PHYS 2054
University Physics I
Spring 2020

Class Time and Location: Lecture: TR 8:00 -9:15 **Lab:** T 9:30-11:30, Room: S235
Instructor: Gaumani Gyanwali – Ph. D.: OSU-Stillwater; MS, BS: Tribhuvan University
Office Location: S 244
Office Hours: Posted on office door
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Prerequisite: *C* or Better in Calculus I – MTH154

Resources:
Textbook: Physics for Scientists and Engineers a Strategic Approach, 4/E, by Randall D. Knight: Pearson 2016. *ISBN 13:978-0-134-08149-6*
(*Older editions of the text will likely serve you well as they do not change much from one edition to the next)*
Required Materials:
1. Calculator: Minimum TI84 CE
2. USB drive at least 2 GB
3. Miscellaneous pens, paper, and pencils.

Course Description: University Physics is a calculus-based physics designed as a two-semester course. PHYS 2054 is the first semester of that course. It focuses on the concepts of kinematics in mechanics and introduces to the field of conservation of energy, waves and sound, theory of gravitation, and thermodynamics. Problem solving strategies will be implemented through underlying principles of mathematics and physics. The main topics will be reinforced with laboratory work.

Program Outcomes: The knowledge and critical thinking skills acquired in the general education component enable students to analyze problems, to arrive at intelligent conclusions, and to make reasoned choices in their professional and personal lives.
- Use analytical and reasoning skills to solve practical problems based on principles of calculus
- Develop critical thinking skills based on basic laws of nature and physics.

Rationale: Through the study of physics with problem solving skills, and laboratory activity, the student develops an understanding of the laws that explain the relationship among force, energy, waves, and heat.

Course Objectives: Upon completion of University Physics I, the student should be able to:

1. Solve problems about motion along a straight line (Components: analyze, compare, correlate, apply)
2. Represent vectors in the correct way and find the resultant vectors using the components of vectors (Components: differentiate, comprehend, apply)

3. Solve problems related to motion in a plane (projectile motion, relative motion and circular motion. (Components: calculate, correlate, compare, solve problems)
4. Understand the concept of force and motion along a straight line as well as motion along a plane and solve problems based on that concept (Components: understand, calculate, solve problems)
5. Understand the relation between types of energies and their conservation. (Components: analyze, compare, correlate, illustrate)
6. Know the relationship between impulse and momentum and apply the principles of conservation of momentum (Components: understand, calculate, correlate, compute)
7. Apply Newtonian mechanics in the form of Theory of Gravity in understanding the motion of planets and satellites (Components: verify, compute, synthesize)
8. Compare and contrast sound and light waves and know the basic properties of these waves in relation to energy (Components: analyze, compare, distinguish, solve)
9. Learn and apply the first law of thermodynamics (Components: comprehend, classify, reason)
10. Perform experiments designed to reinforce the concepts, derive conclusions, and prepare a lab report. (Components: collaboration, data collection, calculation and formulation, proper grammar and format, documentation, logical argument, interpret, hands-on skills)

Topical/Unit Outline:

I. <u>Kinematics in One Dimension:</u>
   a. Uniform motion
   b. Instantaneous velocity
   c. Position and velocity
   d. Motion with constant acceleration
   e. Free fall
   f. Motion on an inclined plane
   g. Instantaneous acceleration

II. <u>Vectors and Coordinate Systems</u>
   a. Scalars and vectors
   b. Using vectors
   c. Coordinate systems and vector components
   d. Unit vectors and vector algebra

III. <u>Kinematics in Two Dimensions</u>
   a. Motion in two dimensions
   b. Projectile motion
   c. Relative motion
   d. Uniform circular motion
   e. Centripetal acceleration
   f. Non-uniform circular motion

IV. <u>Dynamics I: Motion Along a Line</u>
   a. The equilibrium model
   b. Using Newton's second law
   c. Mass, weight, and gravity

d. Friction
e. Drag
f. Examples of the second law

V. Dynamics II: Motion in a Plane
a. Dynamics in two dimensions
b. Uniform circular motion
c. Circular orbits
d. Reasoning about circular motion
e. Non-uniform circular motion

VI. Interactions and Potential Energy
a. Potential energy and gravitation potential energy
b. Elastic potential energy
c. Conservation of energy
d. Energy diagrams
e. Force and potential energy
f. Conservative and nonconservative forces
g. Energy principle revisited

VII. Impulse and Momentun
a. Momentum and Impulse
b. Conservation of momentum
c. Collisions
d. Explosions
e. Momentum in two dimensions

VIII. Newton's Theory of Gravity
a. A brief history
b. Newton's Law of Gravity
c. Little *g* and big *G*
d. Gravitational potential energy
e. Satellite orbits and energy

IX. Travelling Waves
f. The wave model
g. One-dimensional waves
h. Sinusoidal waves
i. Sound and light
j. Waves in two and three dimensions
k. Power, intensity, and decibels
l. The Doppler effect

X. Work, Heat, and The First Law of Thermodynamics
f. It's all about energy
g. Work in ideal gas processes
h. Heat
i. The first law of thermodynamics
j. Thermal properties of matter
k. Calorimetry
l. The specific heat of gases
m. Heat transfer mechanisms

Tentative Schedule for Lecture: University Physics I

Week	Topics/Activities by Book Chapter	Date/Day
1	Syllabus/ Kinematics in One Dimension	1/14 T, 1/16 R
2	Kinematics in One Dimension	1/21 T, 1/23 R
3	Vectors and Coordinate System Kinematics in Two Dimensions	1/28 T 1/30 R
4	Kinematics in Two Dimensions/ Review	2/4 T, 2/6 R
5	**Test 1** Dynamics I: Motion Along a Line	**2/11 T** 2/13 R
6	Dynamics I: Motion Along a Line/Dynamics II: Motion i a Plane	2/18 T, 2/20 R
7	Dynamics II: Motion in a Plane/Review	2/25 T, 2/27 R
8	**Test 2** Interactions and Potential Energy	**3/3 T** 3/5 R
9	Interactions and Potential Energy Impulse and Momentum	3/10 T 3/12 R
10	Impulse and Momentum/Newton's Theory of Gravity	3/16 T, 3/18 R
11	*Spring Break*	*3/23 - 3/27*
12	Newton's Theory of Gravity/Review	3/31 T, 4/2 R
13	**Test 3** Travelling Waves	**4/7 T** 4/9 R
14	Travelling Waves/ Work, Heat, and First Law of Thermodynamics	4/14 T, 4/16 R
15	Work, Heat, and First Law of Thermodynamics Review	4/21 T, 4/23 R
16	**Test 4** Review for final exam	**4/28 T** 4/30 R
17	**Final Exam**	**5/5 T**

Tentative Schedule for Lab:

Date	Experiments	Page #/Miscellaneous info
01/14	Syllabus/Safety	Sign the safety agreement
01/21	Practice with LabQuest	Practice experiment
01/28	1. Graph Matching	Experiment #1
02/04	2. Determining g on an incline	Experiment #4
02/11	3. Projectile Motion	Experiment #8A
02/18	4. Newton's Second Law	Experiment #9
02/25	5. Atwood's Machine	Experiment #10
03/03	6. Newton's Third Law	Experiment #11
03/10	Make-up *(one missed lab from 1 -6)*	
03/17	*7.* Pendulum Periods	Experiment #14
03/24	*Spring Break*	
03/31	8. Energy in Simple Harmonic Motion	Experiment #17
04/07	9. Centripetal Acceleration on a Turn Table	Experiment #20
04/14	10. Speed of Sound	Experiment #33
04/21	11. Tones, Vowels, and Telephones	Experiment #34
04/28	Make-up	

Course Conduct: The class will be taught using a combination of lecture using *Powerpoint* presentation, solving in-class questions, demonstrations, group interaction and discussions, and performing laboratory experiments. Students are strongly encouraged to discuss concepts and examples as opportunities are presented during instructor presentation. It is the student's responsibility to inform the instructor right away when a concept is confusing or otherwise unclear. Students must answer all the in-class questions before leaving the classroom.

You are encouraged to solve problems forming a study group and actively take part in group discussion. You may seek assistance from Student Support Services (SSS) or Learning Enrichment Advising Center (LEAC) but because of the nature of this course, you should have a good strategic plan and visit the instructor often. In case of extreme difficulty, you must inform within the first week after the classes started. Expect a minimum of 12 hours of work on this class

UA Rich Mountain Credit Hour Calculator: For every credit hour, you should expect to spend at least three clock hours per week of concentrated attention on course-related work. This includes but not limited to time attending class, as well as out-of-class time spent completing homework, seeking help from instructor or tutors, preparing for upcoming quizzes/tests/exam, reviewing material, and problem solving. For a four-hour course, a typical student should expect to spend at least twelve hours per week dedicated to this course. This includes the time spent in class. Please see credit hour calculator attached to end of syllabus.

Course Requirements / Evaluation (Grading):

Your grade for this course comes from 4 tests (100 points each) after completion of two or three chapters, one comprehensive final exam given in the finals week (100 points), ten assignments (10 points each), ten quizzes (10 points each) and eleven laboratory reports (20 points each).

Four tests @100 each = 300 (lowest one dropped when taken all four)
One Final Exam @ 100 = 100
11 Lab reports @ 20 each = 200 (lowest one dropped after submitting all eleven)
10 Quizzes @ 10 each = 100
10 Assignments @ 10 each = 100
Total points possible = 800

The final grade for the course will be determined by dividing the student's total number of points earned by the number of possible points. Grades are assigned on the basis of the following percentage scale, after rounding the calculated percentage to the nearest whole number:

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

Class Procedures/Student Requirements:

On-Campus Resources: Your student portal will be populated with the lecture slides for each upcoming chapter. If you wish to bring the printed lecture slides to class and write notes on them, you will need to print the lecture slides of the chapter. I will not bring the printed copies to class just because it is too much waste of paper. Computer labs with printers are available in several places on campus including the Johnson Learning Commons. UA Rich Mountain offers students assistance with quality tutors available in the Student Support Services and Learning Enrichment and Advising Center in the Johnson Learning Commons.

tutor.com provides 5 hours of free tutoring online for each UA Rich Mountain student per semester. Johnson Learning Commons has contract with this online site where personal tutors are available 24/7. Create an account and get help personally from home or anywhere if internet access is available. Follow the link to log in www.tutor.com/uarichmountain

Attendance Policy: Regular attendance and punctuality are expected. It is the responsibility of the student to initiate arrangements for all missed activities. If an absence is a planned absence the student is expected to make arrangements for making up work prior to the absence. More than three absences will be considered excessive and, along with work not made up, may adversely affect the grade for the course. Under no circumstances will the student receive credit for the course if more than a fourth of the classes are missed (13 classes). In case of extended illness, or other circumstances, the student must contact the instructor if a WP is desired. If the instructor is not notified a failing grade will be assigned for the course. Laboratory work is scheduled for a specific time and day. However, two make-up times are available in the whole semester and labs can be made up in those times only. Each student is expected to participate in the required laboratory time in order to receive credit for the laboratory activity. There will be no designation of excused or unexcused absences in the lab. Make-up labs are allowed for excused absences only and a week's prior notice is required. Also, if the student is present in lab but fails to submit the lab report, it is counted as absent and no point will be awarded for that lab.

Assignment Due Dates: Students are expected to submit the assignments and other works on or before the assigned due dates. You will be penalized for the late works depending on the number of days and full point and importance of the works assigned. Lab reports will be due the next week of the lab period.

Make-up Work Policy**:** Make up work should be competed promptly after the absence. A maximum of one week will be the guideline. Make-up exams are given only in instances of the most unavoidable, serious circumstances. Prior notice of absence from an exam is required. Upon return after an absence the student is expected to be prepared for the days' class activities. It will be the student's responsibility to obtain the assignment for that day. Missed labs can be made up in designated dates.

Cell Phone Policy**:** Turn off your cell phone prior to class. If you work for an emergency service such as a fire department, put it on vibrate. It is a sign of disrespect as well as a disruption if non-emergency calls are taken during class. If you chose to take a call

anyway, leave the room and take your supplies with you. You are expected not to return that session.

Extra Credit Opportunity: Optimum student involvement in the course as well as course-related activities is highly recommended and rewarded with extra credit. The value of extra credit points varies with the nature of the activity and the application of that activity in the real life as well as relation of the activity with the course. Points that can be received are unlimited. Simple idea is: the more you are involved in real life science experiences, the more you understand and enjoy it, and you get good grades!!! Some examples of activities (but not limited to) that earn extra credit points include:

a) Being an active member of the Science Club coordinated by the instructor
b) Organize activities within the Science Club or participate actively in the activities organized by the Club
c) Taking leadership in group study sessions and manage study sessions with peers
d) Organize or be involved in science and technology awareness activities and helping society to improve utilizing science knowledge
e) Actively participating in science-related meetings and conferences on/off campus
f) Any other science related activities and duties beyond the demand of the course deemed worthy of extra credit by the instructor

Academic Dishonesty: It is expected that each student shall do his/her own work on class works, quizzes, exams, and lab reports. Cheating, copying other's answers, writing other's statement without citing their reference are all considered plagiarism and are penalized from allowing no point in that particular unit up to dismissal from the whole course, depending on the severity of the offense.

Disability Policy: It is the policy of UA Rich Mountain to accommodate students with disabilities, pursuant to state and federal law. Any student with a disability who needs accommodations should contact the Vice-Chancellor for Student Affairs Office, 394-7622, ext. 1400.

Arkansas Clean Air Act: In compliance with the Arkansas Clean Air Act, UA Rich Mountain is a smoke and tobacco free facility. Students and guests are to refrain from the use of all tobacco products while on campus.

Student Misconduct: Students committing misconduct are subject to disciplinary sanction(s) and/or restrictions. Misconduct or prohibited behavior includes, but is not limited to endangerment, harassment, disruption, sexual misconduct, illegal drugs and/or alcohol, fire or safety issues, gambling, property violations, computer violations or other violations as listed in the UA Rich Mountain catalog.

UA Rich Mountain Mission: University of Arkansas Rich Mountain exists to provide all residents of the Ouachita Mountain Region with exemplary educational and enrichment opportunities to improve the quality of life and standard of living.

Credit Hour Requirement Calculator				
Course Information				
Department, Course Number	PHYS 2054			
Course Title	University Physics I			
Credit Hours	4			
Mode of Delivery	Traditional			
Weeks in Part of Term	15			
Level of Reading Material	Advanced/Scientific/Technical (2)			3
Reading Level of Students	Average Student (2)			3
Average Pages per Hour	10			
		Enter either week or term, not both		
Contact Hours		**Hours/Week**	**Hours/Term**	**Total Hours**
Lecture/Recitation			46	46
Lab Contact Hours			22	22
	Pages Asg'd	**Hours/Week**	**Hours/Term**	
Syllabus Items				
Reading	380			38
Assignment		1		15
Quiz		1		15
Researching Lab questions		2		30
Reviewing for exams			10	10
				0
				0
				0
				0
				0
Total Hours				178
Required Hours				150
Difference				Ok + 28