Physics 71 Course Syllabus
1st Semester AY 2007-2008

Course	Physics 71 Elementary Physics I	
Credit Units	4 units	
Course Description	Mechanics of particles, rigid bodies and fluids	
Prerequisite, Corequisite	Math 17, Math 53	
References	**University Physics, 11th Edition by Young and Freedman** Physics for Scientist and Engineers, 4th Edition by Paul A. Tipler Physics, 5th Edition by Resnick et.al. Conceptual Physics, 8th Edition by Paul G. Hewitt	
Course Goal	The course aims to develop the students' physical intuition and ability to systematically solve a wide variety of problems on mechanics, fluids and wave motion using Newton's Laws and Conservation Principles.	
Course requirements	3 Long Examinations	60 %
	Recitation Class / Quizzes / Homework/ Class Participation	20 %
	Final Exam	20 %
Teacher	Name: _____ Faculty Room: _____ Consultation Schedule: _____ Email: _____	
UVLE Website	http://uvle.up.edu.ph (browse through the Physics 71 group)	

COURSE POLICIES

1. The three (3) long exams and the final exams are all departmental and of multiple choice type which involve problem solving and conceptual questions.
2. In case of one (1) missed long exam (with a ***valid reason***), the score for this missed exam will be the same as the score obtained by the student in the final exam. Only one (1) missed long exam will be excused.
3. A student may be exempted from taking the final exam provided that a pre-final grade that is greater than or equal to 40% out of 80% is obtained. The student, however, may still take the final exam to increase final grade.
4. When a student who is not exempted from taking the final exam misses the final exam itself, a grade of **INC** is given provided that necessary documents to be excused are submitted. For completion, the student has to take the final exam the next semester. Completion grade will be computed based on the class record for the enrolled term and the final exam score. This means that a passing grade or a grade of **5.0** are possible.
5. A grade of **4.0** means conditional and that you will have to take the removal exam within a year. **Note:** *There are only two removal exams in Physics 71 – one after the first semester and the other after the summer class.*
6. As per university rule, you are **ONLY** allowed a **MAXIMUM** of twelve (12) absences including your recitation classes. In the event that you exceeded the maximum number of absences, a grade of **5.0** is given unless you drop the course.
7. There is *NO FORCED DROP*. Lecturer will only give the student a grade of **DRP** upon receiving the processed dropping or *Leave of Absence* (LOA) form. Otherwise a grade of **5.0** is given.
8. The deadline for dropping is on **September 6, 2007** (Thursday). A student granted a LOA will only be given a grade of either DRP or 5.0. A grade of 5.0 is given if the LOA is granted after ¾ of the semester has lapsed and the student's class standing is failing; otherwise a grade of DRP is given.
9. Cheating is punishable by expulsion from the University.

Grading System	
Grade(%) ≥ 90	1.0
90 > Grade(%) ≥ 85	1.25
85 > Grade(%) ≥ 80	1.5
80 > Grade(%) ≥ 75	1.75
75 > Grade(%) ≥ 70	2.0
70 > Grade(%) ≥ 65	2.25
65 > Grade(%) ≥ 60	2.5
60 > Grade(%) ≥ 55	2.75
55 > Grade(%) ≥ 50	3.0
50 > Grade(%) ≥ 45	4.0
45 > Grade(%) ≥ 0	5.0

COURSE COVERAGE

Chapter 1: Units, Physical Quantities, and Vectors

Approx Time	Objectives After the discussion and lined up activities, you should be able to:	Topics
20 mins	▪ Write the name and contact information of the teacher. ▪ Restate the course goal and policies.	Course orientation
40 mins	▪ Convert measurements into different units. ▪ Express measurements in scientific notation correctly. ▪ Use dimensional analysis in checking the correctness of an equation. ▪ Differentiate vector and scalar quantities.	Standards and units Unit consistency and conversions Uncertainty and significant figures Estimates and orders of magnitudes Vectors and vector addition
home-reading	▪ Perform addition and multiplication on vectors. ▪ Rewrite a vector in component form. ▪ Differentiate scalar product and vector product.	Vectors and vector addition Components of vectors Unit vectors Products of vectors

Chapter 2: Motion along a Straight Line

Approx Time	Objectives After the discussion and lined up activities, you should be able to:	Topics
1.5 hours	▪ Describe motion in one dimension (1D) in terms of distance, displacement, speed, average and instantaneous velocities, and average and instantaneous accelerations. ▪ Analyze 1D motion using verbal, graphical and algebraic representations.	Displacement, time, and average velocity Instantaneous velocity Average and instantaneous acceleration
1.5 hours	▪ Solve problems involving motion with constant acceleration, including freely falling bodies.	Motion with constant acceleration Freely falling bodies
Suggested problems: **2.5, 2.7, 2.10, 2.11, 2.12, 2.23, 2.30, 2.38, 2.41, 2.48**		

Chapter 3: Motion in Two or Three Dimensions

Approx Time	Objectives After the discussion and lined up activities, you should be able to:	Topics
1 hour	▪ Extend the definition of position, velocity and acceleration in 2D and 3D using vector representation. ▪ Solve resultant vector quantities. ▪ Describe motion using the concept of relative velocities in 1D and 2D.	Position and velocity vectors Acceleration vector Relative velocity
1 hour	▪ Describe the characteristics of a projectile motion. ▪ Deduce the consequences of the independence of vertical and horizontal components of projectile motion. ▪ Express projectile motion in mathematical form. ▪ Solve projectile motion problems.	Projectile motion
1 hour	▪ Differentiate uniform and non-uniform circular motions. ▪ Give qualitative and quantitative information about system undergoing circular motion.	Motion in a circle
Suggested problems: **3.1, 3.2, 3.5, 3.12, 3.21, 3.33, 3.36, 3.41, 3.67, 3.71**		

Chapter 4: Newton's Laws of Motion

Approx Time	Objectives After the discussion and lined up activities, you should be able to:	Topics
1.5 hours	▪ Identify all contact and non-contact forces acting on a body. ▪ Apply Newton's laws and concepts previously learned in chapters 2 and 3 to infer quantitative and qualitative information about the motion of a body. ▪ Given a physical situation and two forces of equal magnitudes, determine whether the equality is coincidental, a consequence of Newton's 2nd law, or a consequence of Newton's 3rd law. ▪ Distinguish mass and weight.	Force and interactions Newton's first law Newton's second law Mass and weight Newton's third law
0.5 hour	▪ Draw correct free-body diagrams for a given body	Free Body Diagrams
Suggested problems: **4.1, 4.4, 4.7, 4.14, 4.17, 4.18, 4.20, 4.21, 4.30, 4.49**		

Chapter 5: Applying Newton's Laws

Approx Time	Objectives After the discussion and lined up activities, you should be able to:	Topics
1 hour	▪ Apply Newton's 1st law to obtain quantitative and qualitative conclusions about the contact and non-contact forces acting on a body in equilibrium. ▪ Apply Newton's 2nd law and kinematics to obtain quantitative and qualitative conclusions about the velocity and acceleration of one or more bodies, and the contact and non-contact forces acting on them. ▪ Identify action reaction pairs in a given system. ▪ Deduce kinematical constraints of a system.	Newton's first law: particles in equilibrium Newton's 2nd law: dynamics of particles
2 hours	▪ Differentiate the properties of static friction and kinetic friction. ▪ Compare the magnitude of sought quantities such as frictional force, normal force, threshold angles for sliding, acceleration etc. ▪ Apply Newton's 2nd law and kinematics to obtain quantitative and qualitative conclusions about the velocity and acceleration of one or more bodies, and the contact and non-contact forces acting on one or more bodies with friction. ▪ Qualitatively analyze the effect of fluid resistance on moving object.	Frictional forces
1 hour	▪ Apply Newton's 2nd law and kinematics to obtain quantitative and qualitative conclusions about velocity and acceleration of one or more bodies undergoing circular motion, and the contact and non-contact forces acting on them.	Dynamics of circular motion
Suggested problems: **5.2, 5.4, 5.11, 5.15, 5.19, 5.21, 5.31, 5.43, 5.49, 5.114**		

FIRST LONG EXAM
Date: July 18, 2007 (Wednesday) Time: 7:00 – 9:00 AM Room: TBA

Chapter 6: Work and Kinetic Energy

Approx Time	Objectives After the discussion and lined up activities, you should be able to:	Topics
1 hour	▪ Determine the work done by constant force acting on a system. ▪ Relate the work done by a constant force to the change in kinetic energy of a system. ▪ Apply the work-energy theorem to obtain quantitative and qualitative conclusions regarding the work done, initial and final velocities, mass and kinetic energy of the system. ▪ Express the work-energy theorem in graphical representation.	Work Work and kinetic energy Work and energy with varying forces
1 hour	▪ Relate the power to work, energy, force and velocity.	Power
Suggested problems: **6.1, 6.8, 6.18, 6.27, 6.33, 6.37, 6.49, 6.52, 6.69, 6.81**		

Chapter 7: Potential Energy and Energy Conservation

Approx Time	Objectives After the discussion and lined up activities, you should be able to:	Topics
1 hour	▪ Relate the potential energy of a system or object to the configuration of the system.	Gravitational potential energy Elastic potential energy
2 hours	▪ Explain the properties and the effects of conservative forces. ▪ Identify conservative and non-conservative forces. ▪ Express the conservation of energy, verbally and mathematically. ▪ Apply conservation of energy on physical problems involving moving objects whenever appropriate, to obtain qualitative and quantitative conclusions about mass, position, speed, and force constant.	Conservative and non-conservative forces
1 hour	▪ Relate the potential energy function with force, and stable, unstable, and neutral equilibriums.	Force and potential energy Energy diagrams
Suggested problems: **7.9, 7.14, 7.17, 7.26, 7.30, 7.31, 7.38, 7.46, 7.53, 7.86**		

Chapter 8: Momentum, Impulse, and Collisions

Approx Time	Objectives After the discussion and lined up activities, you should be able to:	Topics
2 hours	▪ Relate the momentum, impulse, force, and time of contact in a system. ▪ Explain the conditions for conservation of linear momentum. ▪ Compare and contrast elastic and inelastic collisions. ▪ Predict motion of constituent particles for different types of collisions.	Momentum and impulse Conservation of momentum Inelastic collisions Elastic collisions
1 hour	▪ Locate the center of mass of a system. ▪ Relate the motion of center of mass with momentum and net external force acting on the system.	Center of mass
Suggested problems: **8.4, 8.10, 8.14, 8.25, 8.30, 8.35, 8.39, 8.40, 8.44, 8.47**		

Chapter 9: Rotation of Rigid Bodies

Approx Time	Objectives After the discussion and lined up activities, you should be able to:	Topics
1.5 hours	▪ Distinguish rotational and translational quantities. ▪ Relate the equations of rotational and translational quantities. ▪ Apply the rotational kinematic relations in rotating objects.	Angular velocity and acceleration Rotation with constant angular acceleration Relating linear and angular kinematics
1.5 hours	▪ Analyze the rotational kinetic energy of rotating objects. ▪ Calculate the moment of inertia about a given axis of given multiple objects or uniform objects of various shapes.	Energy in rotational motion Parallel-axis theorem
Suggested problems: **9.2, 9.8, 9.10, 9.13, 9.24, 9.26, 9.37, 9.42, 9.52, 9.55**		

Chapter 10: Dynamics of Rotational Motion

Approx Time	Objectives After the discussion and lined up activities, you should be able to:	Topics
0.5 hour	▪ Relate torque to force and angular acceleration of rigid body. ▪ Describe rotational quantities using vectors. ▪ State the consequences of Newton's 2nd law for rotation under various conditions.	Torque Torque and angular acceleration for a rigid body
1 hour	▪ Compare translational and rotational kinetic energies of a rolling object. ▪ Apply conservation of energy to obtain qualitative and quantitative conclusions on the motion of a system that involves rotation. ▪ Analyze work and power delivered to a rotating system.	Rigid-body rotation about a moving axis Work and power in rotational motion
1.5 hours	▪ Determine angular momentum of different systems. ▪ Recognize whether angular momentum is conserved or not at various times of a given system. ▪ Solve problems involving rotating and rolling systems using Newton's 2nd law for rotation, kinematic equations and/or conservation of angular momentum.	Angular momentum Conservation of angular momentum
Suggested problems: **10.3, 10.6, 10.8, 10.21, 10.23, 10.27, 10.30, 10.34, 10.41, 10.43**		

SECOND LONG EXAM
Date: August 29, 2007 (Wednesday) Time: 7:00 – 9:00 AM Room: TBA

Chapter 11: Equilibrium and Elasticity

Approx Time	Objectives After the discussion and lined up activities, you should be able to:	Topics
1 hour	▪ Enumerate the necessary and sufficient conditions for static equilibrium. ▪ Determine whether a system is in static equilibrium or not. ▪ Compare and contrast the center of mass, center of gravity, and geometric center.	Conditions for equilibrium Center of gravity
1.5 hours	▪ Solve static equilibrium problems, such as see-saw, mobile, cable-hinge-strut system, leaning ladder, and wheel climbing a step.	Solving rigid-body equilibrium problems
0.5 hour	▪ Define stress, strain, and elastic moduli. ▪ Differentiate elasticity and plasticity.	Stress, strain, and elastic moduli Elasticity and plasticity
Suggested problems: **11.10, 11.19, 11.24, 11.28, 11.32, 11.53, 11.60, 11.61, 11.74, 11.75**		

Chapter 12: Gravitation

Approx Time	Objectives After the discussion and lined up activities, you should be able to:	Topics
2 hours	▪ Describe the gravitational force, weight, and acceleration due to gravity based on Newton's law of gravitation. ▪ Determine the net gravitational force on each mass given a system of point masses. ▪ State the physical significance of gravitational field. ▪ Apply gravitational potential energy in several physical problems, such as in determining the escape speed and the maximum height reached by a launched space shuttle. ▪ Differentiate closed and open orbits. ▪ Calculate quantities regarding planetary or satellite motion.	Newton's law of gravitation Weight Gravitational potential energy Motion of satellites
1 hour	▪ Relate Kepler's three laws, Newton's law of gravitation, and conservation of angular momentum.	Kepler's laws and the motion of the planets
Suggested problems: **12.2, 12.5, 12.10, 12.22, 12.34, 12.40, 12.45, 12.55, 12.61, 12.80**		

Chapter 14: Fluid Mechanics

Approx Time	Objectives After the discussion and lined up activities, you should be able to:	Topics
1 hour	▪ Relate density, specific gravity, mass and volume; pressure, area and force; pressure, density and depth. ▪ Apply the above relationships in solving fluid statics problems. ▪ Apply Pascal's principle in analyzing fluids in various systems.	Density Pressure in a fluid
1 hour	▪ Apply the concept of buoyancy and Archimedes' principle to various systems involving fluids and objects in fluids.	Buoyancy
1 hour	▪ Apply Bernoulli's principle and continuity equation, whenever appropriate, in obtaining conclusions relating pressure, elevation, speed and flux. ▪ Recognize the concepts behind and the limits of validity of Bernoulli's principle and the continuity equation.	Fluid flow Bernoulli's equation
Suggested problems: **14.5, 14.10, 14.14, 14.22, 14.23, 14.30, 14.34, 14.37, 14.43, 14.45**		

Chapter 13: Periodic Motion

Approx Time	Objectives After the discussion and lined up activities, you should be able to:	Topics
1 hour	▪ Relate the quantities (amplitude, frequency, angular frequency, period, displacement, velocity, and acceleration) associated with oscillating systems. ▪ Recognize the necessary conditions for an object to undergo simple harmonic motion. ▪ Relate the aforementioned quantities to the energy of a system oscillating in simple harmonic motion.	Describing oscillation Simple harmonic motion Energy in simple harmonic motion
1.5 hour	▪ Identify the period and the frequency of some oscillating systems, namely spring-mass, simple pendulum, and physical pendulum. ▪ Analyze the motion of an oscillating system in terms of the above mentioned quantities including energy.	Applications of simple harmonic motion Simple pendulum Physical pendulum
0.5 hour	▪ Explain qualitatively the effects of different damping and driving conditions on oscillation, such as resonance. ▪ Cite applications of the different damping conditions.	Damped oscillations Forced oscillations and resonance
Suggested problems: **13.2, 13.16, 13.24, 13.27, 13.30, 13.45, 13.46, 13.49, 13.51, 13.54**		

Chapter 15: Mechanical Waves

Approx Time	Objectives After the discussion and lined up activities, you should be able to:	Topics
1 hour	▪ Describe and distinguish mechanical wave, longitudinal wave, transverse wave, periodic wave, and sinusoidal wave. ▪ Relate wave quantities (speed, wavelength, frequency, period, direction, and wave number) from a sinusoidal wave function. ▪ Describe the propagation, speed, energy, and power of waves on a string. ▪ Describe the intensity of waves that travel in 3D, such as sound waves and seismic waves.	Types of mechanical waves Periodic waves Mathematical description of wave Speed of a transverse wave Energy in wave motion
1 hour	▪ Describe qualitatively the superposition of waves. ▪ Describe qualitatively and quantitatively the condition for standing waves on a string.	Wave interference, boundary conditions, and superposition Standing waves on a string Normal modes of a string
Suggested problems: **15.5, 15.7, 15.13, 15.22, 15.31, 15.36, 15.44, 15.47**		

Chapter 16: Sound and Hearing

Approx Time	Objectives After the discussion and lined up activities, you should be able to:	Topics
1 hour	▪ Qualitatively and quantitatively relate the frequency and wavelength of sound with the motion of the source and the listener.	Doppler effect
Suggested problems: **16.25, 16.43**		

THIRD LONG EXAM
Date: October 8, 2007 (Monday) Time: 9:00 – 11:00 AM Room: TBA

PHYSICS PALS:

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