*Our Mission dedicates us to deliver high-quality, innovative, affordable and accessible educational opportunities and services that prepare students for a rapidly changing and diverse global economy*

# Physics 221 - 2013

**Sections:** 221 DEN

**Instructor:** Dr. George R. Bart
Office: Rm. 3850 tel.(773) 907-4096;
Email: gbart@ccc.edu Blackboard course site: https://ccc.blackboard.com/
See online Teacher Profile & below for recommended website links, e,g.,
Course Links Website: http://faculty.ccc.edu/tr-scimath/Physics.htm
Textbook Companion Help Website: http://www.aw-bc.com/young_geller/

**Office Hours:** Best: Mon. & Wed., 4:50-5:15 pm; other times available by appointment

**Meeting Time:** Mon. & Wed., 1:00 - 4:50 pm in Rm. 3833 and, occasionally, in 3186.

**Required Text etc.:** COLLEGE PHYSICS, 9th Edition, H. D. Young; Pearson/ Addison Wesley 2012, ISBN10: 0321749804 OR ISBN13: 9780321749802. The text includes Mastering Physics online access OR CD to an advanced tutorial and homework system. ***Other supplies*** needed: A pocket scientific calculator having all functions. You are expected to know how to use your calculator. If you don't know how to use your calculator, then learn how to use it during the first week of class. Please, carry it with you in class, always; you will be asked to use it in class.

**Course Content:** These are a lecture, workshop, and laboratory trigonometry-based first course in physics. The Physics 221 courses serve the same purpose as the courses Physics 104, 105 & 106 jointly serve at the University of Illinois Chicago, where many of our students seek to transfer. Thus, it provides discussion, lab, tutorial, workshop, and computer simulation activity time. At UIC the courses 104, 105 & 106 total 9 contact hours and additionally have evening examinations. At Truman the course 221 totals 8 contact hours. Thus, transferring credit to UIC, or elsewhere, is no problem. The course is intended for students who already have taken a trigonometry course but it may be taken concurrently. Subject matter includes the study of mechanics, fluid mechanics, elasticity theory, waves in elastic media and sound. Specifically, the course covers the study of vectors, forces, equilibrium of a particle and rigid body, rectilinear motion, plane motion, Newton's laws, gravitation, work and energy, impulse and momentum, rotation, harmonic motion, elasticity, hydrostatics, hydrodynamics, waves in elastic media, sound waves, some relativity theory and heat. **The Catalog Description is below.**

**WAC:** Writing Across the Curriculum (WAC) assignments will be required as appropriate to the topics.

**Laboratory work:** The lab components reinforce concepts introduced in the course lectures. These are done in a contextual, hands-on, small group settings. Often individual quizzes will be given at the end of the period to assess what each student learned from the lab. Then the lab grade will be the quiz grade. Students are allowed to use their lab notes when completing the quizzes. For some labs, there will not be an associated lab quiz. In these cases, lab reports may be collected and graded.

**This longer more detailed syllabus is provided on the first day of class.**

**CONCISE COURSE INFORMATION**
**PHYSICS 221 - DR. BART**

## Truman Gen Ed Goals

This course addresses the Truman College General Education Goals:

- The student exhibits social and ethical responsibility and is aware of her or his place in the global community.
- The student performs effectively in the workplace and has the ability to work and make effective use of a wide variety of current technologies.
- The student communicates effectively in both written and oral formats.
- The student demonstrates the ability to think critically, abstractly, and logically.
- The student gathers interprets and analyzes data.

**CATALOG LISTING OF PHYSICS 077 0221 – Mechanics, Waves and Heat** Credit Hours: 5

Foundations and concepts in Physics, including elementary problems in mechanics, wave, motion and heat. Writing assignments, as appropriate to the discipline, are part of the course.

Prerequisites: Grade of C or better in Math 141, or higher or concurrent enrollment in Math 141 or Math 143, and Eligibility for English 101 or Consent of Department Chairperson.. 4 lecture hours and 4 lab hours per week based on 16 weeks.

**ASSIGNMENTS**

A standing assignment is to read the current textual material before coming to class, as stated in the course outline and as handed out in class. Additional assignments will be given out at appropriate times. These are to be done at home after you have studied the chapter. If they are to serve their purpose, you should do them alone. Bring them to the next session so that we may discuss any points you don't understand. The weekly assignment provides a check of how well you are studying.

Because you will encounter a large number of definitions in this course that will probably be new to you, I suggest that you keep good notes or at least a vocabulary list of the new words you encounter and their meanings. The notes will be an aid in reviewing for exams. It is important not to get behind on memorizing the meaning of words and concepts new to you. Otherwise, you will be overwhelmed by the end of the course.

## HOMEWORK and CLASS PARTICIPATION

Doing homework will increase your changes of success in this class. It typically will consist of doing weekly problems, reading the weekly lab instruction handout, and writing a lab report. If you miss a class you will need to request, any handouts or homework assignments you missed. Some classes will involve interactive class participation using a clicker personal response system. Class participation points will be awarded to augment the homework grade.

**EXAMS**

There will be several short quizzes at the end of several of the lab sessions. All quizzes will be multiple choices and will be announced in advance.

**GRADING**

The final course grade in Physics 221 will be determined by the following system. For performance reference the individual activities can be graded on a raw score percentage scale.

F = less than 45%
D = 45 - 54%
C = 55 - 64%
B = 65 - 74%
A = 75% or above

The final average lab and homework grades will be combined with the other grades to arrive at the final letter grade. Normally this enhances the overall grade, which is the main grade for transfer purposes.

**MIDTERM GRADES**

At midterm, overall assessment letter grades A, B, …, F will be recorded for each student based upon their scores on required assessment assignments such as major tests, lab reports, homework, and quizzes. Any missing assignments are scored as zero. However, if one major test or any two or more other assignments of one type are scored zero, the midterm evaluation will be that the student is not actively pursuing the course and the midterm grade will be recorded as ADW (administrative withdrawal). You must complete assignments to avoid an ADW.

**ATTENDANCE**

A student with more than 3 absences and a current test average below D will be given an automatic F. A missed activity of any kind will be scored zero. **No make-ups will be allowed for unexcused missed activities**! A make-up test for a missed activity may be allowed, depending on a serious excuse and a promptly made appointment with the teacher.

**GradesFirst** *will be used to provide early notice of personal student difficulty in this class. If your coursework is deficient in the course initial weeks,, the GradesFirst system will generate an email to you and will also keep track of that. Your advisor should be listed in GradesFirst. If there is not an advisor listed, werecommend that you reach out to the Advising Office and ask that one be assigned. Advisors can be very helpful as you navigate your academic path at CCC. Log in to GradesFirst at ccc.gradesfirst.com using your CCC username and password. This is the same username and password you would use for Blackboard and email.*

**ACADEMIC INTEGRITY**

This course implements the CCC Academic Integrity policy. The CCC has no tolerance for violations of academic integrity. The student policy manual states, "Plagiarism and cheating of any kind are serious violations of these standards and will result, minimally, in the grade of 'F' by the instructor" (39). All course work will be checked for Academic Integrity. In this course, the first violation will result in an "F" for the assignment; the second violation will result in course failure. Make-ups and revisions are not available after an infraction of academic integrity.

**ACADEMIC SUPPORT SERVICES**

Numerous academic support services are available to students of Truman College. Some are:
**Student Services Department.** It assists students in selecting an academic pathway that aligns with their career goals, provides ongoing support through completion and graduation, offers career and transfer assistance, supports student clubs and organizations, and provides support for veterans and students with disabilities. See: **http://tinyurl.com/6prvec5**
**Tutoring Center**. For students who need help with their assignments: McKeon Administrative Building Room 162, 773-907-4785 or 4790, **http://tinyurl.com/7a8o9ty**..
**Student Success and Leadership Institute (SSLI)**. For students who need various other support services to achieve their educational goals: McKeon Administrative Building Room 162, 773-907-4714. **http://tinyurl.com/75avz7a**
**TRIO Student Support Services**. For low-income students, first generation college students, or students with disabilities who need academic support: Room 1435, 773-907-4797, **http://tinyurl.com/6qdwmc9.**
Registration is required at the start of each semester.
**Disability Access Center**. The Center verifies needs pursuant to the American Disabilities Act (ADA), determines student academic accommodations, and issues accommodation letters. Registration is required at the start of each semester. Room 1435, 773-907-4725, **http://tinyurl.com/7tkvh88**.

**THE WELLNESS CENTER.** Support and help is provided via:

- Personal counseling
- Support groups
- Stress and time management coaching
- Referrals to Community Resources

It is located in Room 1946 of the Main Building, 773-907- 4786. See: **http://tinyurl.com/8uvzd6v**

**FERPA**

FERPA (Family Educational Rights and Privacy Act) is a federal law that protects the privacy of student educational records. Faculty cannot reveal information about students, or discuss student records over the phone or unsecure e-mail. CCC student e-mail meets FERPA requirements. See: **www.ed.gov/policy/gen/guid/fpco/ferpa/index.html**.

**TOPICAL OUTLINE AND SCHEDULE FOR PHYSICS I**

**TEXT BOOK:**
**COLLEGE PHYSICS, 9th Edition,**
**Young, Pearson/ Addison Wesley 2012.**
The text includes Mastering Physics online access or
a CD with advanced tutorial and homework system for optional use.

**Dr.Bart**
**Office 3850**
**773-907-4096**
**MW 4:50-5:15**

**SUPPLEMENTARY MATERIALS:**
**See the recommended Internet links at on the CCC Blackboard Course Website**

| | | YOUNG'S TEXT | |
|---|---|---|---|
| **UNIT** | **ASSIGNMENT** | **PAGES** | **CHAPTER** |
| 1 | Review: Math, Vectors | 0-28 | 0; 1 |
| | Measurement | A1-A6 | Appendices A-E |
| 2 | One Dimensional Motion | 29-67 | 2 |
| | Planar Motion | 68-98 | 3 |
| 3 | Particle Dynamics & Forces I | 99-127 | 4 |
| 4 | Particle Dynamics & Forces II | 128-144; 161-169 | 5.1 - 5.3; 6.1 - 6.2 |
| **TEST I** | | | |
| 5 | Work and Energy | 188-208 | 7.1 -7.5 |
| 6 | The Conservation of Energy | 208-230 | 7.6 - 7.8 |
| 7 | Particle Systems Dynamics | 231-239, 251-253 | 8.1 - 8.2, 8.6 - 8.7 |
| 8 | Collisions: Impulse & Momentum | 239-251 | 8.3 - 8.5 |
| **TEST II** | | | |
| 9 | Rotatonal Motion I | 267-281 | 9-1 thru 9-4 |
| 10 | Rotational Motion II | 281-293; 294-311 | 9-5, 10-1 thru 10-5 |
| 11 | Rigid Body Equilibria | 311-332 | 10-6, 7 |
| 12 | Oscillations | 145-147, 333-364 | 5-4, 11 |
| 13 | Gravitation | 170-187 | 6-3, 4, 5 |
| **TEST III** | | | |
| 14 | Elementary Fluid Mechanics | 407-441 | 13 |
| 15 | Classical Wave Theory & Sound Waves | 365-406 | 12 |
| 16 | Heat | 441-476 | 14 |
| **FINAL EXAM** | | | |

**BRIEF PHYSICS 221 COURSE OBJECTIVES (STUDENT LEARNING OUTCOMES)**

Upon completion of these courses, the student should be able using algebra and trigonometry to:

1. Use skills of scientific reasoning and conceptual and computational problem solving.
2. Apply vectors to solve problems.
3. Use the equations of rectilinear motion and free fall to solve problems.
4. Apply the concepts of plane motion to solve problems.
5. Use the equations of projectile and circular motion to solve problems.
6. Apply Newton's three laws of motion to practical situations.
7. Use work, energy and heat principles to analyze physical situations.
8. State and apply conservation of energy and momentum principles.
9. Analyze and solve rotational kinematics and dynamics problems involving moments of inertia and angular acceleration.
10. Solve problems related to the equilibrium of a rigid body.
11. Solve problems related to mechanical oscillations including springs, simple and physical pendulums and other oscillatory systems.
12. Apply the principles of fluid mechanics to solve problems.
13. Use Newton's law of universal gravitation to various problems in physics and astronomy.
14. Apply the principles of wave motion to solve problems transverse and longitudinal waves, superposition, etc.
15. In a clear manner, describe problems and present their solutions in homework, exams and laboratory reports.
16. Use various instruments to measure physical quantities in the lab.
17. Use modern technology to analyze and solve physics problems (computers, etc.).

## LIST OF PHYSICS EXPERIMENTS/ACTIVITIES

### Students will perform a selection of activities, such as in this list, as determined by the instructor.

1. Introduction (reports, hand and computer graphing, computer algebra calculations, errors and error analysis)
2. Measurement of Length with Vernier Caliper
3. Measurement of small Lengths with Micrometer Caliper- Density of Solids
4. Graphs and Tracks Computer Simulation
5. Composition of Concurrent Forces- Force Table
6. Interactive Internet Software Activities
7. Coefficient of Friction
8. Uniformly Accelerated Motion- Atwood's Machine
9. Equilibrium of a rigid body
10. Centripetal Force
11. Momentum Ballistics- Ballistic Pendulum
12. Balanced Torques and Center of Gravity
13. Young's Modulus of Elasticity
14. Simple Pendulum
15. Simple Harmonic Motion- Spring Force Constant
16. Archimedes' Principle
17. Torsional Pendulum-Determination of the Newtonian Constant of Gravitation G
18. Resonance in air columns
19. Laws of vibrating strings- Standing waves in a string

By Using the Air Cushion Table (ACT):

20. Introduction of ACT-Analysis of a trace-Uniform Motion
21. Rectilinear Motion with constant acceleration a
22. Plane Motion- Projectile Motion
23. Newton's second Law
24. Conservation of Momentum- Elastic and Inelastic Collisions
25. Conservation of Energy in an isolated system
26. Study of Angular Momentum
27. Determination of an unknown force by energy measurements

**APPENDIX - PHYSICS 221 OVERALL DETAILED SYLLABUS**

CITY COLLEGES OF CHICAGO TRUMAN COLLEGE PHYSICAL SCIENCE & ENGINEERING DEPT.

# COURSE SYLLABUS

(General Information: The credit-contact hours and prerequisite for this course were changed in 2011.)

INSTRUCTOR: Dr. G. BART
OFFICE ROOM NUMBER: 3850
OFFICE HOURS: after class
OFFICE PHONE: (773)-907-4096
EMAIL: gbart@ccc.edu
SCIMATH LINKS: http://faculty.ccc.edu/tr-scimath/

COURSE TITLE: Mechanics, Waves and Heat
COURSE NUMBERS: Physics 221
SECTIONS: 077-221 DEN
SEMESTER: Spring 2013
TIME & DAYS: 221 MW, 1:00-4:50
LENGTH OF COURSE: 16 Weeks of class
PREREQUISITE: Math 141 Trigonometry or 143 Pre-Calc

OTHER COURSE INFORMATION

COREQUISITE: Physics 221
CREDIT HOURS: 5 hours
CONTACT HOURS: 8 LECTURE AND LAB TOTAL periods/week
CATALOG DESCRIPTION: See Attached
COURSE OBJECTIVES: See Attached list of Behavioral (Instructional) Objectives
STUDENTS THIS COURSE IS DESIGNED FOR: See Attached Course Syllabus Cover Sheet
METHOD OF INSTRUCTION: See Attached Sheet on General Information
METHOD OF EVALUATION OF STUDENT PERFORMANCE: See Attached Sheet on General Course Information

## *COURSE OUTLINE*

(Specific Information)

TEXTBOOK: COLLEGE PHYSICS, 9th Ed., H. D. Young; Pearson/ Addison Wesley 2012.
The text includes Mastering Physics online access OR CD to an advanced tutorial and homework system.
SUPPLEMENTARY TEXTS: (Not required, for suggested reading Only.)
1. COLLEGE PHYSICS, Weber, White, Manning, McGraw-Hill Co.
2. MODERN COLLEGE PHYSICS, By White; Van Nostrand Co.
3. THE PHYSICS PROBLEM SOLVER, Fogiel (on problems and problem solving techniques).
4. SCHAUM'S OUTLINE SERIES (on problem solving).

Additional References:
HANDOUTS: a) On sample solved problems, will be given out in class.
b) On lab experiments will be given out during and prior to lab date.

Below Recommended Internet Sites have links on the CCC Blackboard Website.
Phys 221 Text Companion Help
College Physics Online HyperTextbook
Monash U. Phys. Diagnostic Test Downloads
U.Guelph CA Physics Tutorials
A vectors intro is in Ch. 5 of the free online trig book: http://tinyurl.com/8woszv4
There are free online physics resources at: http://www.ck12.org/browse/physics/
Project SciMath Links Directory
Phys 235 Text 6th Ed. Companion Site
Phys 235 Text 7th Ed. Companion Site
Phys 235 Text 8th Ed. Companion Site
Phys 235 Text 9th Ed. Companion Site

# GENERAL COURSE INFORMATION

1. COURSE DESCRIPTION

This is a first course in Physics, whose purpose is to present a systematic approach with sufficient rigor to the basic topics encountered in such an introductory course with Trigonometry. The course is intended for students of Sciences and engineering who already have taken a calculus course. Subject matter includes the study of mechanics, fluid mechanics, elasticity theory, waves in elastic media and sound. Specifically, the course covers the study of vectors, forces, equilibrium of a particle and rigid body, rectilinear motion, plane motion, Newton's laws, gravitation, work and energy, impulse and momentum, rotation, harmonic motion, elasticity, hydrostatics, hydrodynamics, waves in elastic media, sound waves and some relativity theory.

An attempt will be made to maintain a balance between developing techniques for solving problems and the theory necessary to support those techniques. Both will be illustrated in numerous applications and a variety of problems, to provide an opportunity for the student to assimilate and familiarize himself/herself with the subject matter. The primary emphasis is on physical principles and problem solving. The ideas expounded and the skills learned are needed for future work in physics and related fields.

2. COURSE GOALS AND OBJECTIVES

The material will be presented in such a manner as to render service not only to physics and engineering students but also to students in the field of related branches of physical sciences. The main goal is the mastery of course objectives. They seek to: A) recognize one's interaction with the physical environment, B) apply habits and skills of scientific thought to personal and social problems, C) choose a socially useful and personally satisfying vocation, D) stimulate the student to further interest in physics and other related fields, and E) provide the student with the tools and necessary background for the study of these fields. The topics (units) to be covered are listed above and a document of course objectives per unit is included in the syllabus.

3. METHOD OF INSTRUCTION

Any method of instruction should stress the active participation of the student, since he/she is in the center of the learning process and the beneficiary of the efforts and outcomes of this course. In this class, we will be using the Lecture-Discussion type of approach which consists primarily of the presentation of the material using concrete examples and applications followed by classroom discussions, oral and written drills, frequent quizzes, daily homework assignments and problem solving. The emphasis will be in obtaining participation and motivation during classroom practice.

4. OUTLINE OF INSTRUCTION AND (BEHAVIORAL) STUDENT LEARNING OUTCOMES

The course is divided into topics (units) listed in the syllabus. Each unit is of approximately three weeks duration. For each chapter within a unit, the reading assignment (textbook pages to be read) and the Homework problems to be worked out and handed in are listed in the topical outline given above(see policy on homework).

An Hour Exam will be given on each, and every, unit upon its completion (see policy on Exams). The purpose of each test is two fold: to evaluate the student's performance and to test for mastery of the course instructional objectives, as related to the material of the unit. It is our hope that this process will identify student strengths and/or weaknesses and provide the Instructor with a reasonable amount of time for corrective action, if necessary.

A list of the course instructional Student Learning Outcomes or Objectives is also included in this syllabus. It is suggested that the student should read them very carefully to find out what is expected of him/her and what will be accepted as adequate achievement. To estimate his/her progress the student should make a periodic review of the instructional objectives. At this point, it is quite important for the student to understand the difference and make the distinction between course description and course objective.

A course description tells you something about the content and the procedures of the course but not everything. It might tell you which field you will be playing on. It does not explain what will be accepted as adequate achievement; it does not confide to you the rules of the game; it does not tell you where the foul lines are or where the goal posts are located or how you will know when you have scored.

A course objective describes a desired outcome of the course. It tells you what you will be like because of some learning experience. It explains what will be accepted as adequate achievement. It confides to you the rules of the game. It tells you where the goal posts are located and how you will know when you have scored. An objective has three main parts: A) an outcome statement that describes the task, activity, knowledge, or accomplishment being sought; B) descriptions of conditions and circumstances under which the outcome will be measured or observed (time limits or materials with which you will be confronted); and C) statements of the criteria of minimum acceptable performance (standards to be used for judging successful performance of task).

5. REQUIRED COURSE MATERIALS AND RESOURCES

A. ***Textbook*** adopted: see the course outline for title, author, publisher and assignments.
B. ***Other supplies*** needed are 1). A pocket scientific calculator having all functions. You are expected to know how to use your calculator. If you don't, then learn how during the first week of class. Please, carry it with you in class, always, you will be asked to use it in class. 2) Ordinary graph paper, semi-log and log-log graph paper. 3) Notebook, whose sheets are regular paper on one side and graph paper on the other side (if possible). 4) a plastic, transparent ruler and a protractor, for graphical constructions.
C. ***Supplementary Materials:***
1. Reference: Books on theory and problems are listed above. Such materials are included to help the student locate any pertinent information (not required, for suggested reading only). Additional books can be suggested, by the instructor, upon request.
2. Class content distributions: These will be given to students for several purposes. These are: a) To stress important concepts b) To supplement material (whenever appropriate) c) To supply the student with extra practice exercises d) To help the student acquire problem solving ability by introducing different problem solving techniques e) To review and prepare the student for evaluation.
3. Imagess: A physics image collection accompanies the textbook. It will be used, on many occasions, to illustrate important concepts and enhance many ideas.
4. Videotapes: a) Videotapes on problem solving (from the department collection) will be used during class but mostly before or after class-time to interested students, upon prior arrangements with the instructor. b) Short videotape experiments and demonstrations using a conceptual approach, from the collection "Physics is Phun", will be shown also. c) Perhaps, the experiment, Measurement of the Gravitational Constant G, will be performed on video. The students will take actual measurements and complete a report. For various reasons, this experiment is difficult to do in the lab.
5. Computer software: a) The SCIMATH LINKS: http://faculty.ccc.edu/tr-scimath/ contain many useful interactive activities to aid students to understand the course content. b) An Interactive Physics Textbook demo CD-ROM and a CD-ROM, CD Physics for Windows & Macintosh, are available in the physics lab-room computers for students to use,. They contain tutorials, simulations, a study guide, a student solutions manual and interactive learning ware. c) Students can, also, use the computers in the physics lab-room to help them prepare their lab reports by using software programs like Derive (to graph certain experimental data, perform calculations, etc.). d) Multimedia Enhanced Physics Instruction, known as MEPI, an interactive CD-ROM for Windows may be used to explore the world of physics. MEPI'S flexible multimedia format places hyper-linked concepts, videos, simulations, quizzes and problems at the student's fingertips.
D. Supportive services and Instructor's office hours: Upon need, the student may be referred to the college supportive services for tutoring and any other available services, provided there are tutors available. The instructor, also, always keeps office hours and students are encouraged and welcome to visit him for additional assistance.
E**)** Group Study: Students should have a section partner or partners, exchange phone numbers and other information, and try to work together. There are advantages in working with a partner; if you are absent, your partner will tell you what happened in class and give you any assignments that you may have missed.

6. ATTENDANCE POLICY
In order, to assist you in your academic career, the following information is being provided on the attendance policy.
⇒ All classes will begin on time and students are expected to be in class on time.
⇒ School attendance policy as described in the CCC Student Policy Manual will be followed.
⇒ A student with more than five (5) absences will be eligible for an automatic F.
⇒ There is no such thing as an excused absence.
⇒ Tardiness**:** Three (3) late arrivals or early departures are equivalent to one (1) absence.
⇒ There is no make-up for a missed lab. Missed tests or lab reports will be scored zero.
⇒ A make-up test for a missed exam may be allowed, depending on the nature of the excuse (if serious) and a promptly made appointment with the instructor.
Absence does not excuse a student from completing the course work, like homework or other assignments. If a student does miss a class, he or she should do the following: a) Read the material for the missed class and b) attempt to do the homework problems or other assignments.

7. LABORATORY

Laboratory sessions are a part of the course. A student must attend all of the sessions, do all of the experiments and hand in sequentially all Lab reports in order to receive full credit. There will be 10 to 12 experiments with required written reports. Some labs will involve a quiz at the end of the session. The precise report format will be described later. The reports will be graded on a 10 to 20 point scale to form your Lab grade. No lab manual is assigned. The instructor will provide instruction sheets on the experiments to be performed. Normally, the relevant material will have been covered in class before the experiment.

8. POLICY ON ASSIGNMENTS AND EXAMS

There will be only two standing assignments; namely, read the current text material and do the scheduled problems. Special assignments, if any, will be given out in class.

***Homework:*** Homework assignments for the entire course are given in the course outline. Students should do the homework and hand it in on time; this will insure them success. Regular and timely homework will be corrected and returned. It must be understood that working and solving problems is necessary to learning physics. On difficult problems, try your best for 15 minutes before giving up. Then get someone to help you or ask the instructor in class or in the office. It is important to try the problems early in the week so that there is time before a test to ask about the points you don't understand. Some of the scheduled problems of each chapter may be used in making up quizzes. Problems are your best aid to learning physics and they may be done in any way helpful to you. There are advantages working with a partner.

NOTE: Homework assignments are due and must be turned in to the Instructor, during the first class session of the week following the presentation and completion of the discussion of a chapter (for example, the homework on work and energy, material covered the fourth week, is due during the first class session of the fifth week).

***Exams*** There will be four (4) major tests (3-Quarterly Exams and a Final) which will consist mostly of problems and short answer type questions. Exam problems may require showing your work in detail; neatness will count. You will need to be able to write solutions as in the examples in the text. Some short quizzes may also be given. No make-ups except in certain individual cases where it will be evident that the student had a good enough reason not to take the test or exam. No one is exempted from the Final Exam.

NOTE: Hourly Exams will be given during the first class session of the week following the completion of a Unit (for example, Test I will be given during the first class session of the fourth week).

9. MAKE-UP PROCEDURE: For make-up procedures, on homework, lab and exams, see sections 6, 7, and 8.

10. STUDENT EVALUATION (GRADING PROCEDURE)

The student earns a final grade at the end of the term by class participation which should be encouraged and required since the only way of learning physics implies doing physics. NOTEBOOK: Students should keep notes for any reference during the progress of the course, thus developing good study management habits.

***A. POINT DISTRIBUTION***

a. Quarterly Exams: Each of the highest 2 exams counts as 20% of the grade for a total of 40%.
b. Final Exam: It counts as 20% of the grade.
c. Lab: The Lab counts as 20% of the grade.
d. Homework and Other Evaluations: They count as 20% of the grade.

***B. GRADE DISTRIBUTION***

The grades that will be earned by the students are approximately based on the following point system:

| GRADE | PERCENT OF POINT ACCUMULATION |
|---|---|
| 1. A | 75%-100% |
| 2. B | 65%-74% |
| 3. C | 55%-64% |
| 4. D | 45%-54% |
| 5. F | Under 45% |

11. OTHER RULES AND REGULATIONS OF THE COURSE:

A. Academic Integrity is of extreme importance. It is expected that every student comply with the Academic Integrity Statement as stated in the CCC Student Policy Manual.

B. It is the responsibility and obligation of the student to abide by the rules set forth (and those stated in the CCC Student Policy Manual), the aims of which are to enable the instructor to deliver the expectations of the course and equitably to evaluate the student's performance.

## INSTRUCTIONAL (BEHAVIORAL) STUDENT LEARNING OUTCOMES

## UNIT I

1. VECTORS/FORCES, MEASUREMENT

A student should be able to:

Obj.1.Distinguish the various kinds of Systems of Units and convert the units of a given physical quantity from one system to another, in a short period of time and with 100% accuracy.

Obj.2 Identify the fundamental (basic) indefinable quantities of mechanics, their symbols and their standards and units in a given System of Units, in a short period of time and with 100% accuracy.

Obj.3.Identify the derived quantities of mechanics in a specified system of units and determine whether a given physical quantity is basic or derived in a specified system of units with 100% accuracy and in a short time period.

Obj.4.Determine the dimensions and specify the "derived" units of a given physical quantity, in a certain system of units, with 100% accuracy and in a short time period.

Obj.5. Demonstrate whether or not an equation seems to be correct by performing dimensional analysis, in a short time period and with 100% accuracy.

Obj.6. Write the value of a given quantity in scientific notation and vice versa, in a short time span and with an accuracy of 100%.

Obj.7. Use prefixes to convert the units of a given physical quantity to a smaller or larger unit within the same system of units, with 100% accuracy and in a short span of time.

Obj.8. Give the definition of a vector or a scalar and classify a given physical quantity (like force, velocity, mass, time, etc) as being a vector or a scalar, with 100% accuracy and in a short period of time.

Obj.9. Represent a force graphically as a vector.

Obj.10. State the mathematical properties of vector addition, subtraction, product types, etc, by applying all possible methods, give their geometrical meaning, combine vectors (forces) to find the resultant and use these concepts to solve physics problems.

Obj.11. Find the unit vector of a given vector and use it in problem solving.

Obj.12. Evaluate any of the given vector product types and use these concepts to solve problems.

Obj.13. Decompose a given vector into components and also find the resultant of two given vectors by rectangular resolution and apply these concepts in solving problems.

2. MOTION IN ONE DIMENSION (RECTILINEAR OR STRAIGHT LINE MOTION), PLANE MOTION

With reasonable accuracy and in a reasonable amount of time, a student should be able to:

Obj.14. Define average velocity, average acceleration, instantaneous velocity and acceleration, their units in the different systems of units and demonstrate his/her understanding of these concepts by using them to solve problems in the following cases: a) rectilinear motion with constant acceleration b) freely falling bodies.

Obj.15. Determine velocity components, define relative velocity and use these concepts in solving problems.

Obj.16. Identify the particles of physics and state their properties.

Obj.17. Define average velocity, average acceleration, instantaneous velocity and acceleration for motion on a plane, decompose the acceleration into rectangular and into normal and tangential components and use these concepts to solve problems.

Obj.18. Analyze the motion of a projectile, and obtain the equations of motion, the trajectory and all the elements of the trajectory and demonstrate his/her understanding of these concepts by applying them to solve problems.

Obj.19. Analyze circular motion, obtain the values of tangential and centripetal acceleration, the centripetal force and use these concepts to solve problems in practical situations like motion in a vertical circle, motion along a highway curve, conical pendulum. Motion of a satellite, etc.

Obj.20. Demonstrate and analyze the effects of the Earth's rotation on the acceleration g and use these concepts to solve problems.

Obj.21. Analyze relative motion in one and two dimensions, determine the relative velocities and the accelerations at low and high speeds (relativistic case) and demonstrate his/her understanding by solving practical problems of all kinds.

3. PARTICLE DYNAMICS I & II (FORCE AND MOTION I & II )

With reasonable accuracy and in a reasonable amount of time, a student should be able to:

Obj.22. State Newton's first law of inertia and third law of action-reaction and apply them to solve problems.

Obj.23. State Newton's second law of motion, write it down and obtain the equations of motion of a moving body and solve them to obtain the quantities of motion of the moving body. He/She should demonstrate ability in solving problems involving motion under the application of constant forces as well as variable forces(dependent on time,position,velocity,etc).

Obj.24. Define the different systems of units and convert units from one system to another.

Obj.25. Determine whether a given reference frame is inertial or not, write Newton's laws for an inertial frame and specify motion with respect to inertial frames and apply to problems.

Obj.26. Distinguish the difference between mass and weight. Specify what a measuring instrument is actually measuring, distinguish between weight and apparent weight and use these concepts to solve practical problems.
Obj.27. Identify static and kinetic friction, state their laws and apply them to solve problems when frictional forces are present.
Obj.28. Identify and describe drag forces, write down their laws and use them in solving problems.
Obj.29. Identify and describe all Forces of Nature and the unification theories and demonstrate his/her ability to solve problems involving such forces.

## UNIT II

### 4. WORK & ENERGY AND 5. CONSERVATION OF ENERGY

With reasonable accuracy and in a reasonable amount of time, a student should be able to
Obj.30. Define and describe the concepts of work done by an applied force (constant or variable force, in one or two dimensions), explore its meaning, define its units, determine the work done by various forces like, friction, gravity, spring force, etc. and apply these concepts to solve problems in various practical situations.
Obj.31. Describe the concept of kinetic energy, state the work-energy theorem and use these ideas in solving practical problems.
Obj.32. Define power, state its units, and apply these concepts in solving problems.
Obj.33. Write down the expression for kinetic energy at high speeds.(relativistic case), compare it with the classical case and use it in solving problems.
Obj.34. State the criteria for a force to be conservative or non-conservative, identify such forces, define potential energy for conservative forces (like gravitational, spring force, etc.), explore the potential energy curve (equilibrium, turning points, etc.) and use these concepts to solve practical problems.
Obj.35. Define total mechanical energy, state the theorem of conservation of total mechanical energy for conservative forces, determine whether or not is valid in a given situation and use it in solving problems in various applications.
Obj.36. Describe the internal work done by internal forces, define internal potential energy for conservative forces and apply it to solve problems.
Obj.37. Describe situations involving non-conservative forces, like frictional force, (external or internal forces), state the work-energy theorem when such forces are present and use these concepts to solve problems in various applications.
Obj.38. Analyze mass-energy relationships in light of relativistic considerations, describe rest mass and energy, mass and total energy, kinetic energy and use these concepts to solve problems.
Obj.39. Identify heat as energy transferred because of a temperature difference; solve problems in various practical situations involving the different types of heat.

### 6. DYNAMICS OF SYSTEMS OF PARTICLES

With reasonable accuracy and in a reasonable amount of time, a student should be able to:
Obj.40. Describe the center of mass (gravity) of a system of particles (body), for discrete or continuous mass distributions, in one, two or three dimensions, list the equations of such center of mass, solve them by summation (discrete system) or by integration using calculus (continuous system) to calculate and find the center of mass and apply these techniques to solve practical problems in various applications.
Obj.41. State and write down Newton's second law of motion for the center of mass of a system of particles, solve the equations and obtain the motion of the center of mass and apply these techniques to solve applied problems.
Obj.42. Define momentum of a particle and a system of particles, in the classical (low speeds) and the relativistic case (high speeds), and use these equations to solve practical problems.
Obj.43. State the law of conservation of momentum for an isolated system, and use it to solve problems.
Obj.44. Write down the equations for a system with variable mass (like a rocket, etc.) and use them to solve problems in various practical cases.
Obj.45. State the work-energy theorem for a system of particles and apply it to solve problems.

## UNIT III

7. COLLISIONS

With reasonable accuracy and in a reasonable amount of time, a student should be able to:
Obj.46. Define impulse of a force, state the impulse-momentum theorem and apply these concepts to solve problems in various practical situations (rocket propulsion, collisions, etc.).
Obj.47. Use the conservation of momentum theorem to solve problems in collisions, elastic or inelastic, one or two dimensional, recoils, reaction and decay processes, etc.

8. ROTATIONAL KINEMATICS AND 9. ROTATIONAL DYNAMICS

With reasonable accuracy and in a reasonable amount of time, a student should be able to:
Obj.48. Define the rotational variables, angular position, velocity, and acceleration, state their units and apply these ideas to solve problems with zero, constant and variable angular acceleration.
Obj.49. Write the relationships between linear and angular velocity, tangential linear acceleration and angular acceleration, radial linear acceleration and linear velocity and apply them to solve problems.
Obj.50. Write the expression for the kinetic energy of rotation and use it to solve problems.
Obj.51. Define the moment of inertia of a rotating body (discrete or continuous, of one, two, or three dimensions) about a certain axis of rotation, write down the equations and solve them to calculate the moment of inertia (by summation or integration) and use them to solve problems.
Obj.52. Use the parallel axis theorem to calculate moments of inertia in various applied cases.
Obj.53. Define torque (moment of a force), state Newton's second law of motion for rotation and use these concepts to solve practical problems.
Obj.54. Define the work done by torque, power, kinetic energy of rotation, state the work-energy theorem in the case of rotation and apply these concepts to solve problems.
Obj.55. Write down the expression for the kinetic energy of a rolling body and use it in problems.
Obj.56. Write the expression for the torque of a moving particle and a moving body, define angular momentum for a moving particle and a rotating body, state Newton's second law in angular form for a system of particles and use these concepts in solving problems.
Obj.57. Define the angular impulse of a torque, state the angular impulse-angular momentum theorem for these vectors, calculate these quantities and use these concepts to solve problems.
Obj.58. Describe the law of conservation of angular momentum for an isolated system and use it to solve problems like the spinning man, springboard diver, stabilizing a satellite or frisbee, the pumping of a swing, spacecraft orientation and other practical problems.
Obj.59. Calculate the torque and the angular momentum of a precessing top, the precession rate of the top and apply these ideas to problem solving.
Obj.60. Describe the quantization of angular momentum, use it in the realm of the microscopic world and apply these concepts in solving problems.
Obj.61. Relate the conservation laws of nature to the existing symmetries and see their connection.

## UNIT IV

10. EQUILIBRIUM OF RIGID BODIES-ELASTICITY

With reasonable accuracy and in a reasonable amount of time, a student should be able to:
Obj.62. State the first condition of equilibrium (translational equilibrium) and apply it to solve problems in Statics.
Obj.63. State the second condition of equilibrium (rotational equilibrium) and apply it to solve problems in Statics.
Obj.64. Apply both conditions of equilibrium to solve problems.
Obj.65. Define a force Couple, determine its moment and use it to solve problems.
Obj.66. Define elasticity, stress, strain, modulus of elasticity, yield and ultimate strength. Plasticity, tension and compression, Young's modulus, relate stress to strain and use these concepts to solve problems.
Obj.67. Define shearing, shear modulus G, and use them to solve problems.
Obj.68. Define hydraulic compression, pressure, bulk modulus B and use them to solve problems.

11. OSCILLATIONS- HARMONIC MOTION

In a reasonable amount of time and with reasonable accuracy, a student should be able to:

Obj.69. Describe oscillatory (periodic) motion, identify the equation of simple harmonic motion, determine the amplitude, period, frequency, phase difference, calculate the velocity, determine the velocity amplitude, calculate the acceleration and determine its amplitude, compare the phase angles of velocity, acceleration and displacement and use all these concepts to solve problems in applications.

Obj.70. Define restoring torque, write Hook's law of force, write Newton's law to obtain the equation of the simple harmonic motion, solve these equations to obtain the quantities of motion and determine the amplitude, period, frequency, phase, etc. and apply these concepts to solve problems in the following cases: a) harmonic oscillators (linear) b) simple pendulum c) physical pendulum d) phantom pendulum e) conical pendulum f) angular harmonic oscillators 9torsional pendulum) and other applications.

Obj.71. Use the energy method to solve problems of simple harmonic motion.

Obj.72. Compare simple harmonic motion and circular motion and apply it to problem solving.

Obj.73. Write Newton's second law for damped simple harmonic motion, solve the equations to obtain the quantities of motion and use these concepts to solve application problems.

Obj.74. Write Newton's second law for forced oscillations, solve the equations to obtain the quantities of motion and the condition for resonance and apply these concepts to solve problems.

12. GRAVITATION

In a reasonable amount of time and with reasonable accuracy, a student should be able to:

Obj.75. State Newton's law of universal gravitation for two particles and apply it to solve problems.

Obj.76. Use the principle of superposition to determine the total force of gravity on a particle due to a system of particles in the case of a) discrete system of particles (by summation) and b) continuous system of particles(by integration) and apply it to solve problems.

Obj.77. Use the shell theorem to solve problems like a tunnel bored through the earth, etc.

Obj.78. Use the force of gravity near the Earth's surface to solve related problems.

Obj.79. Define gravitational potential, energy and use it to solve problems.

Obj.80. State Kepler's laws and use them to solve problems involving planets and satellites.

Obj.81. Determine orbits and energies of satellites.

## UNIT V

13. FLUID MECHANICS

With reasonable accuracy and in a reasonable amount of time, a student should be able to:

Obj.82. Define density, pressure in a fluid, list their units, state the hydrostatic paradox, Pascal's principle, Archimede's principle, determine pressures and forces for a fluid at rest, and apply these ideas to solve applied problems, like forces and torques on a dam, etc.

Obj.83. Define surface tension, pressure difference across a surface film and apply these concepts to solve problems.

Obj.84. State the equation of continuity, write Bernoulli's equation and apply them to solve problems.

Obj.85. Define viscosity, state Poiseville's law, define Reynold's number and apply these concepts to solve problems.

14. WAVES IN ELASTIC MEDIA (WAVES I)

In a reasonable amount of time and with reasonable accuracy, a student should be able to:

Obj.86. Describe the different kinds of waves like mechanical waves, electromagnetic waves, matter waves, determine the amplitude, wavelength, or wave number, angular frequency or frequency, period, phase, wave speed of a traveling wave, etc, and use these concepts to solve problems.

Obj.87. Use the equations of traveling waves to solve problems.

Obj.88. Use the equation of wave speed in a stretched string to solve problems.

Obj.89. Use the equations of energy (kinetic, potential) in a traveling wave as well as the expressions of the power transmitted to solve problems.

Obj.90. Use the superposition principle, the equations for interference of waves and the equations of standing waves to solve problems.

Obj.91. Use the resonance conditions to solve problems.

15. SOUND WAVES (WAVES II)
In a reasonable amount of time and with reasonable accuracy, a student should be able to
Obj.92. Use the speed of sound in an elastic medium and the equations of traveling longitudinal sound waves to solve problems.
Obj.93. Use the equations for sound intensity and sound level to solve problems.
Obj.94. Use the conditions and equations of vibrating systems like strings (guitar, violin, piano), membranes (kettledrum, snare drum), air columns (flute, pipe, organ, oboe), wooden blocks or steel bars (xylophone, marimba), to solve problems.
Obj.95. Use the conditions for beats to solve problems.
Obj.96. Use the Doppler Effect equations (detector moving, source at rest; detector at rest, source moving;

16. OTHER OBJECTIVE
A student should be able to:
Obj.97. Use a micrometer, a vernier caliper, a trip balance, a ruler, a protractor, force tables, stop watches, ballistic pendulum and other instruments to measure physical quantities.

Some of the ideas contained in the next section have been taken from the book Physics For Scientists & Engineers, by R.A.SERWAY.

# TO THE STUDENT

Welcome to the exciting world of Physics! Someone once said that there are only two professions in which people really enjoy what they are doing: Physics and professional sports. I believe that this is an exaggeration, but we must accept it as being true that both fields are exciting and stretch someone's skills to the limit. I sincerely hope that you too will find Physics to be an exciting and enjoyable experience, and that you will profit from this experience. The main objectives of an introductory Physics course are twofold:

1. To provide the student with a clear and logical presentation of the basic concepts, principles and laws of physics.
2. To strengthen the understanding of these concepts and principles via a broad range of interacting applications to the real world.

In order to meet and accomplish these goals and objectives in this Physics course. Emphasis will be placed on sound physical arguments and simultaneously. An attempt will be made to motivate the student by using practical examples, which demonstrate the role physics plays in other disciplines as well. These lines have been written with you the student in mind, in an attempt to help you do well in the course. With this in mind, I feel that it is appropriate to offer some words of advice, which should be of benefit to you, the student.

I. HOW TO STUDY
Classroom instructors very often are asked the questions: How should I study physics? How can I prepare for an exam? Even though, there is no simple answer to these questions, yet I would like to offer some suggestions based on my own experience in learning as a student and on my personal observations as a teacher over the years. The first and most important element in the learning process is to maintain a positive attitude towards the subject matter. You should not fail to recognize the fact that physics is the most fundamental of all sciences and that its concepts, principles and laws are applied to a lot of other disciplines.

It is important to understand the basic principles and concepts in a chapter before you try to solve any of the assigned problems. Read the textbook carefully before attending your class and write down any points which are not clear to you. Always attend class and keep careful notes during the lecture period. Do not hesitate to ask questions about points and ideas that do not seem clear to you and which require clarification. Remember that very few people are capable of absorbing the material after only one reading or after attending class. Read your textbook and your notes several times. Try to reduce memorization to a minimum. Memorizing equations, formulas, derivations, etc does not really mean that you understand the material. The material will be understood through ***a combination of*** 1) efficient study habits 2) discussions with other students and the Instructor 3) your ability to solve the assigned problems in particular and all problems in general. It is important to make a study schedule.

II. STUDY SCHEDULE

Make a study schedule as follows. Read the course syllabus Set up a regular study schedule, on a daily basis.Read the material in the text, before coming to class. As a general rule of thumb, you must spend at least two hours of study time for every hour in class. If you have trouble with the course, seek the advice of the Instructor. Avoid the common practice of delaying study until a few days before the exam. Very often this bad practice leads to a disaster.

Bear always in mind that the Instructor is there to do nothing else but to discuss physics with the student. It is a rare opportunity. You should not miss it. This kind of communication is encouraged and welcome. You will not be penalized for not knowing the answers. On a daily basis, try to solve as many problems as possible. "You do not know much until you have practiced on how to solve problems". Do not deceive yourself into thinking that you understand the problem after seeing its solution. You must be able to solve the problem or similar problems on your own

III. HOW TO SOLVE PROBLEMS

First, ***read the problem several times*** until you are certain you understand what is being asked.

***Look for key words*** that will help you interpret it. This ability to interpret a question properly is an important part of problem solving. Make it a habit to ***write down the information*** given in the problem and the ***quantities to be found***. ***Construct*** the necessary ***diagram*** and show all quantities on it. Do not fail to recognize the ***limitations of*** certain ***formulas or equations*** in a particular situation. ***Use basic principles*** in solving it. ***Work with symbols*** and find ***answers in a final formula form*** using the quantities given. Then plug the numbers in to find the numerical answer. Always, ***use the proper units***.

The following statement is a quote from A Nation at risk- The Imperative for Educational Reform by the National Commission on Excellence in Education, April 1983 (it may be appropriate to read to classes).

TO STUDENTS:

You forfeit your chance for life at its fullest when you withhold your best effort in learning. When you give only the minimum to learning, you receive only the minimum in return. Even with your parent's best example and your teacher's best efforts in the end it is your work that determines how much and how well you learn. When you work to your full capacity, you can hope to attain the knowledge and skills that will enable you to create your future and control your destiny. If you do not, you will have your future thrust upon you by others. Take hold of your life, apply your gifts and talents, and work with dedication and self-discipline. Have high expectations for yourself and convert every challenge into an opportunity.

***What Students Can Do To Improve Their Chance For Success At College***

1. Identify goals, strengths and weaknesses
2. Identify campus supportive services to build on the strengths and work on overcoming weaknesses
3. Arrange for texts and required materials before classes meet.
4. Build a study plan, including when and how much you will need to study to meet your goals
5. Go to every class
6. Sit in the front row and keep your mind actively on your learning goals, and those of the instructor and the course.
7. Take good notes, and make it easier to identify question areas
8. Develop questions about course content to clarify your understanding.
9. Participate in class discussions, to try out your own understanding of concepts and to raise questions of importance.
10. Study with a partner, going over key points, clarifying areas of questions or misunderstanding, discussing points that might come up on exams.
11. Build a study plan for tests.
12. Don't miss quizzes or tests
13. Hand in assignments on time
14. Be neat and legible in your assignment
15. Use the campus supportive services all the way through the term, not just before important tests.