

# **Physics Mechanics- PHY K114 - COURSE SYLLABUS**

**Instructor:** Charles Mihalko

**Room:**

class B-208 lab B-208

**Class Time:** W 3:00- 4:40 pm – Section T12 (lab only)

**E-mail:**

[cmihalko@trcc.commnet.edu](mailto:cmihalko@trcc.commnet.edu)

**Class Time:** W 5:30- 9:55 pm – Section T3 & T3A (class & lab)

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## **Course Description for Physics Mechanics - PHY K114**

4 CREDIT HOURS

This course deals with the fundamental principles of classical mechanics using techniques of algebra and trigonometry. Topics covered include vectors, kinematics, translational and rotational equilibrium, Newton's laws of motion, gravitation, work, power, energy, impulse, momentum, and rotary motion. Three-hour lecture; one two-hour laboratory.

## **Course Topics/Content**

### **Classroom/Lecture (45 hours total)**

Section T3 & T3A

- I. MEASUREMENT (4 hours)
  - Metric and English Systems
  - Dimensional Analysis
  - Math/Trig Review if Needed
- II. VECTORS (4 hours)
  - Vector Components
  - Vector Addition
- III. UNIFORM MOTION (8 hours)
  - Translational Motion
  - Free Fall
  - Projectile Motion
- IV. NEWTON'S LAWS OF MOTION (10 hours)
  - Forces
  - Mass vs. Weight
  - Law of Inertia - Equilibrium with Concurrent Forces
  - Friction
  - Action - Reaction
- V. TORQUE AND ROTATIONAL EQUILIBRIUM (4 hours)
  - Center of Gravity
  - Equilibrium with Non-Concurrent Forces
- VI. POWER - WORK – ENERGY (6 hours)
  - Work - Energy Theorem
  - Kinetic Energy and Gravitational Potential Energy
- VII. IMPULSE AND MOMENTUM (3 hours)
  - Conservation of Momentum
  - Elastic and Inelastic Collisions
- VIII. CIRCULAR MOTION (6 hours)
  - Centripetal Acceleration and Force
  - Newton's Law of Gravitation
  - Moment of Inertia
  - Angular Momentum and its Conservation
- IX. Application of Mechanics to Technology

## **Physics Mechanics- PHY K114 - COURSE SYLLABUS**

### **Lab Experiments (30 hours total)**

Section T3 & T3A & T12

1. Measurement
2. Graphing
3. Vectors
4. Velocity in One Dimension
5. Projectiles - Spring Gun
6. Newton's Second Law - Air Track
7. Newton's Second Law - Atwood's Machine
8. Friction
9. Force Equilibrium (The Bird on the Wire)
10. Static Moment Equilibrium
11. Energy Conservation (Freefall)
12. Momentum Conservation
13. Rotational Motion
14. Rotational Kinetic Energy
15. Additional Lab Experiments:
  - a. The Baseball Lab (Projectiles)
  - b. Energy Conservation - The Pendulum

### **Measurable Objectives: (Classroom/Lecture/Lab)**

Section T3 & T3A & T12

The student will be able to do the following:

1. Use the SI system of measurements in the solution of physics problems.
2. Perform unit conversions and cancel units correctly during computations.
3. Round measurements, using the concepts of accuracy and precision.
4. Solve right triangles using the Pythagorean theorem and trigonometry.
5. Draw vectors and find their components using trig.
6. Add vectors graphically and by using components.
7. Identify in a one dimensional kinematics problem the known quantities and the unknown, choose the correct equation to solve for the unknown, and perform the algebraic manipulations needed to solve the equation.
8. Solve problems involving free fall in one dimension and basic projectile problems.
9. Draw a free body diagram, and state the cause of each of the forces.
10. Resolve the forces of the free body diagram into components along given coordinate axes.
11. Calculate mass from weight and the reverse in both SI and English units.
12. Apply the first condition of equilibrium and solve the resultant equations for the unknowns.
13. Find the resultant force on an object, and apply Newton's second law.
14. Calculate the friction force for an object from the coefficient and the normal force.
15. Calculate the work done on an object and relate it to the change in kinetic energy.
16. Apply the conservation of mechanical energy (KE and GPE) to solve for initial or final speeds, or change in height.
17. Apply the conservation of energy to calculate work done by friction.
18. Apply the impulse-momentum equation to impact problems.
19. Use momentum conservation to solve one-dimensional collision and explosion type problems.
20. Compute angular velocity and acceleration in degree, radian and revolution units.
21. Use the equations of circular motion to calculate initial or final angular velocities, angular acceleration or displacement.
22. Calculate tangential velocity and acceleration from the angular quantities.
23. Calculate centripetal acceleration and centripetal force, and apply the concepts to familiar situations (e.g., cars going around curves, twirling a yo yo on a string).
24. Explain the source of "centrifugal force".
25. Calculate torque on a beam subjected to more than one force.
26. Apply the second condition of equilibrium to solve problems with non-concurrent forces.
27. Given moment of inertia, calculate angular acceleration from net torque.
28. Given moment of inertia, calculate rotational kinetic energy.
29. Use energy conservation to predict which of two same-radius objects will reach the bottom of an incline first.
30. Given moment of inertia, calculate angular momentum.
31. Use the conservation of angular momentum to explain demonstrations using rotating table, hand weights, and bicycle wheel.

# Physics Mechanics- PHY K114 - COURSE SYLLABUS

## Measurable Objectives: (Lab)

Section T3 & T3A & T12

Students will be able to:

1. Read and follow written instruction
2. Assemble and use lab equipment peculiar to mechanics, including but not limited to force tables, air tracks, rotational motion apparatus and various computer-interfaced sensors (photogates, "smart pulleys", motion sensors, laser switches, etc.) as well as video motion-analysis tools..
3. Collect data in an organized fashion, noting precision of measurement and unit labels.
4. Analyze data by creating graphs (by hand and by computer, with slope and intercept, if needed) and by correctly inserting data into equations.
5. State results to the correct accuracy.
6. Calculate % error, where applicable.
7. Explain sources of error in an experiment based on the limitation of the equipment used.
8. Draw conclusions by relating their results to the appropriate physics principles.

## Required Texts/Supplies:

- *College Physics, ed. 7; Wilson and Buffa; Prentice-Hall*
- *Departmental Lab Manual for Mechanics*

## Expectations, Attendance, Grading, Due Dates, and Academic Honesty:

**Attendance-** I will take attendance at each class meeting. Because many of the ideas for out-of-class work will be discussed in detail during class, it is to your advantage to attend regularly. One or two missed classes will not impact your work negatively as long as you make up the work, but excessive absences (more than three) will most likely impact your work negatively.

### General / Due Dates:

1. *Come to class prepared to learn. We will have fun too!*
2. *Come to class prepared as if you will teach the class!*
3. *Work the sample problems in the book as you read & study the material. We will be doing a lot of math work in class, for homework, & assessments. Have paper, pencils & calculator.*
4. *Take notes as you study. Write down your questions. Try to find the answers via Internet search. Bring the questions to class. Chances are, that we all will learn from the questions.*
5. *All written work is due on the assigned date. Late work will automatically have ten percent deducted from the grade. Work over one week late will not be accepted and a grade of zero will be assigned. If you have any questions or concerns about getting your work in on time, please contact me before the due date.*
6. *Actively participate in class!*

### Methods of Evaluation:

- |  |                        |
|--|------------------------|
| • <i>Section Exams (Three Exams)</i>                         | Section T3 & T3A       |
| • <i>Quizzes / Assignments (Weekly)</i>                      | Section T3 & T3A       |
| • <i>Participation / Attendance (Weekly)</i>                 | Section T3 & T3A       |
| • <i>Laboratory (Weekly Lab Reports &amp; Participation)</i> | Section T3 & T3A & T12 |

*The final course grade will be computed according to the following formula:*

<i>Section Exams (Three Exams)</i>	<i>25%</i>	<i>Section T3 &amp; T3A</i>
<i>Quiz / Assignments / Class Participation</i>	<i>50%</i>	<i>Section T3 &amp; T3A</i>
<i>Lab Reports / Participation</i>	<i>25%</i>	<i>Section T3 &amp; T3A &amp; T12</i>
<i>Final Grade</i>	<i>100%</i>	

## **Physics Mechanics- PHY K114 - COURSE SYLLABUS**

### Grading Scale:

Letter	Percent	Letter	Percent
A	94-100	C	73-76
A-	90-93	C-	70-72
B+	87-89	D+	67-69
B	83-86	D	63-66
B-	80-82	D-	60-62
C+	77-79	F	<60

### **Class/Lecture (75% of grade):**

Section T3 & T3A

- Weekly "Exit Tickets" will be completed after the end of class. They are due Thursday Midnight. Your responses are important to help assess the understanding of the topic and what questions you might still have. You will be asked to document 3 important things we discussed in class, 2 questions you still have, and one connection to share. The lowest score will be dropped in computing your grade. Spend no more than five minutes on this assignment. (5% of grade)
- Quizzes / Assignments will be given after every class and will be due before the beginning of the following class. The lowest score will be dropped in computing your grade. This work will be open book/open notes. (45% of grade)
- Three Section Exams will be given during the semester and will be scheduled at least one week in advance. If you must be absent from an exam, consult with me BEFORE the exam is given. These exams will be open book/open notes. (25% of grade)

### **Lab (Reports & Participation) (25% of grade)**

Section T3 & T3A & T12

- Each student will turn in a lab report after each lab. The lab report will be due before the beginning of the following lab. The lowest score will be dropped in computing your grade.
- Lab reports will be neatly typed or handwritten with college level grammar and spelling. Each report should include the following sections:
  - Introduction/Objective: The purpose of the experiment, the physical phenomenon observed and the concept or numerical constant to be verified. (10%)
  - Procedure: A description of the methods and materials for the lab experiment describing the equipment and set up used to observe and investigate the objective and how the data was collected and recorded. Describe the dependent and independent variables where applicable. (20%)
  - Results: Display the data collected and the results obtained expressed as a neatly organized table of data, the mathematical models used and the calculations derived from the data, graphs of results with clearly labeled axes. Calculations used in the experiment should be included in a clear and organized manner with the proper units. (30%)
  - Discussions/Conclusions: An explanation and interpretation of the results and how they compare to the stated objective. Patterns and trends should be identified and related to supporting or refuting your hypothesis. Possible sources of errors should be discussed and the percent error from the accepted values should be indicated when appropriate. Questions related to the experiment should be included and answered as completely as possible. **This section will have the strongest determination for your grade. (40%)**

**Please remember that it is your responsibility to keep up with assignments and paper due dates as outlined by the syllabus and calendar. Contact me if you miss a class to get any handouts from the session you did not attend. If a class is cancelled for some reason, expect to do the work and turn in any papers associated with the cancelled class in the following session.**

### **Revisions to Syllabus:**

The information contained in the syllabus is subject to revision at my discretion. I will inform the class of any changes that are made. If you miss a class, check with a classmate upon your return to verify that you have the most up-to-date information.

## **Physics Mechanics- PHY K114 - COURSE SYLLABUS**

### **Campus and Class Policies:**

**Academic Integrity** - Academic integrity is essential to a useful education. Failure to act with academic integrity severely limits a person's ability to succeed in the classroom and beyond. Furthermore, academic dishonesty erodes the legitimacy of every degree awarded by the College. In this class and in the course of your academic career, present only your own best work; clearly document the sources of the material you use from others; and act at all times with honor.

**Students with disabilities**- Students with learning disabilities should contact the Learning Specialist, Matt Liscum, at 860-215-9265 or via email at [mliscum@trcc.commnet.edu](mailto:mliscum@trcc.commnet.edu) as soon as possible to ensure timely accommodations. Students with physical disabilities should contact Elizabeth Willcox at 860-215-9289 or via email at [ewillcox@trcc.commnet.edu](mailto:ewillcox@trcc.commnet.edu) to facilitate accommodations. All testing accommodations MUST be discussed with the instructor in a timely manner, that is, at least one to two class meetings prior to any scheduled test for which accommodations are needed.

**Title IX of the Education Amendments of 1972 (Title IX)** - prohibits discrimination based on sex in education programs and activities in federally funded schools at all levels. If any part of a school district or college receives any Federal funds for any purpose, all of the operations of the district or college are covered by Title IX. Title IX protects students, employees, applicants for admission and employment, and other persons from all forms of sex discrimination, including discrimination based on gender identity or failure to conform to stereotypical notions of masculinity or femininity. All students (as well as other persons) at recipient institutions are protected by Title IX – regardless of their sex, sexual orientation, gender identity, part-or full-time status, disability, race, or national origin-in all aspects of a recipient's educational programs and activities." If any student experiences sexual misconduct or harassment, and/or racial or ethnic discrimination on Three Rivers Community College Campus, or fears for their safety from a threat while on campus, please contact Vicki Baker, the Diversity Officer and Title IX Coordinator: 860-215-9208 ([vbaker@trcc.commnet.edu](mailto:vbaker@trcc.commnet.edu))

**Statement of Policy for Public Act No. 14-11: An Act Concerning Sexual Assault, Stalking and Intimate Partner Violence on Campus:** "The Board of Regents for Higher Education (BOR) in conjunction with the Connecticut State Colleges and Universities (CSCU) is committed to insuring that each member of every BOR governed college and university community has the opportunity to participate fully in the process of education free from acts of sexual misconduct, intimate partner violence and stalking. It is the intent of the BOR and each of its colleges or universities to provide safety, privacy and support to victims of sexual misconduct and intimate partner violence."

**Academic Dishonesty** - Academic integrity is essential in all aspects of college coursework and learning. I have zero tolerance for academic dishonesty. It is expected that YOU complete all your assigned ALEKS work. Communication or collaboration of ANY sort is ABSOLUTELY PROHIBITED during any exam. Academic Misconduct is punishable in a number of ways, including a score of a zero on the assignment where the cheating took place, a grade of an F in the course and/or possible censure on your permanent record. All cases of academic dishonesty will be referred to the Academic Dean. Do not let yourself come under the suspicion of academic dishonesty.)

**Withdrawal policy**- A student who finds it necessary to discontinue a course once class has met must provide written notice to the registrar. Withdrawal forms are available at the Registrar's office. No punitive "W" grades are assigned to any withdrawal requested before the unrestricted withdrawal deadline for the semester. Withdrawal requests received after this deadline must bear the signature of the instructor. No withdrawals are permitted after the last class preceding the final exam. Students who do not obtain an official withdrawal, but simply stop attending classes, run the risk of receiving an "F" grade for the course.

**Classroom Behavior**- This is a college course for committed students, and I expect you to maintain proper decorum in the classroom. Treat your fellow students with maturity and respect at all times. Extend the same attitude towards your instructor. **Immature behaviors will simply not be tolerated; if I am forced to address a behavior issue more than once, you will be asked to leave and not return to class.**

**Online learning portfolio** - All students are required to maintain an online learning portfolio in Digication that uses the college template.