PHY 4A - College Physics I
HARTNELL COLLEGE

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COURSE/UNITS:	PHY 4A / 4 units	**SEMESTER:**	Spring 2017
INSTRUCTOR:	Laura Fatuzzo	**PHONE:**	(831) 770-7017
OFFICE:		**OFFICE HRS:**	Mon, Wed: 11:00 AM-12:00 noon
EMAIL:	lfatuzzo@hartnell.edu		Fri: 10:30 AM-11:30 AM

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CLASSROOM MEETING TIMES & LOCATION
Mon, Wed 9:30 AM - 10:45 AM in Room S111
Fri 9:30 AM - 10:30 AM in Room S111

LAB-ROOM MEETING TIMES & LOCATION
PHY-4A-1151 Thu 11:00 AM - 1:50 PM in S208
PHY-4A-1152 Thu 2:00 PM - 4:50 PM in S208

CATALOG DESCRIPTION- Lectures and laboratories covering vectors, particle kinematics and dynamics, work, energy, momentum, angular momentum, conservation laws, rotation of rigid bodies, torque, Newton's Law of Gravitation, oscillations, statics, and dynamics of fluids. Required for engineering and physical science majors. Strongly recommended for math majors.

COURSE PREREQUISITE- MAT 3A: Analytic Geometry and Calculus I with a grade of "C" or better

INSTRUCTIONAL METHODOLOGY - Lecture, lab activity, individual assistance, audiovisual assistance (including Power Point or other multimedia), demonstrations, discussion, group activity.
The course requires a minimum of 12 hours per week outside of class.

REQUIRED MATERIALS

- *Physics for Scientists and Engineers with Modern Physics (w/MasteringPhys)* Edition: **4th** by Knight or earlier edition (**Mastering Physics MUST be 4th Edition**)
- Lab Manual – to be purchased in bookstore
- Scientific calculator (Lab and lecture)
- Three or four colored pencils (Lab and exams)
- Notebook for problem-solving
- Quadrille (squares, not lines) notebook (Lab)
- 15-cm clear plastic ruler and protractor (Lab)
- Glue stick (Lab)

CONTACTING INSTRUCTOR- Students are **strongly encouraged and welcomed** to come for help during office hours and/or to contact the instructor via email with any questions or concerns regarding the class. There is no such thing as silly questions, and if they do exist, they are welcomed.

COURSE CALENDAR- Please go to the Classroom Blog for the calendar: **lfphysicsblog.wordpress.com**

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CAMPUS SAFETY

EMERGENCY NOTIFICATION: In the event of a life threatening emergency call 911.To report a non-life threatening incident, safety hazard, or a suspicious activity please contact campus security at 755-6888.
To obtain campus status information, call the campus safety and facilities emergency status bulletin telephone number: 831-796-6222. From a campus line, simply dial 6222

Please visit Hartnell's emergency reporting link here: http://www.hartnell.edu/reporting-emergencies
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Students: If you receive an emergency notification while you are in class, please notify your instructor immediately.

During a campus emergency, you will generally be told to do one of two options, SHELTER IN PLACE or EVACUATE. When either of these are given, vehicle traffic coming onto campus will likely be turned away. Students are required to obey the directions of staff in a timely fashion.

EVACUATION: Please note the exit(s) in the room. In the event of an alarm or safety threat, uniformed Hartnell personnel equipped with two-way radios--including security, and maintenance staff--have up-to-date information; they also have the authority to order either shelter-in-place or immediate building evacuation. For evacuation, immediately heed their directions by proceeding calmly and quickly to an exterior assembly area as indicated by trained staff. Please stay back at least 200 feet from any building until the “all clear” command is issued.

SHELTER IN PLACE: In the event of a safety threat, instructors and staff will lock classroom doors and direct occupants to stay clear of windows. Occupants are requested to remain quiet. During this time, DO NOT access any exits unless directed by first responders or staff. A shelter in place order is also used for severe environmental threats like a thunderstorm.

Active Shooter Response
In the event of an Active Shooter Event, there are three things you need to know in order to survive: Run, Hide, Fight. If you see suspicious behavior on campus, please tell someone. Our campus safety officers are trained to investigate suspicious incidents.

EMERGENCY PREPAREDNESS: The first 72 hours of a disaster are often the most difficult, but this period can be less stressful if everyone has extra supplies on hand. The college has a limited amount of emergency supplies, so students and staff should have on campus their own portable emergency kit including snacks, water, and prescription medication; this is especially important for those who may need to shelter on campus. For more information go to http://72hours.org/

Students: If you have knowledge of an emergency on campus, share it immediately. If you see something suspicious or potentially hazardous, let someone know.
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STUDENT LEARNING OUTCOMES

- Given information about the mechanical energy of a system, the student will trace the flow of energy into other forms and use the Law of Conservation of Energy to predict the state of the system later--both conceptually and quantitatively.
- Given appropriate direction, the student will be able to set up laboratory equipment safely and efficiently, plan and carry out experimental procedures, identify possible sources of error, implement techniques that enhance precision, reduce and interpret data by hand and/or using computers and report verbally and in written language the experimental data, results and conclusion.
- Given information about a particle or simple mechanical system of particles subject to forces and torques, the student will predict the subsequent behavior of the system--both conceptually and quantitatively.
- Given information that describes the properties of a simple fluid the student will characterize and predict the behavior of the fluid

IMPORTANT NOTE ON STUDENT LEARNING OUTCOMES
(1) Students may vary in their competency level on these outcomes, and **(2)** they can expect to achieve these outcomes *only if* they honor all course policies, attend classes regularly, complete all assigned work in good faith and on time, and meet all other course expectations of them as students.
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COURSE OBJECTIVES

Upon satisfactory completion of the course, students will be able to:

1. Set up diagrams of vector quantities such as velocity, acceleration, force, torque, linear momentum, and angular momentum. Utilize the diagrams in problem solving algorithms.
2. Execute conversions among different systems of units.
3. Evaluate formulas representing physical relationships between variables, and critically evaluate the reasonableness of the solutions.
4. Interpret descriptions of mechanics scenarios and construct a set of constraints and approximations in order to solve for unknown quantities.
5. Interpret graphs such as *velocity vs. time* and *force vs. tim*e in the application of laws of motion. Analyze one- and two-dimensional motion of kinematic variables such as position, velocity, and acceleration to solve kinematics problems of constant acceleration.
6. Consider free fall in the context of vector analysis, and the separation of horizontal motion from vertical motion to solve problems of objects falling under the influence of gravity.
7. Recognize and solve problems involving objects moving with uniform circular motion via centripetal force.
8. Construct and interpret system schemas and force diagrams involving a particle isolated from its environment in an inertial frame of reference, and interpret all forces acting on the particle as vectors on the diagram in the solution of problems of Newton's laws.
9. Apply Newton’s laws of motion to the solution of problems in the area of mechanics and fluids.
10. Identify action/reaction pairs to apply Newton's third law.
11. Correctly identify problems where conservation of momentum is appropriate, and successfully apply momentum conservation to solve the problems.
12. Define impulse and its relationship to momentum. Correctly identify and solve problems requiring the impulse/momentum theorem.
13. Correctly identify problems where conservation of angular momentum is appropriate, and successfully apply angular momentum conservation to solve the problems.
14. Identify problems of and apply conservation of energy to analyze the mechanical systems involving conservative forces such as gravity and spring forces. Identify and solve problems including non-conservative forces, such as friction.
15. Utilize both conservation of energy and momentum to analyze problems involving collisions. Compare and contrast elastic and inelastic collisions.
16. Analyze forces to solve problems of extended objects in specified mechanics scenarios
17. Compare and contrast the similarities and differences between the equations for rotational motion and their linear analogs.
18. Identify problems involving both rotational and translational equilibrium. Develop solutions to equilibrium problems by utilizing Newton's laws in linear and rotational forms.
19. Explain the motion of extended objects rotating with and without translation through concepts including angular momentum and rotational kinetic energy.
20. Distinguish simple harmonic motion from repetitive motion and determine position, velocity, and acceleration of a particle undergoing simple harmonic motion as a function of time.
21. Calculate and relate concepts of (angular) frequency, period, amplitude, and phase constant for an object moving with simple harmonic motion.
22. Relate concepts of (angular) frequency, and period of the oscillation to the physical characteristics of a system including mass and elasticity.
23. Relate initial position and velocity for a particle in simple harmonic motion to the amplitude and phase constant of the motion.
24. Analyze the situation of an object partially or fully submerged in a static fluid through the application of Bernoulli's principle, Pascal's Principle, and Archimedes' principle.
25. Analyze ideal fluid flow employing Bernoulli's equation and the equation of continuity.
26. Construct experiments for examining predetermined mechanics scenarios.
27. Collect and interpret experimental data via graphs to display the relationships between the measured quantities to demonstrate quantitatively laws governing mechanics.

STUDENT RESPONSIBILITIES

Students are expected to be collegial, professional and respectful at all times, and together with the instructor, create a positive learning community.

CLASS PARTICIPATION	Students are expected to play an active role rather than a passive role during class. Students are strongly welcomed and encouraged to ask questions, ask that something be clarified, and contribute to the learning community at all times. Students are expected to participate actively in all activities in a professional manner. If a student misses all or part of a class/lab section, the student is still responsible for the material covered during that session. **Notify the instructor as soon as possible of your absence by email,** and find out outside of class if the instructor has made any changes on assignments, due dates etc.
CELL PHONES	If you need to call or text someone, or answer a text or a phone call, please do so outside of class. Do not use non-class related gadgets in class. You may use iPads and other gadgets if they contribute in learning what is being presented in class.
ATTENDANCE, TARDINESS AND BREAKS	Attendance will be taken at the beginning of each class session. The standard attendance policy from the Hartnell Schedule of Classes will be adhered to: "Any lack of attendance which leads an instructor to judge that unsatisfactory progress is being made may result in the student being dropped. Absence from a full semester class in excess of two weeks (consecutive or non-consecutive) may result in the instructor dropping the student. That is, a student may be dropped after missing one more class meeting than twice the number of class meetings per week." This amounts to 8 absences including labs, excused OR unexcused. In addition, 3 tardies can be counted as 1 absence. **IMPORTANT NOTE:** If you are going to be absent, contact the instructor BEFORE CLASS by email. If you are going to miss class excessively, email the instructor that you will be missing many class sessions and that you will take responsibility for the consequences. Come to class prepared and on time. If you feel that you have an acceptable reason for being consistently tardy, such as having to drop off family members to school, please let me know so we can make special arrangements. Except for during exams, you may take bathroom breaks or other needed breaks without asking permission. Be respectful of others when entering and leaving the classroom. If you need to talk to others about non-class related topics, do so outside of the classroom.

TALKING IN CLASS	Talking in class when the instructor is lecturing or a student is asking a question etc. is very disruptive, disrespectful and unprofessional. If you want to discuss something that deals with the topics at hand, want to ask a question, or want to make a comment, let the instructor know by raising your hand. You may talk when the instructor is erasing the board, etc., or when working in groups. If the instructor feels a student is being disruptive, the instructor will talk to the student about how to resolve the issue. If the issue continues not to be resolved, the instructor will follow Hartnell policy to deal with the issue.

ACADEMIC INTEGRITY POLICY (AIP)

As per the Hartnell policy from the Schedule of Classes:
"Dishonesty includes, but is not limited to, in-class cheating, out-of-class cheating, plagiarism, knowingly assisting another student in cheating or plagiarism, or knowingly furnishing false information to College staff, faculty, administrators or other officials. Following are definitions of in-class cheating, out-of-class cheating, plagiarism, and furnishing information. These are not all-inclusive, and the list itself is not meant to limit the definition of cheating to just those mentioned.

1. In-class cheating: during an examination or on any work for which the student will receive a grade or points, unauthorized looking at or procuring information from any unauthorized sources or from any other student's work.
2. Out-of-class cheating: unauthorized acquisition, reading or knowledge of test questions prior to the testing date and time: changing any portion of a returned graded test or report and resubmitting as original work to be regarded; or presenting the work of another as one's own for a grade of points.
3. Plagiarism: unauthorized use of expression of ideas from either published or unpublished work(s) as a student's own work for a grade in a class. This also includes the violation of copyright laws, including copying of software packages.
4. Furnishing false information: forgery, falsification, alteration, or misuse of College situations."
5. If a student is discovered to be cheating, a zero will be immediately given on the assignment and a meeting with the instructor will be scheduled. If a second instance occurs, the prior policy will be invoked in addition to further action taken with administration and the possible result of a failing grade in the course.

STUDENT SUPPORT SERVICES

DEPARTMENT OF SUPPORTIVE PROGRAMS & SERVICES
Hartnell College offers supportive services and instruction for students with disabilities through the Department of Supportive Programs and Services (DSP&S). Students with needs are urged to contact DSP&S and the instructor as soon as possible. The DSP&S office is located in Building B, Room 107. You can also contact them at (831) 755-6760.
CRISIS COUNSELING SERVICES
Appointments may be scheduled by phoning the crisis line (770-7019). Offices are located in building "D" (D-123, -124 and -126).
THE EARLY SUCCESS PROGRAM
We are fortunate to have Hartnell's Early Success Program (ESP) available for students in this course. The ESP allows instructors to notify a special ESP Counselor, who can provide early support and assistance to a student that the instructor feels (or the student feels) will benefit from the services of the program. This is an important source of help. If you want to

hear more about the program, please see me; or if the ESP Counselor contacts you, please take advantage of the help offered.

CLASS COMPONENTS AND GRADES

LAB COMPONENT: -----20%	
CLASS COMPONENT:	
	Four exams @ 10 % each ----------40%
	Homework, quizzes, class assignments, participation points ---20%
	Comprehensive final ----------20%

The grade breakdown is as follows:

A 90 - 100%	B 80 - < 90%	C 70 - < 80%	D 60 - < 70%	F - < 60%

- Remember: **The instructor does not give grades; you earn them**. If you catch a mistake in the grading, such as points being added incorrectly in an exam, notify the instructor immediately, preferably by email, so that the mistake can be corrected as soon as possible.
- Your grades will be posted on Canvas. If you see a mistake, please email the instructor ASAP.
- **Final grades:** If you feel there is a mistake with your final grade for the class, please send the instructor an email showing in detail how you calculated your grade. The instructor will then check your calculation for accuracy. Make sure you weigh each category as stated in the syllabus; do not just add the points.
- **Your final exam will be kept for two years in case you want to go over it the following semester.**
- **You can make an appointment with the instructor at any time during the semester to look over your grades.**

PARTICIPATION POINTS - Participation points may be given at any time. Socrative may be used to record the participation points. Often, participation points are earned for participation in an activity assigned for the first 10 minutes of class, so make sure you come to class on time. As a backup, write the time you came to class on the roll-sheet.

QUIZZES - Quizzes may be given at any time, announced or unannounced. Socrative may be used during the quizzes.

HOMEWORK - For homework assignments and due dates, see Canvas**.** Your homework will consist of completing **Mastering Physics** assignments and completing **Reading Assignments**. Homework is due on the date and time designated.

- **Mastering Physics: No late Mastering Physics assignments will be accepted. You can have TWO replacement assignments; you cannot earn more points than the assignment you are replacing. There are two dues dates for replacement assignments: those that are part of the first set of replacement assignments are due 5 days after Exam 2, while those that are part of the second set are due on the last day of classes.**

- **Reading Assignments:** Two of your reading assignments will be optional. You can earn a total of 40 bonus points by doing all of the reading assignments. **No late reading assignments will be accepted.**

NOTE: IF YOU HAVE ANY QUESTIONS, ISSUES ETC. REGARDING THE HOMEWORK, IT IS YOUR RESPONSIBILITY TO CONTACT THE INSTRUCTOR IMMEDIATELY SO A TIMELY SOLUTION CAN BE FOUND. DO NOT WAIT UNTIL THE LAST MINUTE OR AFTER AN ASSIGNMENT IS DUE TO CONTACT THE INSTRUCTOR OR THE ASSIGNMENT MAY BE COUNTED LATE.

When solving problems from Mastering Physics, you are encouraged to do the problems also on paper in a notebook, showing all the steps. The notebook will not be collected, but it will help you when studying. Follow the problem-solving format shown below.

PROBLEM-SOLVING FORMAT -

1. Be neat.
2. Draw **diagram(s)**, labeling "knowns" and "unknowns."
3. Organize information "knowns" and "unknowns" in a **table.**
4. Show the basic equations used**, in symbol form**, that reflect the main concepts
5. **Substitute numbers** into the equations
6. Solve difficult algebra only if time permits.
7. Highlight or box in the answers or final equation(s)

EXAMS- There will **be four exams** throughout the course. No missed exams will be given unless an arrangement has been made with the instructor **before the exam.** Exam problems will be similar to but not identical to those done in class and to those assigned as homework. You may also have conceptual questions to answer in the exam. **Formulas will be provided**. For each exam problem, you will be graded on procedure, which means you are to follow the problem-solving format above. The problems must be legible and easy to follow or will not be graded.

If you have completed at least 70% of your homework and your attendance is at least 80%, you may regain up to 10 points for **TWO** of the first three exams (not the fourth one) if you earned less than 67% on that exam. The points added cannot make your exam grade be greater than 67%.
To earn back points follow this formula:
(30 minutes spent in the Panther Learning Lab within one week of getting back the exam = 1 point)

NOTE- When taking quizzes and exams, all electronic equipment except calculators needs to be put away. This includes iPads, iPhones, and earphones.

IMPORTANT, REGARING LAB GRADE: No one will be given a passing grade in the course unless at least 3/4 of the required lab reports are satisfactorily completed by the end of the semester.

IMPORTANT STATEMENT: THE SCHEDULE, POLICIES, PROCEDURES, AND ASSIGNMENTS IN THIS COURSE ARE SUBJECT TO CHANGE IN THE EVENT OF EXTENUATING CIRCUMSTANCES, BY MUTUAL AGREEMENT, AND/OR TO ENSURE BETTER STUDENT LEARNING.

LAB CONTENT (TENTATIVE):

1.	Measurement and Graphing	9.	Conservation of Mechanical Energy
2.	Acceleration of Gravity	10.	The Simple Pendulum
3.	Vectors	11.	Inelastic Collisions
4.	Projectile Motion Simulation	12.	Ballistic Pendulum
5.	Newton's Second Law	13.	Torque and Center of Mass
6.	Newton's Third Law	14.	Rotational Dynamics
7.	Drag force on Coffee Filters	15.	Archimedes' Principle
8.	Centripetal Force	16.	Simple Harmonic Motion of a Spring

COURSE CONTENT

I. Vectors
   1. Properties of vectors, addition and subtraction
   2. Coordinate systems/vector components
   3. Vector algebra

II. Mathematical Description of One- and Two-dimensional Motion
   1. Uniform motion
   2. Instantaneous velocity
   3. Finding position from velocity
   4. Motion with constant acceleration
   5. Free fall
   6. Motion on an incline plane

III. Kinematics in Two Dimensions
   1. Acceleration
   2. Projectile motion
   3. Relative motion
   4. Uniform circular motion
   5. Velocity and acceleration in uniform circular motion

IV. Force and Motion
   1. Force definition
   2. Identifying forces
   3. Newton's second law
   4. Newton's first law
   5. Force diagrams

V. Motion Along a Line
   1. Equilibrium
   2. Applications of Newton's second law
   3. Mass, weight, and gravity
   4. Friction
   5. Drag

VI. Newton's Third Law
   1. Analyzing Interacting objects
   2. Newton's third law
   3. Ropes and Pulleys

VII. Motion in a Plane
   1. Dynamics in two dimensions
   2. Velocity and acceleration in uniform Circular motion
   3. Circular orbits

VIII. Work
   1. Work and kinetic energy
   2. Calculating and using work
   3. Work by a variable force
   4. Force, work, and potential energy
   5. Finding force from potential energy
   6. Thermal energy
   7. Conservation of energy
   8. Power

IX. Energy
   1. Kinetic energy and gravitational potential energy
   2. Restoring forces and Hooke's law

X. Impulse and Momentum
   1. Defining momentum and impulse
   2. Conservation of momentum
   3. Inelastic collisions
   4. Explosions Momentum in two dimensions
   5. Elastic potential energy
   6. Elastic collisions

XI. Rotation of a Rigid Body
   1. Rotational motion
   2. Rotation about center of mass
   3. Rotational energy
   4. Calculating moment of inertia
   5. Torque
   6. Rotational dynamics
   7. Rotation about a fixed axis
   8. Static equilibrium
   9. Rolling motion
   10. Angular momentum of a rigid body

XII. Newton's Theory of Gravity
   1. Newton's Law of Gravity
   2. Little g and big G
   3. Gravitational potential energy

XIII. Fluids
   1. Fluids and pressure
   2. Measuring and using pressure
   3. Buoyancy
   4. Fluid dynamics

XIV. Oscillations
   1. Simple harmonic motion (SHM)
   2. SHM and circular motion
   3. Energy in SHM
   4. Dynamics of SHM
   5. Vertical oscillations
   6. Pendulum
   7. Damped oscillations/driven oscillations and resonance