

Instructor: Uwe Thumm, Cardwell Hall 212, thumm@ksu.edu
www.phys.ksu.edu/personal/thumm

Office hours: by appointment

Classes: Tuesdays and Thursdays 11:30-12:45, Cardwell Hall room 146

Textbook: 'Classical Mechanics', Goldstein, Poole, Safko, 3rd edition (Addison-Wesley 2002)
(required)

Supplementary resources (not required)

Basic

'Introduction to Classical Mechanics', Arya
'Mechanics', 3rd edition, Landau & Lifshitz
'Classical Dynamics of Particles and Systems', Thornton & Marion
'Deterministic Chaos', Schuster

Advanced

'Foundations of Mechanics', Abraham & Marsden
'Mathematical Methods of Classical Mechanics', Arnold
'Universality in Chaos', Cvitanović
'Order within Chaos', Bergé, Pomeau, & Vidal
'Chaos in Classical and Quantum Mechanics', Gutzwiller

Mathematical and computational

'Mathematical Methods for Physicists', Arfken, Weber, & Harris
'Tables of Integrals, Series, and Products', Gradsheyn, & Ryzhik
'Handbook of Mathematical Functions', Abramowitz & Stegun
NIST Digital Library of Mathematical Functions: <https://dlmf.nist.gov>
'A first course in computational physics', DeVries & Hasbun
'Numerical Recipes: The Art of Scientific Computing', W. H. Press *et al.*

Course outline

1. Basic Principles of Newtonian Mechanics
2. Lagrange's Equations
3. Central Force Problems, Scattering
4. Hamilton's Equations of Motion, Canonical Transformations
5. Hamilton-Jacobi Theory
6. Dynamical Systems and Chaos
7. Special Relativity

Guidelines for homework

1. To successfully complete this course, you need to practice what we discuss in class by carefully working through all assigned problems.
2. I encourage you to discuss homework assignments in small groups. However, I require that you write down all homework solutions on your own and return them to me in class at the assigned due dates. Only hand in what you understand and are able to reproduce and defend in case I contact you. You will receive no credit for solutions that you have copied and partial credit for incomplete solutions.
3. To obtain full credit, you must present correct answers in a professional, well-organized, and readable manner.
4. Clearly state which references, such as scientific papers, integral tables, books, online resources, etc., you have used to complete the assignments.
5. Once you have completed a problem, sit back, relax, and think about your result in every possible way. Does it make sense? Are there related phenomena? What happens if you change parameters? Does the problem simplify for certain limiting cases? Are the techniques used really new to you or have you already applied them to solve other problems (which ones)?
6. In addition to the “for credit” homework assignments, I will occasionally ask you in class to complete simple calculations that we cannot discuss in all detail. These assignments will not be graded, but it is important that you carefully “fill in” these gaps when reviewing your lecture notes. This is done most efficiently **before** the subsequent lecture.

Exams and grading

There will be two in-class and one final exam. You have to attend the final exam to pass this course. All exams will be held in CW 146 unless announced otherwise. Exam and homework problems may be related to appropriate recent physics colloquia.

	Points	Grade	Points
Exam 1	200	A	> 849
Exam 2	200	B	700-849
Final exam	300	C	550-699
Homework	300	D	450-549
Total	1000	F	< 450

K-State Course Syllabi Statements

1. Academic Honesty: Kansas State University has an Honor and Integrity System based on personal integrity, which is presumed to be sufficient assurance that, in academic matters, one's work is performed honestly and without unauthorized assistance. Undergraduate and graduate students, by registration, acknowledge the jurisdiction of the Honor and Integrity System. The policies and procedures of the [Honor and Integrity System](#) apply to all full and part-time students enrolled in undergraduate and graduate courses on-campus, off-campus, and via distance learning. A component vital to the Honor and Integrity System is the inclusion of the Honor Pledge which applies to all assignments, examinations, or other course work undertaken by students. The Honor Pledge is implied, whether or not it is stated: "On my honor, as a student, I have neither given nor received unauthorized aid on this academic work." A grade of XF can result from a breach of academic honesty. The F indicates failure in the course; the X indicates the reason is an Honor Pledge violation.

2. Students with Disabilities: At K-State it is important that every student has access to course content and the means to demonstrate course mastery. Students with disabilities may benefit from services including accommodations provided by the Student Access Center. Disabilities can include physical, learning, executive functions, and mental health. You may register at the Student Access Center (k-state.edu/accesscenter); to learn more contact: Manhattan/Olathe/Global Campus – Student Access Center [accesscenter@k-state.edu, 785-532-6441]. Students already registered with the Student Access Center please request your Letters of Accommodation early in the semester to provide adequate time to arrange your approved academic accommodations. Once SAC approves your Letter of Accommodation it will be e-mailed to you, and your instructor(s) for this course. Please follow up with your instructor to discuss how best to implement the approved accommodations.

3. Expectations for Classroom Conduct: All student activities in the University, including this course, are governed by the [Student Judicial Conduct Code](#) as outlined in the Student Governing Association [By Laws](#), Article V, Section 3, number 2. Students who engage in behavior that disrupts the learning environment may be asked to leave the class.

4. Mutual Respect and Inclusion in K-State Teaching and Learning Spaces: At K-State, faculty and staff are committed to creating and maintaining an inclusive and supportive learning environment for students from diverse backgrounds and perspectives. K-State courses, labs, and other virtual and physical learning spaces promote equitable opportunity to learn, participate, contribute, and succeed, regardless of age, race, color, ethnicity, nationality, genetic information, ancestry, disability, socioeconomic status, military or veteran status, immigration status, Indigenous identity, gender identity, gender expression, sexuality, religion, culture, as well as other social identities.

Faculty and staff are committed to promoting equity and believe the success of an inclusive learning environment relies on the participation, support, and understanding of all students. Students are encouraged to share their views and lived experiences as they relate to the course or their course experience, while recognizing they are doing so in a learning environment in which all are expected to engage with respect to honor the rights, safety, and dignity of others in keeping with the K-State Principles of Community <https://www.k-state.edu/about/values/community/>.

If you feel uncomfortable because of comments or behavior encountered in this class, you may bring it to the attention of your instructor, advisors, and/or mentors. If you have questions about how to proceed with a confidential process to resolve concerns, please contact the Student Ombudsperson Office. Violations of the [student code of conduct](#) can be reported here: <https://www.k-state.edu/sga/judicial/student-code-of-conduct.html>.

5. Discrimination, Harassment, and Sexual Harassment: Kansas State University is committed to maintaining academic, housing, and work environments that are free of discrimination, harassment, and sexual harassment. Instructors support the University's commitment by creating a safe learning environment during this course, free of conduct that would interfere with your academic opportunities. Instructors also have a [duty to report](#) any behavior they become aware of that potentially violates the University's policy prohibiting discrimination, harassment, and sexual harassment ([PPM 3010](#)).

If a student is subjected to discrimination, harassment, or sexual harassment, they are encouraged to make a non-confidential report to the University's [Office of Civil Rights and Title IX \(OCR & TIX\)](#) using the [online reporting form](#). Incident disclosure is not required to receive resources at K-State. Reports that include domestic and dating violence, sexual assault, or stalking, should be considered for reporting by the complainant to the [Kansas State University Police Department](#) or the [Riley County Police Department](#). Reports made to law enforcement are separate from reports made to OCR & TIX. A complainant can choose to report to one or both entities. Confidential support and advocacy can be found with the [K-State Center for Advocacy, Response, and Education \(CARE\)](#). Confidential mental health services can be found with [Lafene Counseling and Psychological Services \(CAPS\)](#). Academic support can be found with the [Student Support and Accountability \(SSA\)](#). SSA is a non-confidential resource. OCR & TIX also provides a [comprehensive list of resources](#) on their website. If you have questions about non-confidential and confidential resources, please contact OCR & TIX at civilrights@k-state.edu or (785) 532-6220.

7. Academic Freedom: Kansas State University is a community of students, faculty, and staff who work together to discover new knowledge, create new ideas, and share the results of their scholarly inquiry with the wider public. Although new ideas or research results may be controversial or challenge established views, the health and growth of any society requires frank intellectual exchange. Academic freedom protects this type of free exchange and is thus essential to any university's mission.

8. Artificial Intelligence (AI): You may use AI tools only to assist your learning in this course, including idea generation and grammar assessments for written assignments. However, you are prohibited from using generative AI tools to manufacture homework solutions without dominant personal intellectual effort or without being able to understand and defend in every detail solutions you submit. If you choose to use AI, you are expected to provide a citation for it using the following format: "Title of AI Tool. Brief description of the search topic." Using an AI tool to generate assignment content without proper attribution would be a violation of the [K-State Honor Pledge](#).