Year	I	**Course Code:21BSC2C2PHY2L**	**Credits**	4
Sem.	2	**Course Title : Electricity and Magnetism**	**Hours**	52

Course Pre-requisites, if any	NA	
Formative Assessment Marks: 40	Summative Assessment Marks: 60	Duration of ESA: 2 hrs.

Unit No.	**Course Content**	**Hours**
Unit I	**Vector Analysis:** Scalar and Vector Products. Gradient of scalar and its physical significance. Divergence of vector and its physical significance. Curl of vector and its physical significance. Vector integration; line, surface & volume integrals of a vector field. Gauss Divergence theorem & Stokes theorem (statement). Problems **Maxwell's Electromagnetic Theory:** Derivation of Maxwell's equations in differential form. Mention of Maxwell's equations in integral form and their physical significances. Derivation for general plane wave equation in free space. Transverse nature of radiation. Derivation of Poynting's theorem. Problems	13
Activity/Self Study	Solving problems on gradient, divergence & curl of a vector	
Unit II	**DC Circuit Analysis:** Voltage and current sources. Kirchhoff's current and voltage laws. Derivation of Thevenin's Theorem. Derivation of Norton's Theorem. Derivation of Superposition Theorem. Derivation of Maximum Power Transfer Theorem. Problems **Transient Circuits:** Theory of growth and decay of current in RL circuit. Theory of charging and discharging of capacitor in RC circuit. Time constants of RL and RC circuits. Measurement of high resistance by leakage method. Problems	13
Activity/Self Study	1.Solving problems on Thevenin's, Norton's, Superposition and Maximum Power Transfer Theorems. 2.Charging and discharging of a capacitor through high resistance. 3.Measurment of time constant of RL and RC circuit.	
Unit III	**Magneto statics:** Statement of Biot Savart's law. Derive an expression for Magnetic field at a point (1) due to a straight conductor carrying current (ii) along the axis of the circular coil carrying current (iii) along the axis of solenoid. Principle, construction and theory of Helmholtz Galvanometer. Problems **Alternating Current:** Definitions of average, peak and rms values of AC. AC circuits containing LR, CR and their responses (using j operator). Expressions for impedance, current & phase angle in series LCR circuit using j operator. Expressions for admittance and condition for resonance in parallel, LCR circuit using j operator. Concept of Series resonance & parallel resonance (sharpness, half power frequency, quality factor, voltage magnification). Comparison between Series resonance & parallel resonance. De Sauty's Bridge. Problems	13
Activity/Self Study	1.Experiments to show the magnetic field due to straight conductor, circular coil and solenoid. 2.Construction of Helmholtz coil using PVC pipe and copper wire.	

	3.To show the lagging of current and voltage in RL, RC and RLC circuits.	
Unit IV	**Electrical Instrument:** Ballistic Galvanometer; Theory of Ballistic Galvanometer (Derivation for current and Charge). Constants of Ballistic Galvanometer and their relationship. Condition for moving coil galvanometer to be ballistic. Determination of self-inductance (L) by Rayleigh's method. Theory of Earth inductor, Measurement of $B_{H,}$ Bv and angle of dip at a place. CRO block diagram. Use of CRO in the measurement of Voltage, Frequency and Phase. Problems **Dielectrics:** Types of dielectrics (polar and non-polar molecules). Electric dipole moment (p), electric polarization (P). Gauss law in dielectrics. Derivation for Relation between D, E and P. Derivation for relation between dielectric constant and electric susceptibility. Boundary conditions for E & D. Problems	13
Activity/Self-Study	1.To show the working of Ballistic Galvanometer 2.Working of CRO and its applications.	
Recommended Leaning Resources		
Print Resources	1) Electricity and magnetism by Brij Lal and N Subrahmanyam, Rathan Prakash an Mandir, Nineteenth Edition, 1993. 2) Principles of Electronics by V K Mehta and Rohit Mehta, S Chand & Company, Eleventh Edition,2008. 3) Fundamentals of Magnetism & Electricity: D. N. Vasudeva, S Chand Publication, (2011). 4) Fundamentals of Electricity and Magnetism – Basudev Ghosh (Books & Allied New Central Book Agency, Calcutta, 2009). 5) Electricity & Magnetism: B. S. Agarwal, Kedarnath Ramnath Publication (2017). 6) Electricity and Magnetism with Electronics: Dr. K.K. Tewari, S. Chand Publications (1995). 7) Fundamentals of electric circuit theory: Dr. D. Chattopadhyay & Dr. P. C. Rakshit, S. Chand Publications, 7th Rev. Edn. (2006). 8) Electricity and Magnetism: John Yarwood, University Tutorial Press, (1973). 9) Electricity & Magnetism, N S Khare& S S Srivastava, AtmaRam & Sons, New Delhi. 10) Electricity & Magnetism, D L Sehgal, K L Chopra, N K Sehgal, S Chand & Co, Sixth Edition, (1988). 11) Electricity & Electronics, D C Tayal, Himalaya Publishing House, Sixth Edition (1988). 12) Electricity and Magnetism, S P Taneja, R Chand & Co. New Delhi.	

Laboratory Experiments:

NOTE: Minimum of Eight experiments has to be performed

Year	I	**Course Code: 21BSC2C2PHY2P**	**Credits**	2
Sem.	2	**Course Title: Practical-II**	**Hours**	4 hrs/week
Formative Assessment Marks: 25		Summative Assessment Marks: 25	Duration of ESA: 4 hrs.	

Sl. No	**Experiment**
1	Thevenin's & Norton's theorem (Ladder Network)
2	Thevenin's & Norton's theorems (Whetstone Bridge)
3	High resistance by leakage method
4	Time constant of RC circuit by charging and discharging method.
5	Calibration of Ammeter using Helmholtz Galvanometer
6	Constants of Ballistic Galvanometer
7	LCR series / parallel resonance circuit
8	De Sauty's AC bridge
9	Self-Inductance by Rayleigh's method
10	Use of CRO to find voltage, frequency and phase.
11	L & C by Equal Voltage Method
12	Black Box- Identify & Measure R, L & C
13	Anderson's Bridge to determine the self-inductance of the coil (L).
14	Verification of Superposition Theorem
15	Verification of maximum Power Transfer Theorem

Recommended Leaning Resources

Reference Books	1. Physics through experiments. B Saraf etc, - Vikas Publications (2013) 2. D P Khandelwal – A Laboratory Manual of Physics for Undergraduate Classes, Vikas Publications First ed (1985) 3. Advanced Practical Physics for Students – Workshop & Flint, Methuen & Co, London. 4. An Advanced Course in Practical Physics, D Chattopadhyay, P C Rakshit, B Saha, New Central Book Agency (P) Limited, Kolkata, Sixth Revised Edition, (2002) 5. BSC, Practical Physics, CL Arora, SChand& Co, New Delhi, (2007) Revised Edition. 6. B.Sc. Practical Physics, Geeta Sanon R. Chand & Co. New Delhi Rani Channam University, Belagavi, B.Sc. (CBCS) Physics Syllabus

OPEN-ELECTIVE SYLLABUS:

Year	I	**Course Code: 21BSC2O2PHY1**	**Credits**	03
Sem.	2	**Course Title:** OPTICAL INSTRUMENTS	**Hours**	40
Formative Assessment Marks: 40		Summative Assessment Marks: 60	Duration of ESA:.02 hrs.	

Unit No.	**Course Content**	**Hours**
Unit I	**Basics of Optics** Scope of optics, optical path, laws of reflection and refraction as per Fermat's principle, magnifying glass, Lenses (thick and thin), convex and concave lenses, Lens makers formulae for double concave and convex lenses, lens equation.	10
Unit II	Focal and nodal points, focal length, image formation, combination of lenses, dispersion of light: Newton's experiment, angular dispersion and dispersion power. Dispersion without deviation. (Expressions need not be derived, but have to be discussed qualitatively).	10
Unit III	**Camera and microscopes** Human eye (constitution and working), Photographic camera (principle, construction and working), construction, working and utilities of Simple microscopes, Compound microscope, Electron microscopes, Binocular microscopes **Self study** Experimental determination of magnifying power of a microscope. (Construction part can be discussed through block diagrams)	10
Unit IV	**Telescopes and Spectrometer** Construction, working and utilities of Astronomical telescopes Terrestrial telescopes Reflecting telescopes, Construction, working and utilities of Eyepieces or Oculars (Huygen, Ramsden's, Gauss) Spectrometer - Construction, working and utilities, measurement of refractive index. **Self study** Telescopes used at different observatories in and outside India. Hydropower resources, hydropower technologies, environmental impact of hydro power sources. Carbon captured technologies, cell, batteries, power consumption	10
	Activities: 1) Find position and size of the image in a magnifying glass and magnification. 2) Observe rain bows and understand optics. 3) Create a rainbow. 4) Find out what makes a camera to be of good quality.	

	5) Observe the dispersion of light through prism. 6) Make a simple telescope using magnifying glass and lenses. 7) Learn principle of refraction using prisms. 8) Check bending of light in different substances and find out what matters here. 9) Learn about different telescopes used to see galaxies and their ranges. Many more activities can be tried to learn optics by going through you tubes and webistes such as https://spark.iop.org, http://www.yenka.com, https://publiclab.org etc.	