you to collaborate with each other on homework, but the work you turn in must be your own. If, in fact, you do collaborate with fellow students, be sure to include their names at the top of your homework paper. You should read the department's Academic Honesty policy for rules regarding collaboration (available on the course Moodle site). If some point is unclear, be sure to ask me for clarification.

Laboratory: You are responsible for completing all of the assigned experiments at the scheduled times. If you can't make it to your scheduled lab, please see me as soon as possible to arrange a make-up. You can't count on the equipment being available outside of the scheduled lab times.

Final Exam: There will be a comprehensive final exam at a time to be determined by the registrar. Please don't make travel plans that conflict with the scheduled final exam.

Grades: Your course grade will be based on homework (25%), tests (30% total), the final exam (20%) and the laboratory (25%). Feel free to ask me how your grade is determined and how you are doing at any time during the semester.

Diversity, Inclusion and Equity Statement: Students should view this classroom as an inclusive space and safe haven for the free exchange of ideas. As your instructor one of my primary goals is to assure that the background, perspective and beliefs of each student are respected and appreciated regardless of race, ethnicity, gender, social class, sexual orientation, religion, political affiliation, ability level or learning style. Accordingly, I am committed to creating an atmosphere conducive to learning that respects diversity and inclusion and further promotes equity by removing educational barriers. As we work together to build this community of scholars, consider the following actionable points:

- Be open and receptive to the views of others.
- Feel free to share your own unique experiences.
- Honor and be enriched by the uniqueness of your classmates.
- View your classmates as respected resources of information and knowledge.
- Appreciate the opportunity to learn from classmates who may possess skill sets and perspectives that complement your own.

Meeting Federal Credit Hour Standards: The student work in this course is in full compliance with the federal definition of a four credit hour course. **The Federal course credit rule requires a total of 180 hours (12 hours/week) of student work over an approximately 15-week semester for a full unit (four credit hour) course.**

Moodle & Privacy: Moodle contains student information that is protected by the Family Educational Right to Privacy Act (FERPA). Disclosure to unauthorized parties violates federal privacy laws. Courses using Moodle will make student information visible to other students in this class. Please remember that this information is protected by these federal privacy laws and must not be shared with anyone outside the class. Questions can be referred to the Registrar's Office.