

Faculty: Science and Technology

Programme: B.Sc.

Syllabus Prescribed for B.Sc. I Year UG Programme

Programme:

Semester II

Code of the Course/Subject	Title of the Course/Subject	(Total Number of Periods)
PHY-S2/physics	Electrostatics, Magneto-statics, Ultrasonic Waves and Acoustics, Network Theorems	72

#### COs

After going through the course, the student would be able to

7. Discuss the concept of scalars & vectors and their properties.
8. Develop an understanding of Gauss law and its applications to obtain electric field in different cases.
9. Formulate the relationship between electric displacement vector, electric polarization and dielectric constant.
10. Distinguish between the magnetic effect of electric current, electromagnetic induction and the related laws in appropriate circumstances.
11. Simplify electrical circuits by applying various network theorems.

Unit	Content
Unit I	Vector Analysis: Scalar and Vector product, gradient, divergence, Curl and their significance, Vector Integration, Line, surface and volume integrals of Vector fields, Gauss-divergence theorem and Stoke's theorem of vectors. Numericals <b>(12 Periods)</b>
Unit II	Electrostatics: Electrostatic Field, electric flux, Gauss's theorem of electrostatics. Applications of Gauss theorem- Electric field due to point charge, infinite line of charge, uniformly charged spherical shell and solid sphere. Electric potential as line integral of electric field, potential due to a point charge, electric dipole, uniformly charged spherical shell and solid sphere. Relation between electric field and electric potential. Numericals <b>(12 Periods)</b>
Unit III	Capacitors: Capacitance of an isolated spherical conductor. Parallel plate, spherical and cylindrical condenser. Energy per unit volume in electrostatic field. Dielectric medium, Polarisation, Displacement vector. Gauss's theorem in dielectrics. Parallel plate capacitor completely filled with dielectric. Numericals <b>(12 Periods)</b>
Unit IV	Magnetostatics: Biot-Savart's law & its applications- straight conductor, circular coil, solenoid carrying current. Divergence and curl of magnetic field. Magnetic vector potential. Ampere's circuital law. Electromagnetic Induction: Faraday's laws of electromagnetic induction, Lenz's law, self and mutual inductance, L of single coil, M of two coils. Energy stored in magnetic field. Numericals <b>(12 Periods)</b>
Unit V	Network Theorems : Series circuit, Series voltage dividers, Parallel circuits, Series Parallel circuits, Resistances in series and parallel, Kirchhoff's Current and Voltage laws, Wheatstone's Bridge, Ideal constant voltage source, Ideal constant current source, Superposition theorem, Thevenin's theorem, Norton's theorem, Maximum power transfer theorem, Milliman's theorem, Numericals. <b>(12 Periods)</b>
<p><b>*SEM</b>  <b>Multimeter:</b> Principles of measurement of dc voltage and dc current, ac voltage, ac current and resistance. Specifications of a multimeter and their significance.            Introduction to electrical components:  <b>Resistor-</b>Types of Resistors, Color coding - Applications of a Resistor as a heating element in heaters and as a fuse element.  <b>Capacitor-</b> Types of Capacitor, Color coding, Applications of Capacitor in power supplies, motors (Fans) etc.  <b>Inductor-</b>Types of Inductors, EMF induced in an Inductor, Applications of Inductor in a fan, radio tuning</p>	

circuit and Series resonance circuit. Energy audit: Unit of electricity, power of domestic appliances. (12 periods)	
COs: After completion of this course students would be able to 3. Make use of Multimeter for the measurement of electrical parameters and get the knowledge of electronic components and their applications. 4. Estimate the power consumption of domestic appliances and carry out energy audit.	
**Activities	<ol style="list-style-type: none"> <li>1. Use of Multimeter for the measurement of ac voltage &amp; dc voltage in different domestic appliances.</li> <li>2. Use of Multimeter for the measurement of Resistance, Capacitance.</li> <li>3. Estimate the values of Resistor &amp; capacitor by color code method.</li> <li>4. Connect two or three resistors or capacitors or inductors and measure the Series, Parallel Combination values using a Multimeter.</li> <li>5. Identification of electronic components in mobile charger and to estimate their values.</li> <li>6. Estimate and compare the power consumptions of different domestic appliances.</li> <li>7. Energy audit of your home and compare it with monthly electric bill (for three months).</li> </ol>

### Course Material/Learning Resources

Text books & Reference Books:

1. Electricity and Magnetism, Edward M. Purcell, 1986, McGraw-Hill Education.
2. Electricity and Magnetism, J.H. Fewkes & J. Yarwood. Vol. I, 1991, Oxford Univ. Press.
3. Electricity and Magnetism, D C Tayal, 1988, Himalaya Publishing House.
4. University Physics, Ronald Lane Reese, 2003, Thomson Brooks/Cole.
5. D.J. Griffiths, Introduction to Electrodynamics, 3rd Edn, 1998, Benjamin Cummings.
6. A Course in electrical & Electronic Measurements And Instrumentation by A. K. Sawhney, Dhanpatrai & Sons Educational & Technical Publishers, Delhi.
7. Modern Electronic Instrumentation and Measurement Techniques by A.D. Helfrick and W.D. Cooper. PHI Learning Pvt. Ltd. New Delhi.
8. Physics for degree students (B.Sc.2nd year) by C. L. Arora & P.S. Hemne, S. Chand Publication.
9. Physics for degree students(B.Sc. 1st year)by C. L. Arora & P.S. Hemne, S. Chand Publication.
10. Basic Electronics by B. L. Theraja, S. Shand Publication.
11. Electricity and Magnetism, Edward M. Purcell, 1986, McGraw-Hill Education.
12. Properties of Matter and Acoustics for B.Sc, Kiruthiga Sivaprasath & R Murugesan, S. Chand & Co. New Delhi.

Weblink to Equivalent MOOC on SWAYAM if relevant:

<https://nptel.ac.in>

Weblink to Equivalent Virtual Lab if relevant:

<https://vlab.amrita.edu/>

<https://www.vlab.co.in/>

<http://vlabs.iitb.ac.in/vlab/labsps.html>

Any pertinent media (recorded lectures, YouTube, etc.) if relevant:

<https://www.youtube.com/watch?v=rtIJoXxISFE&list=PLyQSN7X0ro2314mKyUiOILaOC2hk6Pc3j>

Sant Gadge Baba Amravati University, Amravati

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Programme: Semester II

Code of the Course/Subject	Title of the Course/Subject	(No. of Periods/Week)
	(Laboratory/Practical/practicum/hands-on/Activity)	

PHY/S2

Physics Lab-2

72

COs

On successful completion of this practical course, the students would be able to

6. Simplify various electrical circuits by using network theorems.
7. Learn the procedures of operation of electrical components like capacitor, resistor and inductor.
8. Acquire skills in measuring dielectric constants of different materials.
9. Perform procedures and techniques related to experiments based on electrical and electronic circuits.
10. Conduct an experiments collaboratively and ethically.

\* List of Practical/Experiments/Activities etc.

It is necessary to perform **TEN** Experiments from the list given below.

1	Verification of Kirchhoff's Current Law
2	Verification of Kirchhoff's Voltage Law
3	To determine unknown resistance by using Wheatstone's bridge
4	Verification of Thevenin's theorem.
5	Verification of Norton's theorem.
6	Verification of Milliman's theorem.
7	To verify the Superposition theorem
8	To verify Maximum Power Transfer Theorem
9	To determine high resistance by leakage method
10	To study the charging & discharging of a condenser through resistor.
11	To compare capacitances using De Sauty's bridge.
12	To determine capacitance by phaser diagram method
13	To determine inductance by phaser diagram method
14	Study of Primary & Secondary coil of Transformer
15	To determine dielectric constant of a given material
16	Study of frequency response of series LCR circuit
17	Comparison of capacities by repeated charge decay method
18	Measurement of the low resistance by Potentiometer

Text books & Reference Books:

18. *B.Sc. Practical Physics* by Harnam Singh & Dr. P. S. Hemne, 2000, S. Chand and Company Limited.

19. *A Textbook of Practical Physics* by Indu Prakash, Ram Krishna & A. K. Jha, 2011, Kitab Mahal Publication.

20. *B.Sc. Physics Practical* by C. L. Arora, 2010, S. Chand and Company Limited.

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<https://www.vlab.co.in/>

<http://vlabs.iitb.ac.in/vlab/labsps.html>

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<https://www.youtube.com/watch?v=rtlJoXxlSFE&list=PLyOSN7X0ro2314mKyUiOILaOC2hk6Pc3j>