

# **TELANGANA UNIVERSITY**



**Telangana State Council of Higher Education  
Govt.of Telangana**

**PROPOSED SYLLABUS**

**For**

**B.Sc PHYSICS (2016-17)**

Unit – I

1. Vector Analysis (13)

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's and Green's theorems- simple applications.

Unit – II

2. Mechanics of Particles (7)

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 (6)

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 (13)

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 (13)

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.

Udaya Kumar Kelly

[Signature]

G. Lalitha

Hantra  
28/4/16

### Suggested Books

1. Berkeley Physics Course. Vol.1, **Mechanics** by C. Kittel, W. Knight, M.A. Ruderman - Tata-McGraw hill Company Edition 2008.
2. **Fundamentals of Physics**. Halliday/Resnick/Walker Wiley India Edition 2007.
3. **First Year Physics - Telugu Academy.**
4. **Introduction to Physics for Scientists and Engineers**. F.J. Ruche. McGraw Hill.
5. **Fundamentals of Physics** by Alan Giambattista et al Tata-McGraw Hill Company Edition, 2008.
6. **University Physics** by Young and Freeman, Pearson Education, Edition 2005.
7. **Sears and Zemansky's University Physics** by Hugh D. Young, Roger A. Freedman Pearson Education Eleventh Edition.
8. **An introduction to Mechanics** by Daniel Kleppner & Robert Kolenkow. The McGraw Hill Companies.
9. **Mechanics**. Hans & Puri. TMH Publications.
10. **Engineering Physics**. R.K. Gaur & S.L. Gupta. Dhanpat Rai Publications.
11. **The Feynman Lectures in Physics, Vol.-1**, R P Feynman, RB Lighton and M Sands, BI Publications,
12. **Mechanics**-P.K. Srivastava - New Age International.

Qayathul Ruddy  
[Signature]

G. Lalitha

Hanw 28/4/16.



39 hrs  
(3 hrs / week)

## FIRST SEMISTER PRACTICALS - Practical Paper - I

### Mechanics Practicals

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

**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.

### Suggested 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

*Qayyum R.N.*  
*[Signature]*

*Gr. Lalotra*

*Hunter*  
*28/4/16.*

**B.Sc. (Physics)**  
**Semester II-Theory Paper – II**  
**Waves and Oscillations**

**52 hrs**  
(4 hrs / week)

**Unit – I**

**1. Fundamentals of Vibrations (13)**

Simple harmonic oscillator, and solution of the differential equation– Physical characteristics of SHM, torsion pendulum, - measurements of rigidity modulus , compound pendulum, measurement of 'g', combination of two mutually perpendicular simple harmonic vibrations of same frequency and different frequencies, Lissajous figures

**Unit – II**

**2. Damped and forced oscillations (13)**

Damped harmonic oscillator, solution of the differential equation of damped oscillator. Energy considerations, comparison with undamped harmonic oscillator, logarithmic decrement, relaxation time, quality factor, differential equation of forced oscillator and its solution, amplitude resonance, velocity resonance. Coupled Oscillators.

**Unit – III**

**3. Vibrating Strings (13)**

Transverse wave propagation along a stretched string, general solution of wave equation and its significance, modes of vibration of stretched string clamped at ends, overtones, energy transport, transverse impedance

**Unit – IV**

**4. Vibrations of bars (13)**

Longitudinal vibrations in bars- wave equation and its general solution. Special cases (i) bar fixed at both ends ii) bar fixed at the mid point iii) bar free at both ends iv) bar fixed at one end. Transverse vibrations in a bar- wave equation and its general solution. Boundary conditions, clamped free bar, free-free bar, bar supported at both ends, Tuning fork.

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

*Alfanzadhe R. K.*  
*[Signature]*

*G. Lalitha*

*H. H. H.*  
*28/4/16.*



Waves and Oscillations Practicals

1. Study of damping of an oscillating disc in Air and Water logarithmic decrement.
2. Study of Oscillations under Bifilar suspension-Verification of axis theorems
3. Study of oscillations of a mass under different combination of springs-Series and parallel.
4. Verification of Laws of a stretched string (Three Laws).
5. Determination of frequency of a bar-Melde's experiment.
6. Observation of Lissajous figures from CRO-Frequency ratio.Amlitude and phase difference of two waves.
7. Volume Resonator –determination of frequency of a tuning fork.
8. Velocity of Transverse wave along a stretched string.
9. Study of damping of a bar pendulum-damping factor
10. Study of coupled oscillator-resonance

**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.

Suggested 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

*Gyaneshu Rathi*

*[Signature]*

*G. Lalotra*

*Haiter*  
*28/4/16*

B.Sc. (Physics)  
Semester III-Theory Paper – III  
Thermal Physics

52 hrs  
(4 hrs / week)

Unit – I

1. Kinetic theory of gases: (4)

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

2. Thermodynamics: (9)

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: (6)

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: (13)

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

*Q. Jagan Kumar R. H.*  
*[Signature]*

*G. Lalitha*

*H. H. H.*  
*28/4/16.*



radiation - Planck's law – deduction of Wein's 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: (13)

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.

#### Suggested books

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. **Modern Physics** by G. Aruldas and P. Rajagopal, *Eastern Economy Education.*
5. Berkeley Physics Course. Volume-5. **Statistical Physics** by F. Reif. *The McGraw-Hill Companies.*
6. **An Introduction to Thermal Physics** by Daniel V. Schroeder. *Pearson Education Low Price Edition.*
7. **Thermodynamics** by R.C. Srivastava, Subit K. Saha & Abhay K. Jain *Eastern Economy Edition.*
8. **Modern Engineering Physics** by A.S. Vasudeva. *S.Chand & Co. Publications.*
9. **Feynman's Lectures on Physics** Vol. 1,2,3 & 4. *Narosa Publications.*
10. **Fundamentals of Optics** by Jenkins A. Francis and White E. Harvey, *McGraw Hill Inc.*
12. B.B. Laud "Introduction to statistics Mechanics"(Macmillan 1981)
13. F.Reif:"Statistical Physics "(Mcgraw-Hill,1998)
14. K.Haung: "Statistical Physics "(Wiley Eastern 1988)

Agarwal Rolly  
[Signature]

G. Lalitha

Haitu 28/4/16.



Thermal Physics Practicals

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. Calibration of thermo couple
6. Cooling Curve of a metallic body
7. Resistance thermometer
8. Thermal expansion of solids
9. Study of conversion of mechanical energy to heat.
10. Determine the Specific of a solid ( graphite rod )

**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.

Suggested 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

*Alfayazul Reby*  
*[Signature]*

*G. Lalotra*

*Hanish*  
*28/4/16*

B.Sc. (Physics)  
Semester IV-Theory Paper – IV  
Optics

52 hrs  
(4 hrs / week)

Unit I

1 Interference: (13)

Principle of superposition – coherence – temporal coherence and spatial coherence – conditions for Interference of light

Interference by division of wave front: Fresnel's biprism – determination of wave length of light. Determination of thickness of a transparent material using Biprism – change of phase on reflection – Lloyd's mirror experiment.

Interference by division of amplitude: Oblique incidence of a plane wave on a thin film due to reflected and transmitted light (Cosine law) – Colours of thin films – Non reflecting films – interference by a plane parallel film illuminated by a point source – Interference by a film with two non-parallel reflecting surfaces (Wedge shaped film) – Determination of diameter of wire-Newton's rings in reflected light with and without contact between lens and glass plate, Newton's rings in transmitted light (Haidinger Fringes) – Determination of wave length of monochromatic light – Michelson Interferometer – types of fringes – Determination of wavelength of monochromatic light, Difference in wavelength of sodium  $D_1, D_2$  lines and thickness of a thin transparent plate.

Unit II:

2 Diffraction: (13)

Introduction – Distinction between Fresnel and Fraunhofer diffraction Fraunhofer diffraction:- Diffraction due to single slit and circular aperture – Limit of resolution – Fraunhofer diffraction due to double slit – Fraunhofer diffraction pattern with N slits (diffraction grating)

Resolving Power of grating – Determination of wave length of light in normal and oblique incidence methods using diffraction grating.

Fresnel diffraction-Fresnel's half period zones – area of the half period zones –zone plate – Comparison of zone plate with convex lens – Phase reversal zone plate – diffraction at a straight edge – difference between interference and diffraction.

*Arundhan Reddy*  
*[Signature]*

*G. Lalitha*

*Haiter*  
*28/4/16.*



### Unit III:

#### 3 Polarization (13)

Polarized light : Methods of Polarization, Polarization by reflection, refraction, Double refraction, selective absorption, scattering of light – Brewster's law – Malus law – Nicol prism polarizer and analyzer – Refraction of plane wave incident on negative and positive crystals (Huygen's explanation) – Quarter wave plate, Half wave plate – Babinet's compensator – Optical activity, analysis of light by Laurent's half shade polarimeter.

### Unit IV:

#### 4 Aberrations and Fiber Optics : (13)

Introduction – Monochromatic aberrations, spherical aberration, methods of minimizing spherical aberration, coma, astigmatism and curvature of field, distortion. Chromatic aberration – the achromatic doublet – Removal of chromatic aberration of a separated doublet.

Fiber Optics : Introduction – Optical fibers – Types of optical fibers – Step and graded index fibers – Rays and modes in an optical fiber – Fiber material – Principles of fiber communication and advantages of fiber communication.

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

#### Suggested books

1. Optics by Ajoy Ghatak. *The McGraw-Hill companies.*
2. Optics by Subramaniam and Brijlal. *S. Chand & Co.*
3. Fundamentals of Physics. Halliday/Resnick/Walker. *C. Wiley India Edition 2007.*
4. Optics and Spectroscopy. R. Murugesan and Kiruthiga Siva Prasath. *S. Chand & Co.*
5. Second Year Physics – *Telugu Academy.*
6. Modern Engineering Physics by A.S. Vasudeva. *S. Chand & Co. Publications.*
7. Feynman's Lectures on Physics Vol. 1, 2, 3 & 4. *Narosa Publications.*
8. Fundamentals of Optics by Jenkins A. Francis and White E. Harvey, *McGraw Hill Inc.*
9. K. Ghatak, *Physical Optics*
10. D.P. Khandelwal, *Optical and Atomic Physics* (Himalaya Publishing House, Bombay, 1988)
11. Jenkins and White: *Fundamental of Optics* (McGraw-Hill)
12. Smith and Thomson: *Optics* (John Wiley and sons)

*Ajay Kumar Reddy*  
*[Signature]*

*G. Lalitha*

*Haniff*  
*28/7/16.*

FOURTH SEMISTER PRACTICALS -Practical Paper – IV

39 hrs  
(3 hrs / week)

Optics Practicals

1. Thickness of a wire using wedge method.
2. Determination of wavelength of light using Biprism.
3. Determination of Radius of curvature of a given convex lens by forming Newton's rings.
4. Resolving power of grating.
5. Study of optical rotation-polarimeter.
6. Dispersive power of a prism
7. Determination of wavelength of light using diffraction grating minimum deviation method.
8. Wavelength of light using diffraction grating – normal incidence method.
9. Resolving power of a telescope.
10. Refractive index of a liquid and glass (Boys Method).
11. Pulfrich refractometer – determination of refractive index of liquid.
12. Wavelength of Laser light using diffraction grating.

**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.

Suggested 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

*Arjun Reddy*  
*[Signature]*

*Gr. Lalitha*

*Hantra*  
*28/4/16*