SYLLABUS
PHY 3221, Classical Mechanics I, Spring Term 2023

Instructor: Sergey Klimenko, NPB2019, Klimenko@phys.ufl.edu, 352-514-8225
Meeting time: Monday, Wednesday, Friday, period 6, 12:50-1:40 am
Classroom: Physics Building, 1101
Office Hours: Zoom and in-person meetings, Monday 2-3 pm and Thursday 2-3 pm

The course grading TA: Makaju, Rebika, e-mail, rmakaju@ufl.edu, NPB2110
Office Hours: Zoom meetings, Monday 11:00-11:50 am

Synopsis: This course is the first part of a two-semester sequence (PHY 3221-4222) in undergraduate level classical mechanics. The goal of the first semester is to develop a bridge from the introductory course (PHY2048) to the Lagrange and Hamilton formulation of mechanics to be studied in depth during the second semester of the course (PHY4222). Physics 3221 will cover chapters 1-7 of the textbook by John R. Taylor. Topics include matrices, vector calculus, reference frames, Newtonian mechanics, conservation laws, harmonic oscillators, and calculus of variation.

Prerequisites: Introductory physics with calculus PHY 2048 or equivalent. Fluency in algebra, trigonometry, and calculus is necessary for your success in Mechanics I. Calculus III will be used extensively throughout the course. A course in differential equations is recommended.

Course Description: This course lays out the foundation for students to understand the mathematical formulation of Newton's mechanics. Starting with the basic concepts introduced by Galileo and Newton, the course gives a deeper understanding of these concepts and introduces a more advanced formulation of mechanics developed by Lagrange and Hamilton. The Lagrangian and Hamiltonian mechanics gives deeper insights into conservation laws in physics, mechanics of non-inertial frames, motion of complex systems and form the basis of other branches of theoretical physics, including quantum mechanics, statistical physics, and field theory. This course requires more advanced mathematical skills and logical reasoning beyond introductory physics courses. The mathematical framework developed in this course - vectors, vector calculus, differential equations, Fourier series, calculus of variation, and linear algebra - provides a solid mathematical background used in science, business, and industry.

Course Learning Goals: The goal of the course is to develop a bridge from the introductory course (PHY2048) to the Lagrangian and Hamiltonian formulation of mechanics. At the end of the semester, students will be able to

- demonstrate knowledge of Newton's Laws
- demonstrate a knowledge of equations of motion
- understand the conservation laws governing physical systems
- apply advanced Newtonian methods to complex motion problems.

- demonstrate knowledge of oscillatory motion.
- demonstrate a basic knowledge of Calculus of Variations
- demonstrate a basic knowledge of Lagrangian & Hamiltonian mechanics.
- apply Lagrangian & Hamiltonian methods to complex motion problems.
- develop skills for logical analysis of complex problems
- develop a solid mathematical background used in science, business, and industry

Required textbook: The main text is John R. Taylor, Classical Mechanics. The textbook is necessary - we shall work through most of the end-of-chapter problems in class and on the homework. The UF library has this book on PHY3221 course reserves for the spring term.

References: Classical Dynamics of Particles and Systems by S. T. Thornton and J. B. Marion An Introduction to Mechanics by D. Kleppner and R.J. Kolenkow (These books are on course reserve at the Smathers Library). These books are recommended for additional reading (non-examinable). The UF library has these books on PHY3221 course reserves for the spring term. For additional reading, I also recommend a comprehensive book on Mechanics, volume 1 by Landau and Lifshiz. Links to all references are shown here: http://phys.ufl.edu/courses/phy3221/spring23/links.html

PHY 3221 web page is http://www.phys.ufl.edu/courses/phy3221/spring23/ This web page contains information relevant for the class. There you will find the course assignments, exam schedule, class schedule, and solutions for graded homework and exam problems. Please, check for updates regularly, especially if you miss a lecture.

Quizzes: There will be 9-10 quizzes throughout the semester. The quizzes will not be announced in advance. Each quiz will last no more than 10 min and will be administered at the beginning or end of the lecture. All quizzes will be ”closed book” and ***NO*** cell phones or other hi-tech gadgets are allowed. ***Quizzes will not be accepted outside of the class and overdue quizzes will not be graded***. One lowest quiz score will be dropped from the grade calculation and there will be 2 bonus quizzes. The lowest score is 0 for missed quizzes and 1-4 for taken quizzes. The quizzes will contribute a total of 10% toward the final grade.

Homework: Tentatively, there will be 9 graded homework (HW) assignments during the semester. Working on HW assignments is important to succeed in this course. This practical work will help you to understand the concepts and logical reasoning that led to a solution. If you let others do this work for you, or just copy solutions from the internet, it may lead to problems at the test time. A good technique for many students is to try all the problems individually, then get together in a group for the tough ones. HW assignments may contain bonus problems. You are not required to work on the bonus problems but solving them may add extra points to your total homework score. Work on simple problems first. Demonstrating that you understand a problem even if you can’t solve all its parts will result in partial credit. However, partial credit is not applied to the bonus problems. Homework assignments and due dates, subject to change, are available via the Homework link on the left panel of the course web page and also in the course schedule. Homework will be collected in the Canvas before the due date. Students will need to upload their homework as a single file in pdf format to the corresponding HW assignment in Canvas. ***HWs will not be accepted outside of the Canvas and overdue***

HWs will not be graded. Make your solutions neat, concise, and intelligible. It is not sufficient just to state the answer. Points may be deducted if it is difficult to find and/or understand the solutions. The lowest homework score will be dropped from the grade calculation at the end of the semester. The HW assignments will be worth 30% of the total grade (see the grading policy below).

Exams: There will be three ~100 minutes out-of-class exams scheduled on February X, March Y and April Z. There is no final exam for this course. All exams are in person. Make your solutions neat, concise, and intelligible. It is not sufficient just to state the answer. Points may be deducted if it is difficult to find and/or understand the solutions. Work on simple problems first. Demonstrating that you understand a problem even if you can't solve all its parts will result in partial credit. However, partial credit is not applied to the bonus problems. The lowest exam score will be dropped from the grade calculation at the end of the semester. The remaining two exams will contribute 60% toward the final grade. All three exams will be "closed book" and ***NO*** cell phones or other hi-tech gadgets are allowed. Calculators are permitted. Relevant Principal Definitions and Equations from the textbook will be provided. During the exam, students can also use one or two A4 format paper sheets with any hand-written material they prepare before the exam.

Grading procedure: All assignments will be graded within a few days after the due date, and exams are graded the next day. The graded assignments will be returned to students and grading scores entered into Canvas for student review. All questions regarding graded work should be sent to klimenko@phys.ufl.edu or asked in person during office hours. Each graded assignment (quiz, homework, or exam) has a maximum score (Sm) - the total sum of scores of all examinable problems in the assignment. In addition to the examinable problems, assignments may have bonus questions, which do not contribute to the maximum score but are accounted for in the total score (S) gained by a student. Because of the bonus questions, it is possible that S could be greater than Sm. The ratios S/Sm from all assignments are used to calculate the final percentage score according to the grading formula posted in Canvas. The percentage score will be determined by your homework assignments (30%), exams (60%), and quizzes (10%). Your final grades will be based on the total sum of percentage scores for quizzes, homework, and exams, and defined by the following grading table:

grade	**A**	**A-**	**B+**	**B**	**B-**	**C+**	**C**	**C-**	**D+**	**D**	**D-**	**E**
score	**90%**	**85%**	**80%**	**75%**	**70%**	**65%**	**60%**	**55%**	**50%**	**45%**	**40%**	**35%**

The corresponding grades are assigned at or above the score threshold shown in the table. These thresholds may be lowered, depending upon numerous factors, but will not be raised. **C is the lowest passing grade for physics majors and for general education credit.**

For additional details regarding grading policies, please, see the university website:
https://catalog.ufl.edu/UGRD/academic-regulations/grades-grading-policies/

Requirements for class attendance and make-up exams, assignments, and other work in this course are consistent with the university policies that can be found at: https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx

Students with disabilities who experience learning barriers and would like to request academic accommodations should connect with the disability Resource Center by visiting https://disability.ufl.edu/students/get-started/. It is important for students to share their accommodation letter with their instructor and discuss their access needs, as early as possible in the semester.

Students are expected to provide professional and respectful feedback on the quality of instruction in this course by completing course evaluations online via GatorEvals. Guidance on how to give feedback in a professional and respectful manner is available at https://gatorevals.aa.ufl.edu/students/. Students will be notified when the evaluation period opens and can complete evaluations through the email they receive from GatorEvals, in their Canvas course menu under GatorEvals, or via https://ufl.bluera.com/ufl/. Summaries of course evaluation results are available to students at https://gatorevals.aa.ufl.edu/public-results/

UF students are bound by The Honor Pledge which states "We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honor and integrity by abiding by the Honor Code. The Honor Code can be found here: https://www.dso.ufl.edu/sccr/process/student-conduct-honor-code/

Office of Academic Support: offers free one-on-one and small group tutoring sessions to all UF students interested. The tutors are proficient in a broad range of topics, including economics, mathematics, statistics, writing, accounting, Spanish and the physical and biological sciences. OAS tutors go through a rigorous selection process and receive training so that they are prepared to answer questions. Remember these tutoring services are offered at no additional cost to all UF students. Contact information: https://oas.aa.ufl.edu/services/

Student Life Success Services: Enhancing student success through learning and engagement - check out this web page:
https://www.ufl.edu/student-life/success-services/
and contact their academic advisors:
http://www.ufadvising.ufl.edu/college-remote-advising-contacts/

Counseling and Wellness Center: Contact information for the Counseling and Wellness Center: http://www.counseling.ufl.edu/cwc/Default.aspx (392-1575), and the UF Police Department: 392-1111 or 911 for emergencies.

Physics is practiced and advanced by a scientific community of individuals with diverse backgrounds and identities and is open and welcoming to everyone. The instructional team recognizes the value in diversity, equity and inclusion in all aspects of this course. This includes, but is not limited to differences in race, ethnicity, gender identity, gender expression, sexual orientation, age, socioeconomic status,

religion, and disability. Students may have opportunities to work together in this course. We expect respectful student collaborations such as attentive listening and responding to the contributions of all teammates. Physics, like all human endeavors, is something that is learned. Our aim is to foster an atmosphere of learning that is based on inclusion, transparency, and respect for all participants. We acknowledge the different needs and perspectives we bring to our common learning space and strive to provide everyone with equal access. All students meeting the course prerequisites belong here and are well-positioned for success.