



PHY 3220
Classical Mechanics
81885 001
Fall 2026

Instructor Name

Hari Srikanth

University Course Description

Topics covered: Newtonian mechanics, oscillatory motion, gravitation, Lagrangian and Hamiltonian Dynamics, Central-Force Motion, Dynamics of a System of Particles, Dynamics of Rigid Bodies, and Non-linear and coupled oscillations.

Course Requisites

Prerequisite(s):

(PHY 3101 Minimum Grade: C-
and PHZ 3113 Minimum Grade: C-)

Corequisite(s):

Course Format

Instruction consists of:

- Interactive lectures twice per week
- Weekly problem-solving sessions
- Periodic homework assignments
- Two in-class examinations

- Comprehensive final examination

Course materials, announcements, homework, and lecture notes will be distributed through Canvas. Students are expected to check Canvas regularly.

Student Learning Outcomes

Upon successful completion of this course, students will be able to:

1. Apply vector calculus and mathematical methods used in classical mechanics.
2. Analyze the motion of particles using Newtonian mechanics.
3. Solve problems involving oscillatory motion and gravitation.
4. Apply conservation laws to physical systems.
5. Use the calculus of variations and Hamilton's Principle to derive equations of motion.
6. Formulate and solve problems using Lagrangian and Hamiltonian mechanics.
7. Analyze central-force motion and orbital dynamics.
8. Investigate the dynamics of systems of particles and rigid bodies.
9. Solve problems involving coupled oscillations.
10. Communicate complete, logical, and mathematically rigorous solutions to physics problems.

Course Objectives

This course provides students with a rigorous foundation in classical mechanics through the study of Newtonian mechanics, oscillations, gravitation, variational methods, Lagrangian and Hamiltonian dynamics, central-force motion, systems of particles, rigid body dynamics, and coupled oscillations. Emphasis is placed on developing analytical problem-solving skills, mathematical reasoning, and the ability to apply physical principles to increasingly complex mechanical systems. The course prepares students for advanced undergraduate and graduate studies in physics.

Required Texts and/or Readings and Course Materials

Required Textbook

Thornton, S. T., & Marion, J. B. *Classical Dynamics of Particles and Systems* (5th Edition).

Supplementary (Optional) Texts and Materials

Recommended References

- John R. Taylor, *Classical Mechanics*
- David Morin, *Introduction to Classical Mechanics: With Problems and Solutions*
- M. Spiegel, *Schaum's Outline of Vector and Tensor Analysis*

How to Succeed in this Course

Student Success Tips

To succeed in this course, students should:

- Attend every lecture and problem-solving session.
- Read the assigned textbook before class.
- Complete homework independently and on time.
- Practice solving problems regularly rather than simply reading solutions.
- Make effective use of office hours (TA and instructor) whenever questions arise.
- Review lecture notes promptly after each class.

Grading Scale

If you score....	Your grade will be...
Above 95	A+
Between 90 and 95	A
Between 85 and 90	A-
Between 80 and 85	B+
Between 75 and 80	B
Between 70 and 75	B-
Between 65 and 70	C+
Between 60 and 65	C
Between 55 and 60	C-

If you score....	Your grade will be...
Between 50 and 55	D+
Between 45 and 50	D
Between 40 and 45	D-
Below 40	F

Grade Categories and Weights

Your final course grade will be based on:

Assessment	Weight
Homework	20%
Two Midterm Tests	50%
Comprehensive Final Exam	30%

Instructor Feedback Policy & Grade Dissemination

Instructor Feedback

Homework assignments will typically be graded and returned within **one week** of the due date, depending on class size and university holidays. Examinations will normally be graded and returned within **7–10 days**. Students are encouraged to review feedback carefully and seek clarification during office hours if they have questions about graded work or course material. Email inquiries will generally receive a response within **one business day** (excluding weekends, holidays, and university closures).

Grade dissemination

Grades for homework, examinations, and other assessments will be posted in the Canvas Gradebook as they become available. Students are responsible for monitoring their grades throughout the semester and contacting the instructor promptly regarding any discrepancies. Final course grades will be assigned according to the grading scale described in the syllabus and submitted through the university's official grading system at the end of the semester.

Major Topics and Course Schedule

Chapters and Topics:

1. Chap. 1: Matrix, Vectors, and Vector Calculus;

2. Chap. 2: Newtonian mechanics;
3. Chap. 3: Oscillations;
4. Chap. 4: Gravitation;
5. Chap. 5: Some methods in the calculus of variations;
6. Chap. 6: Hamilton's Principle – Lagrangian and Hamiltonian Dynamics;
7. Chap. 7: Central-Force Motion;
8. Chap. 8: Dynamics of a System of Particles;
9. Chap. 10: Dynamics of Rigid Bodies;
10. Chap. 11: Coupled Oscillations;

Note that some topics in these chapters are optional and also the emphasis on sections vary. The order in which the material is discussed in the lectures is also determined by the instructor. Tests will be only on material taught in class.

Tentative schedule

Aug 24 to Sep 30 -Chapters 1 - 4

Oct 5 to Oct 28 -Chapters 5 - 7

Nov 2 to Nov 30 -Chapters 8,10,11

USF Core Syllabus Policies

USF has a set of central policies related to student recording class sessions, academic integrity and grievances, student accessibility services, academic disruption, religious observances, academic continuity, food insecurity, pregnancy and related conditions, and sexual harassment that **apply to all courses at USF**. Be sure to review these online:

<https://www.usf.edu/provost/faculty-success/resources-policies-forms/core-syllabus-policy-statements.aspx>

Student Recordings

Florida Statute 1004.097 Free Expression on Campus

Students may, without prior notice, record video or audio of a class lecture for a class in which the student is enrolled for their own personal, educational use (USF Policy 10-048). A class lecture is defined as a formal or methodical oral presentation as part of a

university course intended to present information or teach enrolled students about a particular subject. Recording class activities other than class lectures, including but not limited to lab sessions, student presentations (whether individually or part of a group), class discussion, clinical presentations such as patient history, academic exercises involving student participation, test or examination administrations, field trips, private conversations between students in the class or between a student and the faculty member is prohibited. Recordings may not be used as a substitute for class participation and class attendance and may not be published or shared without the written consent of the faculty member. Failure to adhere to these requirements may constitute a violation of the USF Student Conduct Code.

Course Policies: Grades

Attendance:

Class attendance will be taken regularly and will have an impact on the course grade. Best practices to do well include maintaining regular attendance in the lectures as well as problem solving sessions, following the instructor attentively and taking notes in class. Missing more than 25% of the classes will have an adverse impact on the grades and might necessitate a mandatory meeting with the instructor before the final course grade is assigned.

Problem Solving Session:

The problem solving class on Fridays is very important and meant to help students do well in the course. Note that there will not be much time during regular class lectures for solving problems. Thus students should take advantage of the Friday sessions.

Homework:

Homework will be periodically assigned and collected and accounts for 20% of the final grade. **Students should strictly observe deadlines for turning in homework.**

Make Up Policy: There will be **no make-up tests.** Only exceptions will be any emergency situations with proper documented justification

Notes or Tapes: Are not permitted for the purposes of sale.

Religious Preference Absence Policy: Students who anticipate the necessity of being absent from class due to the observation of a major religious observance must provide advance notice of the date(s) to the instructor, in writing.

Students with disability: Any student with a disability is encouraged to meet with the instructor privately during the first week of class to discuss accommodations. Each student must bring a current **Memorandum of Accommodations** from the Office of Student Disability Services (974-4309, SVC1133) which is prerequisite for receiving accommodations. Accommodated examinations through the Office of Student Disability Services require two weeks notice. All course documents are available in alternate format if requested in the student's **Memorandum of Accommodations**.

Grades of "Incomplete"

The current university policy concerning incomplete grades will be followed in this course. For undergraduate courses: An "I" grade may be awarded to a student only when a small portion of the student's work is incomplete and only when the student is otherwise earning a passing grade. The time limit for removing the "I" is to be set by the instructor of the course. For undergraduate students, this time limit may not exceed two academic semesters, whether or not the student is in residence, and/or graduation, whichever comes first. For graduate students, this time limit may not exceed one academic semester. "I" grades not removed by the end of the time limit will be changed to "IF" or "IU," whichever is appropriate.

Campus Free Expression

It is fundamental to the University of South Florida's mission to support an environment where divergent ideas, theories, and philosophies can be openly exchanged and critically evaluated. Consistent with these principles, this course may involve discussion of ideas that you find uncomfortable, disagreeable, or even offensive.

In the instructional setting, ideas are intended to be presented in an objective manner and not as an endorsement of what you should personally believe. "Objective" means that the idea(s) presented can be tested by critical peer review and rigorous debate, and that the idea(s) is supported by credible research.

In this course you may be asked to engage with complex ideas and to demonstrate an understanding of the ideas. Understanding and engaging with an idea does not require you to believe it or to agree with it.

Course Policies: Technology and Media

PHY 3220 on CANVAS: Course-related materials such as handouts, lecture notes, homework assignments will be posted on CANVAS accessible to registered students. **Please check the course web pages regularly for updates.** A broadcast e-mail will be sent whenever new material is added to the web site. Note that the lecture notes posted may not be exhaustive and cover everything discussed in class. You should be prepared to supplement it with your own notes.

Course Policies: Student Expectations

Health and Wellness

Your health is a priority at the University of South Florida. We encourage members of our community to look out for each other and to reach out for help if someone is in need. If you or someone you know is in distress, please make a referral at www.usf.edu/sos so that the Student Outreach & Support can contact and provide helpful resources to the student in distress. A 24-hour licensed mental healthcare professional, offered through the counseling center, is available by phone at 813-974-2831, option 3. Please remember that asking for help is a sign of strength. In case of emergency, please dial 9-1-1.

Title IX Policy

USF is committed to fostering a safe and respectful learning environment, free from sex discrimination and sexual harassment, in accordance with Title IX and USF Policy 0-004. If a student shares an experience of sexual harassment, sexual assault, stalking, or relationship violence with a USF employee (including faculty), that employee will notify the Title IX Office. This allows the Title IX Office to send the student an email with information about support resources and options—if it is safe to do so. Students are not required to respond to this email. The Title IX Office is a private resource. Information is shared only on a need-to-know basis to provide students with support measures. To speak to a confidential resource, students may contact USF Center for Victim Advocacy at 813-974-5757. Confidential resources do not notify the Title IX Office unless the student requests it. For more information about Title IX, available resources, or to make a report, please visit www.usf.edu/title-ix.

Course Hero / Chegg Policy

The USF Policy on Academic Integrity specifies that students may not use websites that enable cheating, such as by uploading or downloading material for this purpose. This does apply specifically to Chegg.com and CourseHero.com – almost any use of these websites (including uploading proprietary materials) constitutes a violation of the academic integrity policy.

Professionalism Policy

Per university policy and classroom etiquette; mobile phones, iPods, etc. must be silenced during all classroom and lab lectures. Those not heeding this rule will be asked to leave the classroom/lab immediately so as to not disrupt the learning environment. Please arrive on time for all class meetings. Students who habitually disturb the class by talking, arriving late, etc., and have been warned may suffer a reduction in their final class grade.

Turnitin.com

In this course, turnitin.com may be utilized. Turnitin is an automated system which instructors may use to quickly and easily compare each student's assignment with billions of web sites, as well as an enormous database of student papers that grows with each submission. Accordingly, you may be expected to submit all assignments in both hard copy and electronic format. After the assignment is processed, as instructor I receive a report from turnitin.com that states if and how another author's work was used in the assignment. For a more detailed look at this process visit <http://www.turnitin.com>.

Netiquette Guidelines

- Act professionally in the way you communicate. Treat your instructors and peers with respect, the same way you would do in a face-to-face environment. Respect other people's ideas and be constructive when explaining your views about points you may not agree with.
- Be sensitive. Be respectful and sensitive when sharing your ideas and opinions. There will be people in your class with different linguistic backgrounds, political and religious beliefs or other general differences.
- Proofread and check spelling. Doing this before sending an email or posting a thread on a discussion board will allow you to make sure your message is clear and thoughtful. Avoid the use of all capital letters, it can be perceived as if you are shouting, and it is more difficult to read.
- Keep your communications focused and stay on topic. Complete your ideas before changing the subject. By keeping the message on focus you allow the readers to easily get your idea or answers they are looking for.
- Be clear with your message. Avoid using humor or sarcasm. Since people can't see your expressions or hear your tone of voice, meaning can be misinterpreted.

Email and Discussion Board Guidelines

- Use the subject line effectively by using a meaningful line of what your email or discussion is about.
- Keep your emails and postings related to the course content. You should not post anything personal on a discussion board unless it is requested by the instructor.
- Any personal, course or confidential issues should be directly communicated to the instructor via email. The discussion boards are public spaces; therefore, any issues should not be posted there.

End of Semester Student Evaluations

All classes at USF make use of an online system for students to provide feedback to the University regarding the course. These surveys will be made available at the end of the semester, and the University will notify you by email when the response window opens. Your participation is highly encouraged and valued.

Food and Drink Policy (for in-campus sessions only).

Please adhere to the firm policy of no beverages (other than bottled/capped water), food, tobacco products, or like items in the classroom. Your understanding of the necessity for this policy and cooperation will be greatly appreciated. This policy will be strictly enforced.

Learning Support and Campus Offices

Academic Accommodations

Students with disabilities are responsible for registering with Student Accessibility Services (SAS) in order to receive academic accommodations. For additional information about academic accommodations and resources, you can visit the SAS website.

[SAS website for the Tampa campus and Sarasota-Manatee Teachout site.](#)

[SAS website for the St. Pete campus.](#)

Academic Support Services

The USF Office of Student Success coordinates and promotes university-wide efforts to enhance undergraduate and graduate student success. For a comprehensive list of academic support services available to all USF students, please visit the [Office of Student Success website](#).

Canvas Technical Support

If you have technical difficulties in Canvas, you can find access to the Canvas guides and video resources in the “Canvas Help” page on the homepage of your Canvas course. You can also contact the help desk by calling 813-974-1222 in Tampa or emailing help@usf.edu.

[USF IT Services](#)

Center for Victim Advocacy

The [Center for Victim Advocacy](#) empowers survivors of crime, violence, or abuse by promoting the restoration of decision making, by advocating for their rights, and by offering support and resources. Contact information is available online.

Counseling Center

The Counseling Center promotes the wellbeing of the campus community by providing culturally sensitive counseling, consultation, prevention, and training that enhances student academic and personal success. Contact information is available online.

[Counseling Center website for the Tampa campus and Sarasota-Manatee Teachout site.](#)

[Counseling Center website for the St. Pete campus.](#)

Tutoring

The Tutoring Hub offers free tutoring in several subjects to USF undergraduates. Appointments are recommended, but not required. For more information, email asctampa@usf.edu.

[Tutoring website for the Tampa campus and Sarasota-Manatee Teachout site.](#)

[Tutoring website for the St. Pete campus.](#)

Writing Studio

The Writing Studio is a free resource for USF undergraduate and graduate students. At the Writing Studio, a trained writing consultant will work individually with you, at any point in the writing process from brainstorming to editing. Appointments are recommended, but not required. For more information or to make an appointment, email: writingstudio@usf.edu.

[Writing studio website for the Tampa campus and Sarasota-Manatee Teachout Site.](#)

[Writing studio website for the St. Pete campus.](#)

Student Ombuds Office

Florida Statute 1006.51 and Florida Board of Governors Regulation 6.011 require that all public institutions provide ombuds services to students. The Student Ombuds Office at USF is a confidential, impartial, informal, and independent resource for students experiencing challenges related to the university. Ombuds can help students safely explore options, clarify processes, and consider next steps. [Learn more or make an appointment at usf.edu/student-ombuds.](https://usf.edu/student-ombuds)