



# **B.Sc. PHYSICS SYLLABUS**

**Kadi Sarva Vishwavidyalaya, Gandhinagar  
B. Sc. Physics**

**Course Description:** This course is designed to enable students to acquire understanding of fundamentals of Physics. The course is aimed at providing practical training on handling various scientific instruments and is intended to enable students carry simple experiments in laboratories.

**COURSE STRUCTURE:**

<b>Year</b>	<b>Semester</b>	<b>Paper</b>	<b>Paper Name</b>	<b>Theory Marks</b>	<b>Experiment Marks</b>	<b>Total Marks</b>
B.Sc I	I	CPH-101	Introduction to General Physics	100	50	150
	II	CPH-201	Fundamentals of Physics	100	50	150
B.Sc II	III	CPH-301		100	50	150
		CPH-302		100	50	150
	IV	CPH-401		100	50	150
		CPH-402		100	50	150

**Semester I**  
**CPH-101 Introduction to General Physics**

**RATIONALE:** This course is designed to enable students to acquire basic understanding of the Physical world, its origin and structure to help the potential application of the unexplored and unidentified organisms in the industry.

**LEARNING OUTCOMES:**

- Understand the concept of origin of Physical Science.
- Develop a concrete understanding of the Physical systems around us.
- Gain knowledge about the various laws of nature, new frontier of physics with potential applications in our day by day life.

**TEACHING AND EVALUATION SCHEME:** The objective of evaluation is not only to measure the performance of students, but also to motivate them for better performance. Students are evaluated on the basis of Mid Term examinations for 30 marks and End Term Examination conducted by University examination for 70 marks.

Subject Code	Subject Title	Credits	Theory			Total Marks
			Hrs.	Max Marks		
				Mid Term	End Term	
CPH- 101	Introduction to General Physics	4	48	30	70	100

**COURSE CONTENT**

<p><b>Number of lectures: 12</b> <b>Weightage: 25%</b></p>
<p><b>Unit 1:</b></p> <p><b>(a) Vector analysis:</b></p> <ul style="list-style-type: none"> <li>• Triple Products of Vectors, Scalar Triple Product, Some Important Conclusions from Scalar Triple Product , The Vector Triple Product <math>A \times (B \times C)</math></li> <li>• Differentiation of a Vector with Respect to time, Scalar and Vector Fields, Partial Differentiation and Gradient, Operations with <math>\nabla</math>, The rate of Flow of flux of a Vector Field,</li> <li>• Vector Integration, Surface Integral, Gauss's Divergence Theorem, Stoke's Theorem, Derivation of Green's Theorem from Gauss Divergence theorem</li> </ul> <p><b>(b) Simple Harmonic Motion and Damped Vibration</b></p> <ul style="list-style-type: none"> <li>• Composition of Two Simple Harmonic Motions along the same direction of the same frequency, Composition of two simple harmonic motions acting upon a particle simultaneously at right angles to each other, same time period but different in phase, Motion in a resisting medium</li> </ul>

**Unit 2****Number of lectures: 12****Weightage: 25%****(a) D.C. Circuits:**

- Simple R-L Circuit - Growth and Decay of Current Helmholtz equation, R-C Circuit
- Measurement of high resistance by method of leakage, Comparison of capacities by De Sauty's Method
- Ideal L-C. Circuit, Series LCR Circuit (for charge case only)

**(b) Network Theorems:**

- Superposition Theorem, Thevenin's Theorem, Norton's Theorem, Maximum Power Theorem

**Unit 3****Number of lectures: 12****Weightage: 25%****(a) Heat and Thermodynamics:**

- Second Law of Thermodynamics, Carnot's Theorem, Thermodynamic Scale of Temperature, Identity of Perfect Gas Scale and Absolute Scale, Thermodynamics of Refrigeration

**(b) Entropy:**

- Entropy, Change of Entropy in a Reversible process, Change of Entropy in an Irreversible process, Principle of increase of entropy or degradation of energy, Formulation of the second law in terms of entropy, Entropy and Second Law

**Unit 4****Number of lectures: 12****Weightage: 25%****(a) Rectifier and filter circuits:**

- The Half Wave Rectifier, Voltage regulation, Ripple factor, Ratio of Rectifications, Transformer utilization factor
- The Full Wave Rectifier, The Bridge Rectifier, The Inductor filter, The Capacitor filter, Ripple factor, The Choke input filter, Ripple factor in LC filter, Value of Critical inductance, The CLC filter

**(b) Transistors:**

- Review of Construction of transistor, Transistor current components, Detailed Transistor Leakage currents, C-B Configuration static characteristics, Load line, Operating point

## REFERENCES:

1. Electricity and Magnetism By K.K. Tewari (S.Chand& Company Ltd.)
2. Mathematical methods in physical sciences By M.L.Boas (John Willey & Sons)
3. Waves And Oscillations By N. Subrahmanyam&BrijLal (Vikas Publishing House Pvt Ltd., New Delhi)
4. Thermodynamics and statistical Physics By Singhal, Agarwal and Prakash (PragatiPrakashan, Meerut)
5. University Physics By Sears, Zeemansky and Young (Narosa Publishing House)
6. Heat and Thermodynamics By Richard H. Dittmon, & Mark W.Zemansky (TMH)
7. Electronic Devices & Circuits by Allen Mottershead (PHI Pvt.Ltd)
8. Hand Book of Electronics by Gupta & Kumar (PragatiPrakashan, Meerut-Revised addition)
9. Basic Electronics and Linear circuits by BhargvaKulshreshth& Gupta TMH Edition
10. Elements of Electronics by Bagde& Singh
11. Fundamentals of Physics by Haliday, Resnik, Walker (Wiley-India Edition)
12. Basic Electronics and linear circuits by Bhargava,Kulshreshtha and Gupta (TMH)

## INSTRUCTION STRATEGIES

1. Interactions with the students to understand the level of students
2. Explaining & Discussing the major terminologies related to Physics
3. Teaching the topics included in the syllabus with the help of teaching aids like OHP, LCD (Power point presentation), Notes, Question Banks, References and Reprints / Copy of Articles, Models, Diagrams
4. Assistance in solving of questions from our question bank.

## TEACHING AND EXAMINATION

UNIT	Examination Scheme %Weightage	Teaching Scheme No. of Lecture
Unit 1	25	12
Unit 2	25	12
Unit 3	25	12
Unit 4	25	12
<b>Total</b>	<b>100</b>	<b>48</b>

**Semester I**  
**Physics Practical I - PCH 101**

**RATIONALE:** This course is designed to enable students to acquire on hand basic understanding of the physical phenomena, fundamental laws of physics, as well as on hand experience of handling the various instruments which have much use in industries as well as in research institutes. These experiments make the students capable and competent to work in physics related industries and research institutes.

**LEARNING OUTCOMES:**

- Understand the basic principles and of physics.
- Develop an understanding about the handling of various instruments.
- Develop an analytical attitude for physical laws through simple and basic experiments.
- Gain knowledge and expertise in experimental physics field.

**TEACHING AND EVALUATION SCHEME:** The objective of evaluation is not only to measure the performance of students, but also to motivate them for better performance. General viva-voce will be conducted to analyze the knowledge of the student.

Subject Code	Subject Title	Credits	Practical		Total Marks
			Hrs.	Max Marks	
PPH- 101	Physics practical –I	2	6 (6 hrs& 1 Day)	50	50

**LIST OF EXPERIMENTS (Any Twelve)**

1. Damping coefficient, Relaxation and quality factor in the damped motion of a simple Pendulum.
2. Momentum of Inertia of a Fly wheel.
3. Verification of Steafan’s law using A.C.Source.
4. Arrangement of Spectrometer for parallel rays using Schuster method and calibration of spectrometer.
5. Refractive index of liquid using convex lens.
6. Study of Resonator.
7. To determine the magnetic moment of a given Bar magnet using deflection magnetometer in Gauss A and B position.
8. Determination of the capacity ‘c’ of condenser.
9. Study of the series resonance with frequency variation.
10. Decay of Potential across condenser.
11. P-N Junction diode as Half Wave Rectifier (i) Without filter (ii) With Series inductor Filter (iii) With Shunt Capacitor Filter. Calculation of percentage of regulation.
12. V-I characteristics of Zener diode and its use as Voltage regulator.
13. Verification of Thevenin’s theorem.
14. Characteristics of common Emitter Transistor.

## **INSTRUCTION STRATEGIES**

1. Explanation of Principles, protocols, expected result trends, handling of instruments and equipments, precautions and safety measures in class and demonstration of important steps.
2. Monitoring of the students performing the experiments.
3. Evaluation of results of each experiment.

## Semester II

### CPH 201- Fundamentals of Physics

**RATIONALE:** This course is designed to enable students to acquire basic understanding of the basic principles of physics.

**LEARNING OUTCOMES:**

- Understand the concept of physical sciences.
- Develop an understanding of the various physical laws and its applications.
- Gain knowledge about the physics existing in and around the society.

**TEACHING AND EVALUATION SCHEME:** The objective of evaluation is not only to measure the performance of students, but also to motivate them for better performance. Students are evaluated on the basis of Mid Term examinations for 30 marks and End Term Examination conducted by University examination for 70 marks.

Subject Code	Subject Title	Credits	Theory			Total Marks
			Hrs.	Max Marks		
				Mid Term	End Term	
CPH- 201	Fundamentals of Physics	4	48	30	70	100

**COURSE CONTENT**

<p><b>Unit – I</b></p> <ul style="list-style-type: none"> <li>• <b>Mechanics of a single particle &amp; of particles:</b> Motion of a particle subjected to a resistive force , mechanics of a system of particle, Motion of a system with variable mass</li> <li>• <b>(b) Motion in a central force field &amp; Pendulum:</b> Equivalent one body problem, Motion in central force field, General features of the motion, Motion in an inverse square law force field, Equation of the orbit. Kapler’s law of planetary motion, Compound Pendulum, Bar-Pendulum</li> </ul>	<p><b>Number of lectures: 12</b> <b>Weightage: 25%</b></p>
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<p><b>Unit 2</b></p> <p><b>a) Refraction Through Lenses:</b></p>	<p><b>Number of lectures: 12</b> <b>Weightage: 25%</b></p>
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- Principal Foci, Least possible distance between an object & its real image in a convex lens, Derivation produced by a thin lens, Equivalent Focal Length of Two Thin Lenses Separated by a Finite Distance, Cardinal Points of an Optical system, Principal Foci and Focal Planes, Principal Points and Principal Planes, Nodal Points, Aberrations, Spherical aberration in a Lens, Chromatic aberration.

**b) Interference:**

- Interference in thin films, Interference due to reflected light, Interference due to transmitted light, Newton's Rings, Determination of the wavelength of sodium light using Newton's Rings, Refractive Index of a Liquid using Newton's Rings

**Unit 3**

**Number of lectures: 12**

**Weightage: 25%**

**a) Electrostatics:**

- a. Gauss's Law, Gauss's Law in Differential Form, Gauss's Law and Coulomb's Law, Force on The surface of a charged Conductor, Electrostatic Energy in the medium surrounding the charged conductor, Millikan's Oil drop Method for Determination of Electronic charge

**b) Steady Current:**

- b. Current and current density, Conservation of Charge i.e., Continuity Equation, Ohm's Law at a Point, Wiedmann and Franz Law, The Relaxation Time.

**Unit 4**

**Number of lectures: 12**

**Weightage: 25%**

**a) Waves:**

- c. Theory of Resonator, Dependence of the Frequency of Resonator on the size and the Shape of the Mouth, Velocity of Transverse Waves along a Stretched String, Laws of Transverse Vibration of Strings, Melde's Experiment, Kundt's Tube

**b) Ultrasonic waves:**

- d. Ultrasonic, Production of Ultrasonic Waves, Piezo-Electric Oscillator, Detection of Ultrasonic Waves, Applications of Ultrasonic waves

## REFERENCES:

1. Elements of Properties of Matter By D.S.Mathur (S.Chand & Company Ltd.) Text book of Organic Chemistry, ArunBahal, S.Chand.
2. Mechanics & Electrodynamics By Brijlal, N.Subrahmanyam & JivaSeshan – (S.Chand & Co.)
3. Classical Mechanics by Goldstain (Narosa Pub.)
4. A Textbook of OPTICS By N.Subrahmanyam & BrijLal (S.Chand & Company Ltd.)
5. Optics and Atomic Physics By D.P.Khandelval (Himalaya publishing house)
6. Principles of Optics By B.K.Mathur (S.Chand & Company Ltd.)
7. Optics By AjoyGhatak (TMH Edition)
8. Electricity and Magnetism By K.K.Tewari (S.Chand & Company Ltd.)
9. Electricity and Magnetism by Mahajan and Rangwala.
10. Electricity and Magnetism - Berkley Physics Course Vol-II
11. Waves and Oscillations By N.Subrahmanyam and BrijLal (Vikas Publishing House Pvt.Ltd., New Delhi) – Second Revised Edition
12. University Physics By Sears, Zeemansky and Young (Narosa Publishing House)
13. A Text Book on Oscillations, Waves and Acoustics By M.Ghosh & D.Bhattacharya (S.Chand)
14. Vibration, Waves & Heat By Sears and Zeemansky

## INSTRUCTION STRATEGIES

1. Interactions with the students to understand the level of students
2. Explaining & Discussing the major terminologies related to Microbiology
3. Teaching the topics included in the syllabus with the help of teaching aids like OHP, LCD (Power point presentation), Notes, Question Banks, References and Reprints / Copy of Articles, Models, Diagrams
4. Assistance in solving of questions from our question bank.

## TEACHING AND EXAMINATION

UNIT	Examination Scheme % Weightage	Teaching Scheme No. of Lecture
Unit 1	25	12
Unit 2	25	12
Unit 3	25	12
Unit 4	25	12
Total	100	48

**Semester II**  
**Physics Practical- II PCH 201**

**RATIONALE:** This course is designed to enable students to acquire on hand basic understanding of the physical phenomena, fundamental laws of physics, as well as on hand experience of handling the various instruments which have much use in industries as well as in research institutes. These experiments make the students capable and competent to work in physics related industries and research institutes

**LEARNING OUTCOMES:**

- Understand the basic principles and of physics.
- Develop an understanding about the handling of various instruments.
- Develop an analytical attitude for physical laws through simple and basic experiments.
- Gain knowledge and expertise in experimental physics field.

**TEACHING AND EVALUATION SCHEME:** The objective of evaluation is not only to measure the performance of students, but also to motivate them for better performance. General viva-voce will be conducted to analyse the knowledge of the student.

Subject Code	Subject Title	Credits	Practical		Total Marks
			Hrs.	Max Marks	
PPH- 201	Physics Practical-II	2	6 (6 hrs& 1 Day)	50	50

**LIST OF EXPERIMENTS LIST OF EXPERIMENTS**

1. Bar Pendulum: Determination of 'K' and 'g'
2. Double Refraction by Calcite prism.
3. Newton's rings: Determination of R and  $\lambda$  using sodium light.
4. Melde's Experiment.
5. Find out Refractive index of prism using spectrometer.
6. Study of line spectra.
7. To determine the ratio of magnetic moments of two magnets by using vibrational magnetometer.
8. Determination of self-inductance 'L' of Inductor.
9. Study of parallel resonance with frequency variation.
10. Study of transformer.
11. P-N Junction diode as Full Wave Rectifier (i) Without filter (ii) With Series inductor Filter (iii) With Shunt Capacitor Filter. Calculation of percentage of regulation.
12. Bridge Rectifier (i) Without filter (ii) With Series inductor Filter (iii) With Shunt Capacitor Filter. Calculation of percentage of regulation.
13. Verification of Maximum power transfer theorem.
14. Basic Logic Gates AND, OR, NOT

## **INSTRUCTION STRATEGIES**

1. Explanation of Principles, protocols, expected result trends, handling of instruments and equipments, precautions and safety measures in class and demonstration of important steps.
2. Monitoring of the students performing the experiments.
3. Evaluation of results of each experiment.