Fall 2021

PHYS 430-001: Classical Mechanics I

Slawomir Piatek

Course Outline

Phys 430-001, Classical Mechanics
Fall 2021

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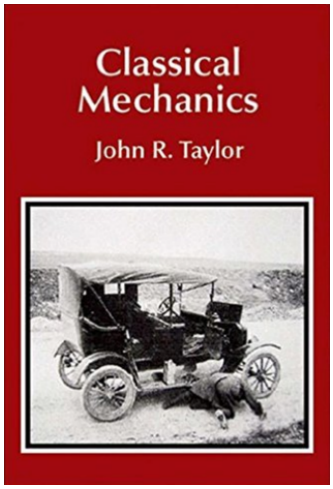
Lecture: Monday & Thursday, 4:00 PM – 5:20 PM (in person)
Location: FMH 405

When away, a lecture will be given online via WebEx at:

https://njit.webex.com/meet/piateknjit.edu

Office Hour: M & R, 8:30 AM – 9:30 AM via WebEx
https://njit.webex.com/meet/piateknjit.edu

Textbook: *Classical Mechanics*, John R. Taylor, ISBN-10: 189138922X; ISBN-13: 978-1891389221



Lecture Quizzes: Staring on September 9, a lecture quiz will be given by the end of every Thursday class. The quiz will contain 3 open-ended problems worth 5 points each for a total score of 15. The quiz will be administered within Canvas, including quiz submissions. The quizzes are open textbook but closed notes.

Midterm: There will be a midterm on Thursday, October 21, covering chapters 1 – 6. The exam will contain five open-ended problems, each worth 10 points for the total score of 50. The exam will be administered within Canvas, including the submission. The format is open textbook but closed notes.

Final Exam: A final exam will be given during the final exam period (TBA), covering chapters 7 – 11. The exam will contain five open-ended problems, each worth 10 points

for the total score of 50. The exam will be administered within Canvas, including the submission. The format is open textbook but closed notes.

Homework: No formal homework will be assigned; however, the syllabus lists suggested practice problems that a student should attempt to solve. Problems for the lecture quizzes, midterm, and final may be (but do not have to be) selected from the suggested problems.

Grading:

Lecture quizzes 40%
Midterm 30%
Final 30%

Cutoffs for letter grades:

85% − A
80% − B+
70% − B
65% − C+
50% − C
40% − D
Below 40% − F

Students with disabilities:

If you need accommodations due to a disability, please contact Chantonette Lyles, Associate Director of Disability Support Services, Fenster Hall Room 260 to discuss your specific needs. A Letter of Accommodation Eligibility from the Disability Support Services office authorizing your accommodations will be required.

Honor Code and Etiquette:

NJIT has a zero-tolerance policy for cheating of any kind and for student behavior that disrupts learning by others. Violations will be reported to the Dean of Students. The penalties range from a minimum of failure in the course plus disciplinary probation up to expulsion from NJIT. Avoid situations where your own behavior could be misinterpreted as dishonorable. **Students are required to agree to the NJIT Honor Code on each exam, assignment, quiz, etc. for the course.**

Please do not eat, drink, or create noise in class that interferes with the work of other students or instructors. Creating noise or otherwise interfering with the work of the class will not be tolerated.

Class Calendar

Lecture	Topic	Reading Material	Suggested Problems
1. R, 9/2	Mass, force, Newton's Laws	Ch. 1, 1.1 – 1.5	Ch. 1: 2, 5,10,18, 23,30
2. W(M), 9/8	Newton's II Law in Cartesian and Polar coordinates.	Ch. 1, 1.6 – 1.7	Ch. 1: 35,36,39,40,41,44,46,48,49
3. R, 9/9	Linear air resistance	Ch. 2, 2.1 – 2.3	Ch. 2: 1,2,5,7,8,11,12,13,15,16,18,21
4. M, 9/13	Quadratic air resistance, complex exponentials, and motion in E and B fields	Ch. 2, 2.4 – 2.7	Ch. 2:23,24,27,28,38,40,41,45,47,53
5. R, 9/16	Rockets, angular momentum	Ch.3, 3.1 – 3.4	Ch.3: 1,2,3,8,10,11,13,15,21,22
6. M, 9/20	Center of mass, angular momentum	Ch. 3, 3.4 – 3.5	Ch. 3: 25,27,29,31,32,34,35
7. R, 9/23	Kinetic and potential energy	Ch. 4, 4.1 – 4.2	Ch. 4: 2,3,4,5,7,8,9
8. M, 9/27	Force and potential energy	Ch. 4, 4.3 – 4.6	Ch. 4: 11,13,15,20,21,23,24,26,28
9. R, 9/30	Curvilinear systems, central forces	Ch. 4., 4.7 – 4.8	Ch. 4: 30,31,32,34,36,41,42
10. M, 10/4	Energy of interaction	Ch. 4., 4.9 – 4.10	Ch. 4: 46,47,52,53
11. R, 10/7	Oscillations	Ch. 5, 5.1 – 5.4	Ch. 5: 1,2,6,7,10,14,20,23,28
12. M, 10/11	Driven oscillations and resonance	Ch. 5, 5.5 – 5.6	Ch. 5: 33,40,42
13. R, 10/14	Fourier series, driven oscillations, and Parseval theorem	Ch. 5, 5.7 – 5.9	Ch. 5: 46,54
14. M, 10/18	Calculus of variations	Ch. 6, 6.1 – 6.4	Ch. 6: 1,3,4,7,9,11,13,17,23,25
15. R, 10/21	Midterm		
16. M, 10/25	Lagrange equations	Ch. 7., 7.1 – 7.2	Ch. 7: 1,2,3,4,6,8
17. R, 10/28	Lagrange equations with constraints	Ch. 7, 7.3 – 7.4	Ch. 7: 9,10,11
18. M, 11/1	Examples of Lagrange equations	Ch. 7, 7.5 – 7.7	Ch. 7: 14,15,16,18,20,21,23, 27,29,31,34,35,36,37,40,41
19. R, 11/4	Two-body, central force problem	Ch. 8, 8.1 – 8.5	Ch. 8: 1,3,6,7,8,10,13
20. M, 11/8	Kepler orbits	Ch. 8, 8.6 – 8.8	Ch. 8: 15,16,20,22,23,28,29,31,34
21. R, 11/11	Non-inertial frames	Ch. 9, 9.1 – 9.4	Ch. 9: 2,3,4,6
22. M, 11/15	Rotating frames	Ch. 9, 9.5 – 9.9	Ch.9: 9,10,11,13,14
23. R, 11/18	Rotating frames	Ch. 9, 9.5 – 9.9	Ch.9:16,18,19,20,26,28,29
24. M, 11/22	Rotation about a fixed axis	Ch. 10, 10.1 – 10.2	Ch. 10: 2,3,5,8,9,10,12,15,18
25.M,11/29	Inertia tensor and principal axis theorem	Ch. 10, 10.3 – 10.6	Ch. 10: 20,22,25,27,28,,29,34,35,36,37
26. R, 12/2	Euler's equations	Ch. 10, 10.7 – 10.8	Ch. 10: 40,42,43,44,45,47
27. M, 12/6	Coupled oscillators	Ch. 11, 11.1 – 11.3	Ch. 11: 1,2,3,,4,5,12
28. R, 12/9	Lagrangian approach	Ch. 11, 11.4 – 11.7	Ch. 11: 14,15,18,19,24,26,29,31