

# TELANGANA UNIVERSITY

## SCHEME OF INSTRUCTION :: B.Sc. PHYSICS SYLLABUS UNDER CBCS SCHEME Revised and effective from academic year 2019-2020

Semester	Paper [ Theory and Practical ]	Instructions Hrs/week	Marks	Credits
I	Paper – I : Mechanics	4	100	4
	Practicals – I : Mechanics	3	50	1
II	Paper – II: Thermal Physics	4	100	4
	Practicals – II : Thermal Physics	3	50	1
III	Paper – III : Electromagnetic Theory	4	100	4
	Practicals – III : Electricity & Magnetism	3	50	1
IV	Paper – IV : Optics	4	100	4
	Practicals – IV : Optics	3	50	1
V	Paper –V : A. Modern Physics B. Computational Physics using MATLAB	4	100	4
	Practicals – V: A. Modern Physics B. Computational Physics using MATLAB	3	50	1
VI	Paper – VI : A. Electronics B. Applied Optics	4	100	4
	Practicals VI: A. Electronics B. Applied Optics	3	50	1

Total credits: 30

### Skill enhancement courses

1. Measurements and Errors
2. Electrical circuits and Networking
3. Basic Instrumentation
4. Biomedical Instrumentation
5. Digital Electronics

### Generic Elective:

1. Renewable Energy & Harvesting

Project work /Optionals (Nano science)

# B.Sc (Physics): Semester - I

## Paper - I: Mechanics

(w. e. from academic year 2019-20)  
(CBCS)

### Unit - I

#### 1. Vector Analysis (14)

Scalar and vector fields, gradient of a scalar field and its physical significance. Divergence and curl of a vector field and related problems. Vector integration, line, surface and volume integrals. Stokes, Gauss and Greens theorems - simple applications.

### Unit - II

#### 2. Mechanics of Particles (07)

Laws of motion, motion of variable mass system, motion of a rocket, multi-stage rocket, conservation of energy and momentum. Collisions in two and three dimensions, concept of impact parameter, scattering cross-section.

#### 3. Mechanics of rigid bodies (07)

Definition of Rigid body, rotational kinematic relations, equation of motion for a rotating body, angular momentum and inertial tensor. Euler's equation, precession of a top, Gyroscope.

### Unit - III

#### 4. Central forces (14)

Central forces - definition and examples, conservative nature of central forces, conservative force as a negative gradient of potential energy, equation of motion under a central force, gravitational potential and gravitational field, motion under inverse square law, derivation of Kepler's laws, Coriolis force and its expressions.

### Unit - IV

#### 5. Special theory of relativity (14)

Galilean relativity, absolute frames, Michelson-Morley experiment, Postulates of special theory of relativity. Lorentz transformation, time dilation, length contraction, addition of velocities, mass-energy relation. Concept of four vector formalism.

**NOTE:** Problems should be solved at the end of every chapter of all units.

### Textbooks

3. Berkeley Physics Course. Vol.1, Mechanics by C. Kittel, W. Knight, M.A. Ruderman - *Tata-McGraw hill Company Edition 2008.*
1. Fundamentals of Physics. Halliday/Resnick/Walker *Wiley India Edition 2007.*
2. First Year Physics - *Telugu Academy.*
4. Introduction to Physics for Scientists and Engineers. F.J. Ruche. *McGraw Hill.*
5. Sears and Zemansky's University Physics by Hugh D. Young, Roger A. Freedman *Pearson Education Eleventh Edition.*
6. Theory of relativity - Resnick

### Reference Books

1. Fundamentals of Physics by Alan Giambattista et al *Tata-McGraw Hill Company Edition, 2008.*
2. University Physics by Young and Freeman, *Pearson Education, Edition 2005.*
3. An introduction to Mechanics by Daniel Kleppner & Robert Kolenkow. *The McGraw Hill Companies.*
4. Mechanics. Hans & Puri. *TMH Publications.*

## Question paper pattern

42 ~~36~~ hrs  
(3 hrs / week)

### FIRST SEMESTER PRACTICALS

#### Practical Paper – I : Mechanics

1. Study of a compound pendulum determination of 'g' and 'k'.
2. Y by uniform Bending
3. Y by Non-uniform Bending.
4. Moment of Inertia of a fly wheel.
5. Measurement of errors –simple Pendulum.
6. 'Rigidity moduli by torsion Pendulum.
7. Determine surface tension of a liquid through capillary rise method.
8. Determination of Surface Tension of a liquid by different methods.
9. Determine of Viscosity of a fluid.
10. Calculation of slope and intercept of a  $Y = mX + C$  by theoretical method

**Note:** Minimum of eight experiments should be performed. Maximum of 15 students per batch and maximum of three students per experiment should be allotted in the regular practical class of three hours per week.

#### **Text and reference books**

1. D.P. Khandelwal, "A laboratory manual for undergraduate classes" (Vani Publishing House, New Delhi).
2. S.P. Singh, "Advanced Practical Physics" (PragatiPrakashan, Meerut).
3. "Practical Physics" R.K Shukla, AnchalSrivastava
4. Practical physics - Ramakrishna and Indupratap

Unit – I

1. Kinetic theory of gases: (6)

Introduction – Deduction of Maxwell's law of distribution of molecular speeds, Transport Phenomena – Viscosity of gases – thermal conductivity – diffusion of gases.

2. Thermodynamics: (8)

Basics of thermodynamics-Kelvin's and Clausius statements – Thermodynamic scale of temperature – Entropy, physical significance – Change in entropy in reversible and irreversible processes – Entropy and disorder – Entropy of universe – Temperature-Entropy (T-S) diagram – Change of entropy of a perfect gas-change of entropy when ice changes into steam.

Unit – II

3. Thermodynamic potentials and Maxwell's equations: (7)

Thermodynamic potentials – Derivation of Maxwell's thermodynamic relations – Clausius-Clayperon's equation – Derivation for ratio of specific heats – Derivation for difference of two specific heats for perfect gas. Joule Kelvin effect – expression for Joule Kelvin coefficient for perfect and Vanderwaal's gas.

4. Low temperature Physics: (7)

Joule Kelvin effect – liquefaction of gas using porous plug experiment. Joule expansion – Distinction between adiabatic and Joule Thomson expansion – Expression for Joule Thomson cooling – Liquefaction of helium, Kapitza's method – Adiabatic demagnetization – Production of low temperatures – Principle of refrigeration, vapour compression type.

Unit – III

5. Quantum theory of radiation: (14)

Black body-Ferry's black body – distribution of energy in the spectrum of Black body – Wein's displacement law, Wein's law, Rayleigh-Jean's law – Quantum theory of

radiation - Planck's law – deduction of Wein's distribution law, Rayleigh-Jeans law, Stefan's law from Planck's law.

Measurement of radiation using pyrometers – Disappearing filament optical pyrometer – experimental determination – Angstrom pyroheliometer - determination of solar constant, effective temperature of sun.

#### Unit – IV

#### 6. Statistical Mechanics: (14)

Introduction, postulates of statistical mechanics. Phase space, concept of ensembles and some known ensembles, classical and quantum statistics and their differences, concept of probability, Maxwell-Boltzmann's distribution law -Molecular energies in an ideal gas- Maxwell-Boltzmann's velocity distribution law, Bose-Einstein Distribution law, Fermi-Dirac Distribution law, comparison of three distribution laws, Application of B-E distribution to Photons-planks radiation formula, Application of Fermi-Dirac statistics to white dwarfs and Neutron stars.

#### Textbooks

1. **Fundamentals of Physics.** Halliday/Resnick/Walker.C. *Wiley India Edition 2007.*
2. **Second Year Physics – Telugu Academy.**
3. **Modern Physics** by R. Murugesan and Kiruthiga Siva Prasath (for statistical Mechanics) *S. Chand & Co.*
4. **Heat and Thermodynamics** by Mark W.Zemansky 5<sup>th</sup> edition McGraw - Hill
5. **Heat and Thermodynamics** by D.S. Mathur.

#### Reference Books

1. **Modern Physics** by G. Aruldhas and P. Rajagopal, *Eastern Economy Education.*
2. B.B. Laud "Introduction to statistics Mechanics"(Macmillan 1981)
3. F.Reif: "Statistical Physics "(Mcgraw-Hill,1998)
4. K.Haung: "Statistical Physics "(Wiley Eastern 1988)

**42 hrs**  
**(3 hrs / week)**

**III SEMESTER Practicals Paper – III :**  
**Thermodynamics**

1. Co-efficient of thermal conductivity of a bad conductor by Lee's method.
2. Measurement of Stefan's constant.
3. Specific heat of a liquid by applying Newton's law of cooling correction.
4. Heating efficiency of electrical kettle with varying voltages.
5. Determination of Thermo emf
6. Cooling Curve of a metallic body (Null method)
7. Resistance thermometer. To Determine temp coeff resistance
8. Thermal expansion of solids
9. Study of conversion of mechanical energy into heat.
10. Determine the Specific of a solid (graphite rod)
11. Thermistor Characteristics. Calculation of A and B

**Note:** Minimum of eight experiments should be performed. Maximum of 15 students per batch and maximum of three students per experiment should be allotted in the regular practical class of three hours per week.

**Text and reference books**

1. D.P. Khandelwal, "A laboratory manual for undergraduate classes" (Vani Publishing House, New Delhi).
2. S.P. Singh, "Advanced Practical Physics" (Pragati Prakashan, Meerut).
3. Worsnop and Flint- Advanced Practical physics for students.
4. "Practical Physics" R.K Shukla, Anchal Srivastava

## Question paper pattern

Faculty of Science

Physics

Title of the paper:

Paper:

Duration: 3Hrs]

[Max.Marks : 80

### Section-A: Short Answer Questions

(8 x 4 = 32)

Answer any EIGHT questions

1. Unit – I
2. Unit – I
3. Unit – I (Problem)
4. Unit – II
5. Unit – II
6. Unit – II (Problem)
7. Unit – III
8. Unit – III
9. Unit – III (Problem)
10. Unit – IV
11. Unit – IV
12. Unit – IV (Problem)

### Section B: Essay Answer Questions

(4 x 12 = 48)

13 (a) Unit – I  
OR

(b) Unit – I

14 (a) Unit – II  
OR

(b) Unit – II

15 (a) Unit – III  
OR

(b) Unit – III

16 (a) Unit – IV  
OR

(b) Unit – IV