

## **COURSE DESCRIPTION**

This three (3) credit course covers topics in equilibrium, statics, elasticity, fluids, heat and thermodynamics. An understanding of selected properties of solids and fluids would be examined and related to their uses in the natural and man-made world. The impact of heat energy on civilization, its harnessing, utilization and dissipation in everyday machines such as automobile engines and refrigerators, as well as its detrimental impact as seen in Global Warming would be considered here.

## **COURSE GOALS**

To Understand:

- Behavior of rigid bodies.
- Properties of materials influence their utilization in and interaction with the environment.
- The importance of heat energy to humans and its effect on the environment.

To apply:

- The knowledge gained stability and balance of everyday objects and structures.
- The knowledge of materials properties to life processes.
- Energy conservation to everyday activities.

## **COURSE OBJECTIVES:**

- i. Appreciate the conditions necessary for equilibrium.
- ii. The understanding that rigid bodies can be stressed in various manners.
- iii. Understand that rotational quantities are analogous to and related to their linear counterparts.
- iv. Understand the properties of fluids.
- v. Appreciate the work done by heat energy.
- vi. Apply the knowledge of energy conversion to energy conservation in human society.

## **COURSE UNITS:**

1. Equilibrium and stability.
2. Fluids
3. Thermodynamics

## **METHOD OF INSTRUCTION:**

Lectures, Video Clips, Java Applets, group and individual assignments, and Laboratory exercises.

## **COURSE CONTENT:**

At the end of each unit, students should understand and appreciate following topics and apply the knowledge gained to situations they encounter in every day life:

### **UNIT 1**

- Conditions for static equilibrium
  - Sum of the forces = 0
  - Sum of the torques = 0
- Types of equilibrium
  - Stable
  - Unstable
  - Neutral
- Mechanical properties of solids
  - Young's modulus
  - Stress and strain
  - Bulk modulus
  - Fracture

## UNIT 2

- Density
- Pressure
  - General definition
  - Pressure exerted by a fluid
  - Atmospheric, gauge, and actual pressure
- Fluid statics
  - Equilibrium
  - Pascal's principle
  - Archimedes' principle and buoyancy
- Fluid dynamics
  - Equation of continuity
  - Bernoulli's equation

## UNIT 3

- Temperature
  - The zeroth law of thermodynamics
  - Temperature scales
  - Absolute zero
- Thermal expansion
  - Linear
  - Area
  - Volume
- Ideal gases
  - Definition
  - Equation of state
- Mole (Avogadro's number)
- Kinetic theory of gases
  - Molecular speed distribution
  - Kinetic energy, pressure, temperature
- Heat
  - Energy transfer
  - Mechanical equivalent
  - Specific heat
  - Calorimetry
- Internal energy of a gas
- Phase equilibrium
- Latent heat
- Phase changes and energy conservation
- Mechanisms of heat exchange
  - Conduction
  - Convection
  - Radiation
- The first law of thermodynamics
  - Definitions of  $Q$ ,  $W$  and  $U$
  - Sign conventions
  - Specific heat at constant pressure
  - Specific heat at constant volume
- The second law of thermodynamics
  - Carnot's theorem
  - Heat engines
  - Refrigerators and heat pumps
- Entropy

## EVALUATION

Evaluation consists of Lab. Reports and assignments together with Mid-term Test. Final evaluation comes at the end of the course in the form of final examination. The pass mark is 50% ,however the candidate must score 40% in either sections of the course

Source of Marks	Marks
Laboratory Exercise	20%
Mid Term Exam	15%
Assignments	15%
Final examination	50%

## GRADING:

90-100 A+	77-79 B+	67-69 C+	55-59 D+
85-89 A	73-76 B	63-66 C	50-54 D
80-84 A-	70-72 B-	60-62 C-	0-49 F

## COURSE POLICIES:

### ***Class Structure:***

The structure of this class will be a combination of instructor-led discussion, in-class activities, individual lab work, quizzes, and projects. Any final project or assignment is due at the last day of class. No assignments will be accepted after the last day.

### ***Attendance:***

The study Science is cumulative (i.e., an understanding of earlier material is necessary to grasp later covered concepts.) Past experience has shown a high relationship between absences and low grades. Furthermore, absences will severely limit interaction with other students. It is very important that you make every effort to attend every class. Please be guided by UTT's policy on class attendance to qualify to graduate from this course

### ***Late Assignment.***

All assignments are due according to the course calendar. Any late assignment received within one week after the date due will be graded and then assigned a score equivalent to 80% of the earned grade. Assignments will not be accepted (and a grade of 0 points given) more than one week after the assignment is due. The late policy does not apply to a final project or assignment which must be turned in by the last week of class.

### ***Schedule***

The schedule for the course is listed on the course calendar. All due dates are section specific and will be supplied to you by your instructor at the first class meeting. The Module tests are not scheduled on this course calendar. The instructor will assign all Module test dates.

### ***Academic Integrity***

Academic integrity is submitting one's own work and properly acknowledging the work of others. Any violation of this principle constitutes academic dishonesty and is liable to result in disciplinary action. Forms of academic dishonesty include:

- Plagiarism - submitting all or part of another's work as one's own in an academic exercise, such as an examination, computer program, or written assignment. Please note that allowing someone to submit your work also constitutes plagiarism on your part.
- Cheating - using or attempting to use unauthorized materials on an examination or assignment, such as using unauthorized texts or notes or improperly obtaining, or attempting to obtain, copies of an examination or answers to an examination.
- Facilitating Academic Dishonesty - helping another commit an act of dishonesty, such as substituting for an examination or completing an assignment for someone else.
- Fabrication - altering or transmitting, without authorization, academic information or records.

**TEXT(S).**

**Physics with principles and applications, 6<sup>th</sup> Ed. Douglas Giancoli, Pearson.**

**RECOMMENDED READINGS, MATERIALS**

**Conceptual Physics 10<sup>th</sup> Ed. Paul G. Hewitt, Pearson International Edition**