GOVERNMENT DEGREE COLLEGE FOR WOMEN (AUTONOMOUS)

BEGUMPET, HYDERABAD-16

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

DEPARTMENT OF PHYSICS

SYLLABUS (2017-18)

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
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Osmania University, Hyd.

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

1-26 Pages

Government Degree College for Women, Begumpet, (Autonomous)
Hyderabad
Department of Physics AND Electronics
PHYSICS-SEMESTER I,II ,III ,IV(2017-18)

MODULE:

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

PHYSICS-SEMESTER –V,VI(2017-18)
MODULE:

THEORY : Max.Marks :100
Split
End Semester:75M
Internal Assessment: 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)

Resolved to accept the above pattern of examinations for B.Sc I & II Year

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 Feymman, RB Lighton and M Sands - The Feymman 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.

42 hrs
(3 hrs / week)

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 Outcome:

Students who have completed this course should be able to:

CO1. Deliberate the characteristics of oscillations of a system of particles

CO2. Write down in details with application, if applicable, strings and rods vibrations

CO3. Learn the characteristics of small oscillations of mechanical system

COURSE CODE: PHY201

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

56 hrs

(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 SIIM, 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*.

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42 hrs

SECOND SEMISTER PRACTICALS

Practical Paper – II : Waves and Oscillations

1. Study of damping of an oscillating disc in Air and Water logarithmic decrement.
2. Study of Oscillations under Bifilar suspension.
3. Study of oscillations of a mass under different combination of springs.
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.
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
10. Study of coupled oscillator.

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. Worsnop and Flint- Advanced Practical physics for students.
4. "Practical Physics" R.K Shukla, AnchalSrivastava

Course Outcome:

Students who have completed this course should be able to:

CO1. Deliberate the characteristics of Thermodynamic potentials and parameters

CO2. Write down in details with application, if low temperature and radiation pyrometers

CO3. Learn the characteristics of statistical distributions of MB,FD AND BE STATISTICAL system

COURSE CODE: PHY301

Subject: Physics

B.Sc. Semester III-Theory Syllabus
Paper – III : Thermodynamics
(W.E.F the academic year 2017-2018)

56 hrs

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 Claussius 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. Murugeshan and Kiruthiga Siva Prasath (for statistical Mechanics) *S. Chand & Co.*
4. **Heat and Thermodynamics** by Mark W.Zemansky 5th edition Mc Graw - Hill
5. **Heat and Thermodynamics** by D.S. Mathur.

Reference Books

1. **Modern Physics** by G. Aruldhas and P. Rajagopal, *Eastern Economy Education.*
2. Berkeley Physics Course. Volume-5. **Statistical Physics** by F. Reif. *The McGraw-Hill Companies.*
3. **An Introduction to Thermal Physics** by Daniel V. Schroeder.*Pearson Education Low Price Edition.*
4. **Thermodynamics** by R.C. Srivastava, Subit K. Saha&Abhay K. *Jain Eastern Economy Edition.*
5. **Modern Engineering Physics** by A.S. Vasudeva. *S.Chand& Co. Publications.*
6. **Feyman's Lectures on Physics** Vol. 1,2,3& 4. *Narosa Publications.*
7. **Fundamentals of Optics** by Jenkins A. Francis and White E. Harvey, *McGraw Hill Inc.*
8. B.B. Laud **"Introduction to statistics Mechanics"**(Macmillan 1981)
9. F.Reif**: "Statistical Physics "**(Mcgraw-Hill,1998)
10. 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 mechanical energy to 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" (PragatiPrakashan, Meerut).
3. Worsnop and Flint- Advanced Practical physics for students.
4. "Practical Physics" R.K Shukla, AnchalSrivastava

Course Outcome:

Students who have completed this course should be able to:

CO1. Deliberate the characteristics of GEOMETRICAL OPTICS

CO2. Write down in details with application, in Interference ,Diffraction and polarization and optical fibers

CO3. Learn the characteristics of interference ,diffraction and polarisation

COURSE CODE: PHY401

B.Sc. Semester IV-Theory Syllabus **56 hrs**

Subject : (Physics) **Paper – IV : Optics**

(W.E.F the academic year 2017-2018)

Unit I

1 Interference: (14)

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 I1:

2 Diffraction: (14)

Introduction – Distinction between Fresnel and Fraunhoffer diffraction Fraunhoffer diffraction:- Diffraction due to single slit and circular aperture – Limit of resolution – Fraunhoffer diffraction due to double slit – Fraunhoffer 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.

Unit I1I:

3 Polarization (14)

Polarized light : Methods of Polarization, Polarization by reflection, refraction, Double refraction, selective absorption , scattering of light – Brewsters 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 : (14)

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

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

Textbooks

1. **Optics** by AjoyGhatak. *The McGraw-Hill companies*.
2. **Optics** by Subramaniyam and Brijlal. *S. Chand & Co*.
3. **Fundamentals of Physics**. Halliday/Resnick/Walker.*C. Wiley India Edition 2007*.
4. **Optics and Spectroscopy**. R. Murugeshan and Kiruthiga Siva Prasath. *S. Chand & Co*.
5. **Second Year Physics** – *Telugu Academy*.

Reference Books

1. **Modern Engineering Physics** by A.S. Vasudeva. *S.Chand & Co. Publications*.
2. **Feyman's Lectures on Physics** Vol. 1,2,3& 4. *Narosa Publications*.
3. **Fundamentals of Optics** by Jenkins A. Francis and White E. Harvey, *McGraw Hill Inc.*
4. K. Ghatak, **Physical Optics'**
5. D.P. Khandelwal, Optical and Atomic Physics' (Himalaya Publishing House, Bombay,1988)
6. Jenkins and White: 'Fundamental of Optics' (McGraw-Hill)
7. Smith and Thomson: 'Optics' (John Wiley and sons)

42 hrs

IV SEMESTER Practicals Paper – IV :
Optics

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.

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, AnchalSrivastava

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.

CHAIRMAN
Board of Studies in Physics
Osmania University, Hyd.

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

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.*

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

B.Sc. (Physics)- II Year

Semester – III

Paper – III:: Electromagnetic Theory

(DSC - Compulsory)

Unit I : Electrostatics (11 hrs)

Electric Field:- Concept of electric field lines and electric flux, Gauss's law (Integral and differential forms), application to linear, plane and spherical charge distributions. Conservative nature of electric field 'E', Irrotational field. Electric potential:- Concept of electric potential, relation between electric potential and electric field, potential energy of a system of charges. Energy density in an electric field. Calculation of potential from electric field for a spherical charge distribution.

Unit II : Magnetostatics (12 hrs)

Concept of magnetic field 'B' and magnetic flux, Biot-Savart's law, B due to a straight current carrying conductor. Force on a point charge in a magnetic field. Properties of B, curl and divergence of B, solenoidal field. Integral form of Ampere's law, Applications of Ampere's law: field due to straight, circular and solenoidal currents. Energy stored in magnetic field. Magnetic energy in terms of current and inductance. Magnetic force between two current carrying conductors. Magnetic field intensity. Ballistic Galvanometer:- Torque on a current loop in a uniform magnetic field, working principle of B.G., current and charge sensitivity, electromagnetic damping, critical damping resistance.

Unit III: Electromagnetic Induction and Electromagnetic waves (13)

Faraday's laws of induction (differential and integral form), Lenz's law, self and mutual Induction. Continuity equation, modification of Ampere's law, displacement current, Maxwell equations. Maxwell's equations in vacuum and dielectric medium, boundary conditions, plane wave equation: transverse nature of EM waves, velocity of light in vacuum and in medium. Poynting's theorem.

UNIT IV:

Varying and alternating currents (6)

Growth and decay of currents in LR, CR and LCR circuits - Critical damping. Alternating current, relation between current and voltage in pure R, C and L-vector diagrams - Power in ac circuits. LCR series and parallel resonant circuit - Q-factor. AC & DC motors-single phase, three phase (basics only).

Network Theorems(6):

Passive elements, Power sources, Active elements, Network models: T and π Transformations, Superposition theorem, Thevenin's theorem, Norton's theorem. Reciprocity theorem and Maximum power transfer theorem (Simple problems).

Text Books

1. Fundamentals of electricity and magnetism By Arthur F. Kip (McGraw-Hill, 1968)
2. Telugu Academy
3. Electricity and magnetism by J.H.Fewkes& John Yarwood. Vol.I (Oxford Univ. Press, 1991).
4. Introduction to Electrodynamics, 3rd edition, by David J. Griffiths, (Benjamin Cummings,1998).
5. Electricity and magnetism By Edward M. Purcell (McGraw-Hill Education, 1986)
6. Electricity and magnetism. By D C Tayal (Himalaya Publishing House,1988)
7. Electromagnetics by Joseph A.Edminister 2nd ed.(New Delhi: Tata McGraw Hill, 2006).

B.Sc. (Physics) – II year
Semester - III
Paper – III:: Electromagnetic Theory Practicals
(DSC - Compulsory)

PHYSICS LABORATORY

1. To verify the Thevenin Theorem
2. To verify Norton Theorem
3. To verify Superposition Theorem
4. To verify maximum power transfer theorem.
5. To determine a small resistance by Carey Foster's bridge.
6. To determine the (a) current sensitivity, (b) charge sensitivity, and (c) CDR of a B.G.
7. To determine high resistance by leakage method.
8. To determine the ratio of two capacitances by De Sauty's bridge.
9. To determine self-inductance of a coil by Anderson's bridge using AC.
10. To determine self-inductance of a coil by Rayleigh's method.
11. To determine coefficient of Mutual inductance by absolute 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.

B.Sc. (Physics) - II Year
Semester – IV
Paper – IV:: Waves and Optics
(DSC - Compulsory)

Unit-I Waves(12)

Fundamentals of Waves -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.
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.

Unit II: Interference: (12)

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 III: Diffraction: (12)

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.

Unit IV: Polarization (12)

Polarized light : Methods of Polarization, Polarizatioin 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.

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 Subramaniyam and Brijlal. *S. Chand & Co.*
3. **Second Year Physics** – *Telugu Academy.*
4. **Modern Engineering Physics** by A.S. Vasudeva. *S.Chand & Co. Publications.*
5. **Fundamentals of Optics** by Jenkins A. Francis and White E. Harvey, *McGraw Hill Inc.*
6. K. Ghatak, **Physical Optics'**
7. D.P. Khandelwal, Optical and Atomic Physics' (Himalaya Publishing House, Bombay,1988)
8. Jenkins and White: 'Fundamental of Optics' (McGraw-Hill)
9. Smith and Thomson: 'Optics' (John Wiley and sons).

B.Sc. (Physics) – II year
Semester - IV
Paper – IV:: Waves and Optics Practicals
(DSC - Compulsory)

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.
13. Verification of Laws of a stretched string (Three Laws).
14. Velocity of Transverse wave along a stretched string
15. Determination of frequency of a bar-Melde"s experiment

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 Srivastav.

After the completion of the course Student will be familiar with

CO1. Understand in depth The wave function and uncertainty Principle

CO2. Specify in depth Formalism of quantum mechanics

CO3. Understand the details of Schrodinger equation in one dimension

CO4. Deliberate the details of Angular Momentum

CO5. Understand in depth Schrodinger equation in three dimensions