

Fall 2019 Physics 3201

Instructor: Aleksandr Chernatynskiy
117 Physics
aleksandrc@mst.edu
Help Session: 2-4 pm Monday, PHYS 202
Office Hours: By appointment, or feel free to stop by if the door (Phys 117) is open

Text: *Classical Mechanics*, J.R. Taylor

See also: H. Goldstein, “*Classical Mechanics*”; L. Landau and E. Lifshitz, “*Mechanics*”

Web: Canvas, <https://sites.google.com/a/mst.edu/aleksandr-chernatynskiy/classes/phys3201>

Instruction: This class follows the “Flipped Classroom” approach, where you, the students, are responsible for studying prerecorded videos of the lectures **before** the class session. The lectures are available for download at the class website. In the class, the key points of the lecture will be highlighted, and you will be given an opportunity (**greatly encouraged**) to ask questions about the material covered. The interactive quiz (administered via kahoot.com) will follow *thus a device with the wireless internet access, such as smartphone, is required*. The quizzes will cover factual materials of the lectures and test basic understanding of that material. The remainder of the class session will be devoted to working through the homework and other exam-like problems with the immediate help and support of the instructor. The overall idea is to “flip” the lectures and the homework: lecture is done at home at your own pace, while application of this material (solving problems) is done in the class.

Grading:

| | |
|--|-----|
| Homework (10 highest score assignments out of ~12) | 15% |
| Quizzes | 15% |
| Exam 1 (09/17) | 70% |
| Exam 2 (10/15) | |
| Exam 3 (11/12) | |
| Final (Comprehensive) | |

The grade for the class consist of three elements: quizzes, homework and exams, as highlighted in the table above.

➤ For quizzes, administered at every class session, the percentage of the correct answers is counted. It is thus essential to study the lecture material before the class in order to successfully score sufficient grade on the quiz. Note, that it is impossible to get an “A” without respectable quiz score.

➤ Assigned homework will be collected every week on the due date, late homework **will not** be accepted. For an honest attempt to solve the homework **full credit will be given**; Instructor will return the homework with the feedback. Attempting and turning in the homework is a must, if “A” is desired. Solutions will be discussed during the class sessions.

➤ The hour exams will be given in class at the following anticipated dates: **1: 09/17, 2: 10/15 and 3: 11/12**. The lowest grade on one of these exams will be dropped. The final will be comprehensive.

➤ Every problem in the exam will be graded on the 5 point scale and overall score adjusted to make up percentage indicated in the table. Note, that **incorrect units** of the answer will result in automatic **1 point deduction**.

➤ After the first exam, I will have an individual meeting with everyone who would get “C” or lower on it in order to find a way for improvement.

➤ This term we will be using Piazza for class discussion. The system is highly catered to getting you help fast and efficiently from classmates, the TA, and myself. Rather than emailing questions to the teaching staff, I encourage you to post your questions on Piazza. If you have any problems or feedback for the developers, email team@piazza.com. Find our class page at: <https://piazza.com/mst/fall2019/mstphysics320110171659fs2019/home>

Absolute Grading Scale: The grade cuts are (to four significant figures):

A for 89.50% of total possible points

B for 79.50% of total possible points

C for 69.50% of total possible points

D for 59.50% of total possible points

F for less than 59.50% of possible points

The grade cuts are absolute and will not be lowered. Points will not be added to a student’s grade to bring it above the cutoff.

Title IX: Missouri University of Science and Technology is committed to the safety and well-being of all members of its community. US Federal Law Title IX states that no member of the university community shall, on the basis of sex, be excluded from participation in, or be denied benefits of, or be subjected to discrimination under any education program or activity. Furthermore, in accordance with Title IX guidelines from the US Office of Civil Rights, Missouri S&T requires that all faculty and staff members report, to the Missouri S&T Title IX Coordinator, any notice of sexual harassment, abuse, and/or violence (including personal relational abuse, relational/domestic violence, and stalking) disclosed through communication including but not limited to direct conversation, email, social media, classroom papers and homework exercises.

Missouri S&T’s Title IX Coordinator is interim chief diversity officer Neil Outar. Contact him (naoutar@mst.edu; (573) 341-6038; Temporary Facility A-1200 N. Pine Street) to report Title IX violations. To learn more about Title IX resources and reporting options (confidential and non confidential) available to Missouri S&T students, staff, and faculty, please visit <http://titleix.mst.edu>.

Student Honor Code and Academic Integrity: Academic Dishonesty will not be tolerated. Please see <http://academicsupport.mst.edu/academicintegrity/studentresources-ai> and in particular <http://stuco.mst.edu/honor-code/> for more details.

Course assistance: If you have a disability and anticipate needing accommodations in this course, you are encouraged to meet with Dr. Chernatynskiy early in the semester. You will need to request a letter from Disability Support Services (<http://dss.mst.edu>, 203 Norwood Hall, 341-6655, dss@mst.edu) verifying your disability and specifying the accommodation you need and give this to Dr. Chernatynskiy before accommodation can be arranged. **Testing accommodations require seven days notice.**

Physical Mechanics Fall 2019 (Phys 3201)

Course topics

| Class # | Date | Topics/Reading material | Homework | Lecture # |
|---------|-------|---|----------|-----------|
| 1 | 08/20 | Math Primer: Essential math used in this course | | |
| 2 | 08/22 | Newtonian mechanics; motion with constant forces | | 02 |
| 3 | 08/27 | Motion with variable forces | # 1 | 03 |
| 4 | 08/29 | Momentum, Angular momentum, Conservation, Rockets | | 04 |
| 5 | 09/03 | Energy, Formal 1D solution | #2 | 05 |
| 6 | 09/05 | Oscillations | | 06 |
| 7 | 09/10 | Variational Calculus | #3 | 07 |
| 8 | 09/12 | Lagrangian mechanics | | 08 |
| 9 | 09/17 | Exam 1 | | |
| 10 | 09/19 | Lagrangian mechanics: Examples | | 09 |
| 11 | 09/24 | Lagrangian with constrains | #4 | 10 |
| 12 | 09/26 | Conservation laws in Lagrangian | | 11 |
| 13 | 10/01 | 2-body problem | #5 | 12 |
| 14 | 10/03 | Oscillations Revisited | | 13 |
| 15 | 10/08 | Hamiltonian formulation of mechanics | #6 | 14 |
| 16 | 10/10 | Canonical transformations | | 15 |
| 17 | 10/15 | Exam 2 | | |
| 18 | 10/17 | Rigid Body Dynamics I | | 16 |
| 19 | 10/22 | Rigid Body Dynamics II | #7 | 17 |
| 20 | 10/24 | Rigid Body Dynamics III | | 18 |
| 21 | 10/29 | Collision theory | #8 | 19 |
| 22 | 10/31 | Rutherford scattering | | 20 |
| 23 | 11/05 | Motion in Non-inertial Frames: Linear motion | #9 | 21 |
| 24 | 11/07 | Motion in Non-inertial Frames: Rotational motion | | 22 |
| 25 | 11/12 | Exam 3 | | |
| 26 | 11/14 | Nonlinear Oscillations (chaos) | #10 | 23 |
| 27 | 11/19 | Relativity: Lorentz transformation | | 24 |
| 28 | 11/21 | Relativity: Spacetime | #11 | 25 |
| | 11/26 | Thanksgiving Break: No classes | | |
| | 11/28 | | | |
| 29 | 12/03 | Relativity: Dynamics and Energy | #12 | 26 |
| 30 | 12/05 | Final Review | | |
| | 12/12 | Final Exam @ 12.30 pm | | |