# Phys 2425.001 Advanced Physics I Online

**Course Syllabus:** Summer 2020

***"Northeast Texas Community College exists to provide personal, dynamic learning experiences empowering students to succeed."***


## Instructor: Mr. Mark Ellermann II

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| Office Hours | Monday | Tuesday | Wednesday | Thursday | Friday |
|---|---|---|---|---|---|
| | 1 – 3 pm Online | 1 – 3 pm Online | 1 – 3 pm Online | 1 – 3 pm Online | 1 – 3 pm Online |

***This syllabus serves as the documentation for all course policies and requirements, assignments, and instructor/student responsibilities.***

*Information relative to the delivery of the content contained in this syllabus is subject to change. Should that happen, the student will be notified.*

**Course Description:** Advanced Physics I is a calculus-based course intended for students majoring in computer science, engineering, mathematics, physics, or related fields of study. Topics include 1-D motion, 2-D motion, rotational motion, Newton's laws, energy, momentum, equilibrium, gravity, oscillatory motion, waves, and heat.
Four hours credit.

**Prerequisite(s):** MATH 2413 ( C or better )

**Student Learning Outcomes:**
Upon successful completion of this course, students will

2425.1 Determine the components of linear motion (displacement, velocity, and acceleration), and especially motion under conditions of constant acceleration.

2425.2 Apply Newton's Laws to physical problems and solve problems involving forces and work.

2425.3 Identify the different types of energy and solve problems using principles of conservations of energy.

2425.4 Define the principles of impulse, momentum, and collisions and use the principles to solve problems involving momentum.

2425.5 Discuss rotational kinematics and dynamics and the relationship between linear and rotational motion, including center of mass and center of rotation, and use these concepts to solve problems involving rotational and linear motion.

2425.6 Define equilibrium, including the different types of equilibrium.

2425.7 Discuss simple harmonic motion and its application to real-world problems.

2425.L1 Prepare laboratory reports that clearly communicate experimental information in a logical and

scientific manner and evaluate the accuracy of physical measurements and potential sources of error in measurements.

2425.L2 Relate physical observations and measurements involving classical mechanics to theoretical principles.

2425.L3 Design fundamental experiments involving principles of classical mechanics.

**Core Curriculum Purpose and Objectives:**
Through the core the core curriculum, students will gain a foundation of knowledge of human cultures and the physical and natural world; develop principles of personal and social responsibility for living in a diverse world; and advance intellectual and practical skills that are essential for all learning.

Courses in the foundation area of mathematics focus on quantitative literacy in logic, patterns, and relationships. In addition, these courses involve the understanding of key mathematical concepts and the application of appropriate quantitative tools to everyday experience.

**College Student Learning Outcomes:**
Critical Thinking Skills
**CT.1** Students will demonstrate the ability to 1) analyze complex issues, 2) synthesize information, and 3) evaluate the logic, validity, and relevance of data.

Communication Skills
**CS.1** Students will effectively develop, interpret and express ideas through written communication.

Empirical and Quantitative Skills
**EQS.1** Students will manipulate numerical data or observable facts by organizing and converting relevant information into mathematical or empirical form.

**EQS.2** Students will analyze numerical data or observable facts by processing information with correct calculations, explicit notations, and appropriate technology.

**EQS.3** Students will draw informed conclusions from numerical data or observable facts that are accurate, complete, and relevant to the investigation.

Teamwork
**TW.2** Students will work with others to support and accomplish a shared goal.

**Evaluation/Grading Policy:**
The cumulative average of your homework (via WebAssign), Blackboard quizzes, and discussion forums will represent 25% of your total grade. WebAssign homework is automatically graded, as are the Blackboard quizzes. Discussion forums will be graded at the end of each week. Late assignments will be given a grade of 0.

Laboratory work and assignments will represent 20% of your grade. Labs consist of three parts: Pre-lab, lab work, and post-lab. Pre-labs will be due when lab begins. If you do not complete the pre-lab before you arrive, you will not be allowed to stay. Lab work will be turned in with your post-lab at the end of the lab period. If the post-lab involves a lab report, it will be due when you arrive at lab the following week. All lab parts will be graded and returned to you by the end of lab the following week. Failure to turn in a lab assignment on time will result in a 0 for that assignment.

There will be three (3) exams during the semester and one mandatory final exam. The cumulative average of all exams will represent 50% of your total grade. Your test will consist of a multiple choice part and a show-your-work part. The multiple choice part will be 10 questions assessed at 5 points per question. The show-your-work part will be worth 60 points total and will vary from 3-5 questions depending on the material. These questions WILL require calculation and critical thinking skills. Exams will be graded at least one week after the exam date. Make-up exams will not be given unless the student has coordinated with the instructor prior to the exam.

You will also be expected to spend at least one (1) hour each week in SI tutoring. Your attendance in SI tutoring will be counted as 5% of your final grade. If you happen to miss one week of tutoring, you can make it up at a rate of 2:1 (2 hours extra will forgive 1 hour missed). If you have extenuating circumstances that absolutely will not allow you to make this requirement, please meet with me personally to discuss the issue.

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|---|---|
| **Homework/Quizzes** | 25% |
| **Lab Grade** | 25% |
| **Exams** | 50% |
| **Total** | **100%** |

This course uses a traditional letter-grade system as follows. Percentages will be rounded to the nearest whole value.:

| | |
|---|---|
| **A** | (90% - 100%) |
| **B** | (80% - 89%) |
| **C** | (70% - 79%) |
| **D** | (60% - 69%) |
| **F** | ( < 60% ) |

**Required Instructional Materials:**
You will need *Physics for Scientists and Engineers, 10th Ed.* for this course. This text is included in your Inclusive Access bundle, which was part of your course fees (if you want to 'opt-out' of this program, you can do so at the Inclusive Access link in Blackboard during the first week of class). If you prefer to have a paper copy, you can ask for an 'upgrade' at the NTCC bookstore, or order your own online.

You will also need a scientific calculator for this course. A graphing calculator is recommended.

**Publisher:** Cengage **ISBN Number:** 978-1-337-55327-8

**Optional Instructional Materials:**
If you need a little more background on any topic this semester, I highly recommend *The Cartoon Guide to Physics* by Larry Gonick and Art Huffman. While this test will not be used directly in class, I have found it to help students struggling with difficult concepts.

**Minimum Technology Requirements:**
A scientific calculator is required for this course, graphing calculator is preferred. You will also need access to the Internet for your Blackboard and WebAssign work.

**Required Computer Literacy Skills**:
You will need to be able to navigate Blackboard and WebAssign to access your online work. Also, you will need to use a word processor to type lab reports.

**Course Structure and Overview:**
This is a 10-week online course consisting of Blackboard and WebAssign online work and assignments, remote lecture, and at-home lab (by home materials and virtual simulations). A typical week will start with preliminary video(s) and quiz covering basic information, difficult material discussed in lecture, and concepts explored in lab. Lecture will be a mixture of new information and time to work difficult problems. Expect to work with others in class. Labs will match the topic discussed in lecture during the same week.

**Communications:**
Email will be responded to within 24 hours IF SENT SUNDAY-THURSDAY. No sensitive information will be sent to a non-NTCC email address.

**Institutional/Course Policy:**
Late work will not be accepted without prior approval by the instructor. Students and instructor are expected to treat each other with respect in all communications. Keep up with online preliminary assignments as well as homework, as the preliminary assignment will prepare you for lecture, and the homework will give you practice.

**NTCC Academic Honesty/Ethics Statement:**
NTCC upholds the highest standards of academic integrity. The college expects all students to engage in their academic pursuits in an honest manner that is beyond reproach using their intellect and resources designated as allowable by the course instructor. Students are responsible for addressing questions about allowable resources with the course instructor. Academic dishonesty such as cheating, plagiarism, and collusion is unacceptable and may result in disciplinary action. This course will follow the NTCC Academic Honesty and Academic Ethics policies stated in the Student Handbook. Refer to the student handbook for more information on these subjects.

**ADA Statement:**
It is the policy of NTCC to provide reasonable accommodations for qualified individuals who are students with disabilities. This College will adhere to all applicable federal, state, and local laws, regulations, and guidelines with respect to providing reasonable accommodations as required to afford equal educational opportunity. It is the student's responsibility to request accommodations. An appointment can be made with the Academic Advisor/Coordinator of Special Populations located in Student Services and can be reached at 903-434-8264. For more information and to obtain a copy of the Request for Accommodations, please refer to the special populations page on the NTCC website.

**Family Educational Rights and Privacy Act (FERPA)**:
The Family Educational Rights and Privacy Act (FERPA) is a federal law that protects the privacy of student education records. The law applies to all schools that receive funds under an applicable program of the U.S. Department of Education. FERPA gives parents certain rights with respect to their children's educational records. These rights transfer to the student when he or she attends a school beyond the high school level. Students to whom the rights have transferred are considered "eligible students." In essence, a parent has no legal right to obtain information concerning the child's college records without the written consent of the student. In compliance with FERPA, information classified as "directory information" may be released to the general public without the written consent of the student unless the student makes a request in writing. Directory information is defined as: the student's name, permanent address and/or local address, telephone listing, dates of attendance, most recent previous education institution attended, other information including major, field of study, degrees, awards received, and participation in officially recognized activities/sports.

**Tentative Course Timeline (*note* instructor reserves the right to make adjustments to this timeline at any point in the term):**

# Course Schedule

| Week | Unit | Online | Lecture | Lab |
|---|---|---|---|---|
| 1 | Units and Sig figs | Sig fig rules, review of derivatives and integrals, units in physics, scalar vs vector va+A3:E14lues (identify) | Review derivatives and integrals, Unit conversions, using units to support mathematical results, scalars vs vectors from a mathematical perspective. | Lab 1 Units and Significant Digits |
| 2 | 1-D Motion | Relate kinematic equations by derivatives and integrals, solve kinematic equations, solve freefall, using particle approximation | Relate kinematic equations by derivatives and integrals, solve 1-D for two objects, solve freefall,constant and non-constant acceleration (EXAM) | Lab 2 – 1-D Motion<br>Lab 3 – Freefall |
| 3 | Vector Mathematics | Representing vectors in polar and Cartesian, add/subtract vectors | dot product, cross product | Lab 4 – Vectors in 2-D |
| 4 | 2-D Motion | solving 2-D with parametric equations, vectors to solve 2-D, circular motion, tangential vs radial acceleration | circular motion, tangential vs radial acceleration | Lab 5 – Projectile motion |
| 5 | Forces | define force, define Newton's laws, gravitational force, frictional force, equilibrium | Newton's laws to solve problems, gravtitational force, frictional force, circular motion forces (EXAM) | Lab 6 – Determining Friction |
| Spring Break | | | | |
| 6 | Forces | define force, define Newton's laws, gravitational force, frictional force, equilibrium | Newton's laws to solve problems, gravtitational force, frictional force, circular motion forces (EXAM) | Introducing the Lab Practical |
| 7 | Energy | define energy, total vs mechanical energy, work done by force, conservative vs. non conservative forces, energy diagrams, equilibrium in energy, define power | energy diagrams, using conservation of energy, solve problems with energy diagrams, varying gravitational field | Lab 7 – Using Conservation of Energy |
| 8 | Linear Momentum | inelastic vs elastic collisions, center of mass, motion of center of mass | solve using conservation of momentum, motion of center of mass, rocket propulsion | Lab 8 – Collisions in 1-D |
| 9 | Angular Momentum | calculate mass moment of inertia, define angular momentum, relate moment of inertia to rotational energy, transfer of energy by colinear and coaxial methods. | calculate mass moment of inertia, angular momentum as a result of angular collisions, and total momentum after free collision, transfer of energy by colinear and coaxial methods (EXAM) | Lab 9 – Torque<br>Lab 10 – Rotational Intertia<br>**Lab Practical** |
| 10 | Oscillations | define oscillation, describe SHO, energy in SHO | oscillatory motion, solve SHO pendulum, solve SHO damped, solve SHO forced | Lab 11 – Pendulum Swing |
| 10 | | | Final Exam | No Lab |