



- b) Use of equipment for determining velocity of ultrasonics in different liquids.
- c) Verify optical laws; reflection, refraction from plane interfaces and surfaces.
- d) Apply knowledge of optics to determine focal length and magnifying power of optical lenses.
- e) Understand uses of electrical components and meters and verify Ohm’s law for flow of current.
- f) Quantify resistances and verify laws of series and parallel combination of resistances.
- g) Apply concept of electrical vibrations in determine frequency of AC main.
- h) Analyse electrical circuits and verify Kirchhoff’s law governing electrical circuits.
- i) Measure resistance of a galvanometer and how it is converted into an ammeter and volt-meter.
- j) Investigate characteristics of semiconductor diodes, photoelectric cells and determine operational parameters associated with their performance.
- k) Work with laboratory lasers and understand method to measure the wavelength of the light emitted from a laser.
- l) Handle optical fibers and determine numerical aperture of given optical fiber.
- m) Understand construction and working of an optical projection system.

**Recommended Books:**

1. Text Book of Physics for Class XI& XII (Part-I, Part-II); N.C.E.R.T., Delhi
2. Comprehensive Practical Physics, Vol, I & II, JN Jaiswal, Laxmi Publications (P) Ltd., New Delhi
3. Practical Physics by C. L. Arora, S. Chand & Company Ltd.
4. e-books/e-tools/ learning physics software/you Tube videos/ websites etc.

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Course Code	:	ES 108
Course Title	:	Introduction to IT Systems Lab
Number of Credits	:	2 (L: 0, T: 0, P: 4)
Prerequisites (Course code)	:	NIL, should be doing ES102 in parallel
Course Category	:	ES

**Course Objectives:**

This Lab course is intended to practice whatever is taught in theory class of ‘Introduction of IT Systems’ and become proficient in using computing environment - basic computer skills, basic application software tools, Computer Hardware, cyber security features, etc.

**Course Content:**

S.No.	Topics for Practice
1	Browser features, browsing, using various search engines, writing search queries
2	Visit various e-governance/Digital India portals, understand their features, services offered
3	Read Wikipedia pages on computer hardware components, look at those components in lab, identify them, recognise various ports/interfaces and related cables, etc.
4	Install Linux and Windows operating system on identified lab machines, explore various options, do it multiple times



5	Connect various peripherals (printer, scanner, etc.) to computer, explore various features of peripheral and their device driver software.
6	Practice HTML commands, try them with various values, make your own Webpage
7	Explore features of Open Office tools, create documents using these features, do it multiple times
8	Explore security features of Operating Systems and Tools, try using them and see what happens.

This is a skill course. More you practice, better it will be.

**References:**

1. Online resources, Linux man pages, Wikipedia.
2. R.S. Salaria, Computer Fundamentals, Khanna Publishing House.
3. Ramesh Bangia, PC Software Made Easy – The PC Course Kit, Khanna Publishing House.
4. Mastering Linux Shell Scripting: A practical guide to Linux command-line, Bash scripting, and Shell programming, by Mokhtar Ebrahim, Andrew Mallett.
5. IT Essentials PC Hardware and Software Companion Guide, Davis Anfinson and Ken Quamme, CISC Press, Pearson Education.
6. PC Hardware and A+ Handbook, Kate J. Chase PHI (Microsoft).

**Course outcomes:**

At the end of the course student will be able to comfortably work on computer, install and configure OS, assemble a PC and connect it to external devices, write documents, create worksheets, prepare presentations, protect information and computers from basic abuses/attacks.

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Course Code	:	ES110
Course Title	:	Fundamentals of Electrical and Electronics Engineering Lab
Number of Credits	:	1 (L: 0, T: 0, P: 2)
Prerequisites	:	NIL
Course Category	:	ES

**Suggested Practicals/Exercises:**

The practical in this section are PrOs (i.e. sub-components of the COs) to be developed and assessed in the student for the attainment of the competency.

S. No.	Practical Outcomes (PrOs)	Approx. Hrs.
1.	Determine the permeability of magnetic material by plotting its B-H curve.	02*
2.	Measure voltage, current and power in 1-phase circuit with resistive load.	02*
3.	Measure voltage, current and power in R-L series circuit.	02*
4.	Determine the transformation ratio (K) of 1-phase transformer.	02
5.	Connect single phase transformer and measure input and output quantities.	02
6.	Make Star and Delta connection in induction motor starters and measure the line and phase values.	02
7.	Identify various passive electronic components in the given circuit	02
8.	Connect resistors in series and parallel combination on bread board and measure its value using digital multimeter.	02
9.	Connect capacitors in series and parallel combination on bread board and measure its value using multimeter.	02*