GOVERNMENT DEGREE COLLEGE FOR WOMEN (AUTONOMOUS)

BEGUMPET, HYDERABAD-16

Affiliated To Osmania University, Re-Accredited With 'B^{+}' Grade by NAAC

DEPARTMENT OF PHYSICS

SYLLABUS (2016-17)

B.Sc. Physics Year course structure

Paper	Semester	Hours per week	Hours per week		Max Marks		
			Theory	Practicals	Theory	Practicals	Credits
B.Sc-I	I,II	6	4	3	100	50	5
B.Sc-II	III,IV	6		3	100	50	5
B.Sc-III (2018-20)	V (P5,P6), VI(P7,P8)	6 6	3 3	3 3	100 100	50 50	4 4

Practical's for each 20 students per batch

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

Semester	Paper [Theory and Practical]	Instructions Hrs/week	Marks	Credits
I	Paper – I : Mechanics & Oscillations	4	100	4
	Practicals – I : Mechanics & Oscillations	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 : Electromagnetic Theory	3	50	1
IV	Paper – IV : Waves & Optics	4	100	4
	Practicals – IV :Waves & Optics	3	50	1
V	Paper –V : A. Modern Physics B. Computational Physics	4	100	4
	Practicals – V: A. Modern Physics B. Computational Physics	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. Experimental methods and Errors analysis
2. Electrical circuits and Networking
3. Basic Instrumentation
4. Biomedical Instrumentation
5. Digital Electronics

Generic Elective:
1. Renewable Energy & Energy Harvesting

Project work /Optional (Nano science)

CHAIRMAN
Board of Studies in Physics
Osmania University, Hyd.

HEAD
Department of Physics
University College of Science
Osmania University, Hyd.

1 – 26 Page

Government Degree College for Women, Begumpet, (Autonomous) Hyderabad

Department of Physics AND Electronics
PHYSICS-SEMESTER I,II ,III ,IV(2016-17)

MODULE:

THEORY : Max.Marks :100
Split
End Semester: 60M
Internal Assesment: 40M

PHYSICS-SEMESTER –V,VI(2016-17)
MODULE:

THEORY : Max.Marks :100
Split
End Semester:75M
Internal Assesment: 25M

Government Degree College for Women (Autonomous) Begumpet,   Hyderabad

Model Question Paper for B.Sc I Year, II Year (Semester I, II, III & IV)

Time: 2 ½ hrs   Max Marks: 60

Section-A

Note: Answer any 5 of the following – Each question carries 4 Marks   5 X 4=20 Marks

Q1   Unit I
Q2   Unit I
Q3   Unit II
Q4   Unit II
Q5   Unit III
Q6   Unit III
Q7   Unit IV
Q8   Unit IV

Section-B

Note: Answer all the questions –Each question carries 10 Marks   4 X 10=40 Marks

Q9   a) Unit-I
                or
          b) Unit I

Q10   a) Unit-II
                Or
          b) Unit-II

Q11   a) Unit-III
                Or
          b) Unit-III
Q12   a) Unit-IV
                Or
          b) Unit-IV

Government Degree College for Women(Autonomous), Begumpet, Hyderabad

Pattern of Examination

Internal and Semester Evaluation pattern for first and second year is given here under:

Internal Assessment

    a. Two internals of **20 Marks** each. Average of the two internals is considered for computation of marks
      10 Marks for Unit-wise exams (20 objective type questions X ½ Mark = 10 Marks)
      5 Marks for seminar and group discussion
      5 Marks for assignment

    b.   Internal exam consists of **20 Marks**
      In **Section A** (Two short answer Questions of 5 marks to be answered out of 4 (**2 X 5M=10M**)
      In **Section-B** (**one** question is to be answered with **internal choice** and carries **10 M**)

    c.   Internals shall be held at the end of every **9th week** and **14th week** of each semester

    d.   The duration of the internals shall be **45 minutes**

Semester Examination

Semester Exams will be conducted in October and April of every year

a.   60 marks are allotted for each paper per semester
b.   Section-A (5 questions out of 8 questions have to be attempted – each question carries 4 marks-5 X 4 = 20M)
c.   Section-B (4questions with internal choice are to be attempted- each question carries 10 M- 4 X 10=40 M)

- **COURSE OBJECTIVES**

- **The course should enable the students to**

- **Understand basic principles of Mechanics, Optics, Thermal Physics, Waves & Oscillations, Modern Physics, Electromagnetism, Solid state Physics and Electronics**

- **Gain the knowledge of free electron theory of metals and mobility mechanism of semi conductor materials which leads to the application in Electronics and concepts of shell model, liquid drop model for determining the stability of nucleus of an atom, structure of an atom and its spectroscopy.**

- **Learn and gain knowledge about various types of Electronic devices, Abberations in Spherical Lens, Interference, diffraction, Polarisation and Optical fibre mechanism for communication system.**

- **Know about various types of lasers and significance of super conductivity in Industrial, Medical fields etc.**

- **Learn about Material properties like Magnets, digital Electronics and Network theorems, Harmonic oscillations in strings, bars and damped vibrations.**

COURSE OUTCOMES

- **By the end of the course students will be able**

- **To make careful experimental observations and draw conclusions from such data**

- **To distinguish between inferences based on theory and the outcomes of experiments**

To write a technical report which communicates scientific information in a clear and concise manner.

B.Sc. (Physics)Semester I-Theory Syllabus   **56 hrs**
Paper – I : Mechanics

(W.E.F the academic year 2016-2017)
(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. Centralforces (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

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.*

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. **Sears and Zemansky's University Physics** by Hugh D. Young, Roger A. Freedman *Pearson Education Eleventh Edition.*
4. **An introduction to Mechanics** by Daniel Kleppner& Robert Kolenkow. *The McGraw Hill Companies.*
5. **Mechanics**. Hans &Puri. *TMH Publications.*
6. **Engineering Physics**. R.K. Gaur & S.L. Gupta. *DhanpatRai Publications.*
7. R P Feynman, RB Lighton and M Sands - The Feynman Lectures in Physics, Vol.-1, BI Publications,
8. J.C. Upadhyay - Mechanics.
9. P.K. Srivastava - Mechanics, New Age International.

B.SC LABORATORY COURSE OBJECTIVES

- To provide an experimental foundation for the theoretical concepts introduced in the lectures

- To teach how to make careful experimental observations and how to think about draw conclusions from such data

- To help students understand the role of direct observations in physics and to distinguish between interferences based on theory and the outcomes of experiments.

- To introduce the concepts and techniques which have a wide application in experimental science but have not been introduced in the standard courses

- To teach how to write a technical report which communicates scientific information in a clear and concise manner;

- **LAB OUT COMES**

- By the end of the course students will be able

- To make careful experimental observations and draw conclusions from such data

- To distinguish between inferences based on theory and the outcomes of experiments

- To write a technical report which communicates scientific information in a clear and concise manner.

FIRST SEMISTER 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.

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

COURSE CODE: PHY201

B.Sc. (Physics)Semester II-Theory Syllabus   56 hrs
Paper – II : Waves and Oscillations

(W.E.F the academic year 2016-2017)
(CBCS)

Unit – I

1. Fundamentals of vibrations (14)

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 (14)

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 (14)

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 (14)

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.

Textbooks

1. **Fundamentals of Physics**. Halliday/Resnick/Walker *Wiley India Edition 2007*.
2. **First Year Physics** - *Telugu Academy*.
3. **Introduction to Physics for Scientists and Engineers**. F.J. Ruche. *McGraw Hill*.
4. **Fundamentals of Acoustics by Kinsler and Fray, Meer publishers**.

Reference Books

1. **Fundamentals of Physics** by Alan Giambattista et al *TMH 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. **Engineering Physics**. R.K. Gaur & S.L. Gupta. *Dhanpat Rai Publications*.

.

B.Sc. (Physics)- I Year

Semester – I

Paper – I:: Mechanics and Oscillations

(DSC - Compulsory)

Unit – I

1. Vector Analysis (10)

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 (6)

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 (7)

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.

5. Special theory of Relativity (7)

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.

Unit – IV

6. Oscillations(12)

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.

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

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

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. **Sears and Zemansky's University Physics** by Hugh D. Young, Roger A. Freedman *Pearson Education Eleventh Edition.*
6. **Theory of relativity** - **Resnick**

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

COURSE CODE: PHY201

B.Sc. (Physics)- I Year
Semester – II
Paper – II:: Thermal Physics
(DSC - Compulsory)

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: (8)**
Basics of Thermodynamics- Carnot's engine (qualitative)-Carnot's theorem -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: (6)**
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: (12)**
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 law, Rayleigh-Jeans law, Stefan's law from Planck's law. Measurement of radiation using pyrometers – Disappearing filament optical pyrometer – experimental determination – Angstrom pyro heliometer - determination of solar constant, effective temperature of sun.

Unit – IV
6. **Statistical Mechanics: (12)**
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.

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

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. Murugeshan and Kiruthiga Siva Prasath (for statistical Mechanics) *S. Chand & Co.*
4. **Modern Physics** by G. Aruldhas 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. B.B. Laud "**Introduction to statistics Mechanics**"(Macmillan 1981)

B.Sc. (Physics) – I year
Semester - II
Paper – II:: Thermal Physics Practicals
(DSC - Compulsory)

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