

Master Course Syllabus

Course Discipline and Number: PHSC211

Year: 2025-2026

Course Title: Physics I (Mechanics and Heat)

Credit Hours: 4

I. Course Description: This is the first semester of an integrated two semester, calculus-based, physics sequence. Topics include motion, static and dynamic systems, conservation of energy and momentum, rotation, elasticity, harmonic motion, fluid mechanics, heat, heat transfer, and thermodynamics. The laboratory will emphasize techniques of error analysis and graphical analysis. PHSC211 fulfills the SUNY General Education Natural Sciences (and Scientific Reasoning) requirement. PHSC104 or NYS Regents Physics strongly recommended. A scientific calculator is required. Prerequisites: MATH201; prior completion or concurrent enrollment in ENGL100. 4 Cr. (3 Lec., 2 Lab.) Spring semester.

II. Additional Course Information:

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| 1. This first semester of an integrated two-semester sequence intended primarily for Engineering Science and other students requiring a calculus-based physics course. |
| 2. A scientific calculator is required. |

III. Student Learning Outcomes

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

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| 1. Demonstrate understanding of the basic terms and concepts in mechanics and heat. |
| 2. Solve problems involving calculus and vector mechanics (unit vectors, dot products, and cross products). |
| 3. Analyze data using error analysis. |
| 4. Use common laboratory equipment to measure, collect and record laboratory data for analysis. |
| 5. Work in groups to perform laboratory analyses, discuss, and report observations and results in writing or through oral presentations. |

IV. Tompkins Cortland Institutional Learning Outcomes; Program Learning Outcomes; SUNY General Education Competencies and Knowledge and Skills Areas

Tompkins Cortland ILOs

Complete this section for “service” courses only (e.g., courses that are required of all students; courses that are not program specific but satisfy liberal arts requirements; or commonly used in multiple academic programs to meet non-program-specific requirements). Check only Institutional Learning Outcomes (ILOs) that are meaningfully developed and assessed in this course. For each ILO chosen, include the SLO to which it aligns.

Students will:

☐ Communicate effectively, in oral and written forms, taking into consideration audience and purpose.

- ☐ Apply principles and methods of scientific inquiry and quantitative reasoning appropriate to their discipline.
- ☐ Use information, critical thinking, and the creative process to solve problems and reach conclusions.
- ☐ Use technology appropriate to their discipline.
- ☐ Describe the ways in which social, economic, or environmental sustainability depends on their own and the collective contributions of a diversity of ideas and people.

Program Learning Outcomes

Complete this section for program-specific courses (e.g., those that share the same discipline code as the academic program or satisfy requirements in related programs). List the academic program(s) here and note which Student Learning Outcomes align to specific Programmatic Learning Outcomes. Please see the MCS Instructions for more details.

Specify the Academic Program: Engineering Science A.S.

PLO #1 Apply mathematical, scientific, computing, and engineering principles to solve engineering problems and design engineering components.

SLO #2 Solve problems involving calculus and vector mechanics (unit vectors, dot products, and cross products).

PLO #2 Conduct scientific experiments, gather accurate data, interpret the relationships among variables, and use engineering judgment to draw appropriate conclusions as a result of that analysis.

SLO #3 Analyze data using error analysis.

SLO #4 Use common laboratory equipment to measure, collect and record laboratory data for analysis.

SLO #5 Work in groups to perform laboratory analyses, discuss, and report observations and results in writing or through oral presentations.

PLO #3 State laboratory processes and results in clear and precise written reports and oral presentations.

SLO #5 Work in groups to perform laboratory analyses, discuss, and report observations and results in writing or through oral presentations.

PLO #4 Use technology appropriate to current engineering practices.

SLO #5 Work in groups to perform laboratory analyses, discuss, and report observations and results in writing or through oral presentations.

PLO#5 Recognize ethical and professional responsibilities in engineering situations and make informed judgments that consider the impact of engineering solutions in global, economic, environmental, and societal contexts.

SUNY General Education Competencies

If this course assesses a SUNY GEN ED Competency, check all that apply and indicate which course outcome(s) address each checked item:

☒ CRITICAL THINKING & REASONING- Students will:

- a. clearly articulate an issue or problem;
- b. identify, analyze, and evaluate ideas, data, and arguments as they occur in their own or others' work; acknowledge limitations such as perspective and bias; and
- c. develop well-reasoned (logical) arguments to form judgments and/or draw conclusions.

Course SLO(s):

SLO #3 Analyze data using error analysis.

SLO #5 Work in groups to perform laboratory analyses, discuss, and report observations and results in writing or through oral presentations

☐ INFORMATION LITERACY - Students will:

- a. locate information effectively using tools appropriate to their need and discipline; evaluate information with an awareness of authority, validity, and bias; and demonstrate an understanding of the ethical dimensions of information use, creation, and dissemination.

Course SLO(s):

☒ SUNY GENERAL EDUCATION KNOWLEDGE AND SKILLS AREA(s): **Natural Sciences (and Scientific Reasoning)**

For courses that are approved to meet one (or more) of the ten SUNY General Education Knowledge and Skills Areas, indicate which area the course fulfills, and which outcome(s) are aligned with the SUNY outcomes for that area:

Students will demonstrate scientific reasoning applied to the natural world, including

- an understanding of the methods scientists use to explore natural phenomena, including observation, hypothesis development, measurement and data collection, experimentation, evaluation of evidence, and employment of data analysis or mathematical modeling; and
- application of scientific data, concepts, and models in one of the natural sciences.

Course SLO(s):

SLO #2 Solve problems involving calculus and vector mechanics (unit vectors, dot products, and cross products).

SLO #3 Analyze data using error analysis.

SLO #4 Use common laboratory equipment to measure, collect and record laboratory data for analysis.

SLO #5 Work in groups to perform laboratory analyses, discuss, and report observations and results in writing or through oral presentations.

☐ This course does not address any of the above Tompkins Cortland ILOs, PLOs, or SUNY General Education Competencies or Knowledge and Skills Areas.

V. Essential Topics/Themes

1. Kinematics
2. Laws of motion / circular motion
3. Work and Energy/ Potential Energy/ Conservation of Energy
4. Momentum/ Impulse/ Conservation of Momentum
5. Rotation of rigid bodies
6. Angular momentum / torque
7. Equilibrium
8. The Law of Gravity
9. Oscillatory motion
10. Elasticity / Fluid Mechanics
11. Thermodynamics
12. Labs will include: The Simple Pendulum; Acceleration of Gravity; Error Analysis; Graphical Analysis; Rolling Objects; Simple Harmonic Motion: Fluid Flow in Tubes; and Newton's Law of Cooling

VI. Methods of Assessment/Evaluation

Method	% Course Grade
1. Exams	60% 50-75%
2. Labs	20% 15-30%
3. Final Exam	20% 15-25%

VII. Texts – ☒ Required ☐ Recommended ☐ Used for more than one course (list courses)

High school instructors may consult with staff in the CollegeNow office for additional information and guidance.

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1. Physics for Scientists & Engineers with Modern Physics, 10th Edition, by Serway and Jewett. (Cengage, 2019).	☐

Editions listed are current as of date of syllabus. More recent editions may be used.

VIII. Bibliography of Supplemental Materials

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Editions listed are current as of date of syllabus. More recent editions may be used.

IX. Other Learning Resources

Audiovisual: The Mechanical Universe; Annenberg 1984

Electronic:

Other:

Attendance Policy: To maintain good grades, regular attendance in class is necessary. Absence from class is considered a serious matter and absence never excuses a student from class work. It is the responsibility of all instructors to distribute reasonable attendance policies in writing during the first week of class. Students are required to comply with the attendance policy set by each of their instructors. Students are not penalized if they are unable to attend classes or participate in exams on particular days because of religious beliefs, in accordance with Chapter 161, Section 224-a of the Education Law of the State of New York. Students who plan to be absent from classroom activity for religious reasons should discuss the absence in advance with their instructors. See college catalog for more information.

Services for Students with Disabilities: It is the College's policy to provide, on an individual basis, appropriate academic adjustments for students with disabilities, which may affect their ability to fully participate in program or course activities or to meet course requirements. Students with disabilities should contact the Coordinator of Access and Equity Services, to discuss their particular need for academic adjustments. All course materials are available in alternate formats upon request.

Academic Integrity: Every student at Tompkins Cortland Community College is expected to act in an academically honest fashion in all aspects of their academic work: in writing papers and reports, in taking examinations, in performing laboratory experiments and reporting the results, in clinical and cooperative learning experiences, and in attending to paperwork such as registration forms.

Any written work submitted by a student must be their own. If the student uses the words or ideas of someone else, they must cite the source by such means as a footnote. Our guiding principle is that any honest evaluation of a student's performance must be based on that student's work. Any action taken by a student that would result in misrepresentation of someone else's work or actions as the student's own — such as cheating on a test, submitting for credit a paper written by another person, or forging an advisor's signature — is intellectually dishonest and deserving of censure.

Several degree programs offer student learning opportunities (such as internships, field work, and clinical experiences) outside the standard classroom setting. As part of the learning process, students must understand and engage in conduct that adheres to principles guiding employment within the professional workplace. These behaviors include, but are not limited to, academic integrity, accountability, reliability, respect, use of appropriate language and dress, civility, professional ethics, honesty, and trustworthiness. Disciplinary action may be initiated for inappropriate conduct occurring while participating in any course-related project or event.