

B. Sc. II Year		BPH-S402			Semester-IV	
SEC 3		BASIC INSTRUMENTATION SKILLS				
Total Lectures	Time Allotted for End Semester Examination	Marks Allotted for Continuous Assessment	Marks Allotted for End Semester Examination (ESE)	Maximum Marks (MM)	Total Credits	
60	3 Hrs	30	70	100	04	

NOTE: The question paper shall consist of TWO sections (Sec.-A, Sec.-B). Sec.-A shall contain 10 short answer type questions of Five mark each and student shall be required to attempt any Five questions. Sec.-B shall contain 8 descriptive type questions of ten marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus. The previous year paper/model paper can be used as a guideline and the following syllabus should be strictly followed while setting the question paper.

*This course is to get exposure with various aspects of instruments and their usage through hands-on mode. Experiments listed below are to be done in continuation of the topics.*

**Basic of Measurement:** Instruments accuracy, precision, sensitivity, resolution range etc. Errors in measurements and loading effects. Multimeter: Principles of measurement of dc voltage and dc current, ac voltage, ac current and resistance. Specifications of a multimeter and their significance. (8

Lectures)

**Electronic Voltmeter:** Advantage over conventional multimeter for voltage measurement with respect to input impedance and sensitivity. Principles of voltage measurement (block diagram only). Specifications of an electronic Voltmeter/ Multimeter and their significance. AC millivoltmeter: Type of AC millivoltmeters: Amplifier-rectifier, and rectifier- amplifier. Block diagram ac millivoltmeter, specifications and their significance. (8

Lectures)

**Cathode Ray Oscilloscope:** Block diagram of basic CRO. Construction of CRT, Electron gun, electrostatic focusing and acceleration (Explanation only– no mathematical treatment), brief discussion on screen phosphor, visual persistence & chemical composition. Time base operation, synchronization. Front panel controls. Specifications of a CRO and their significance. (12

Lectures)

Use of CRO for the measurement of voltage (dc and ac frequency, time period. Special features of dual trace, introduction to digital oscilloscope, probes. Digital storage Oscilloscope: Block diagram and principle of working. (6

Lectures)

**Signal Generators and Analysis Instruments:** Block diagram, explanation and specifications of low frequency signal generators. pulse generator, and function generator. Brief idea for testing, specifications. Distortion factor meter, wave analysis. (8

Lectures)

**Impedance Bridges & Q-Meters:** Block diagram of bridge. working principles of basic (balancing type) RLC bridge. Specifications of RLC bridge. Block diagram & working principles of a Q- Meter. Digital LCR bridges. (6 Lectures)

**Digital Instruments:** Principle and working of digital meters. Comparison of analog & digital instruments. Characteristics of a digital meter. Working principles of digital voltmeter.

(6 Lectures)

**Digital Multimeter:** Block diagram and working of a digital multimeter. Working principle of time interval, frequency and period measurement using universal counter/frequency counter, time- base stability, accuracy and resolution.

(12 Lectures)

**The test of lab skills will be of the following test items**

1. Use of an oscilloscope.
2. CRO as a versatile measuring device.
3. Circuit tracing of Laboratory electronic equipment,
4. Use of Digital multimeter/VTVM for measuring voltages
5. Circuit tracing of Laboratory electronic equipment,
6. Winding a coil / transformer.
7. Study the layout of receiver circuit.
8. Trouble shooting a circuit
9. Balancing of bridges

**Laboratory Exercises**

1. To observe the loading effect of a multimeter while measuring voltage across a low resistance and high resistance.
2. To observe the limitations of a multimeter for measuring high frequency voltage and currents.
3. To measure Q of a coil and its dependence on frequency, using a Q- meter.
4. Measurement of voltage, frequency, time period and phase angle using CRO.
5. Measurement of time period, frequency, average period using universal counter/frequency counter.
6. Measurement of rise, fall and delay times using a CRO.
7. Measurement of distortion of a RF signal generator using distortion factor meter.
8. Measurement of R, L and C using a LCR bridge/ universal bridge.

**Open Ended Experiments**

1. Using a Dual Trace Oscilloscope
2. Converting the range of a given measuring instrument (voltmeter, ammeter)

**Reference Books**

- A text book in Electrical Technology - B L Theraja - S Chand and Co.
  - Performance and design of AC machines - M G Say ELBS Edn.
  - Digital Circuits and systems, Venugopal, 2011, Tata McGraw Hill.
  - Logic circuit design, Shimon P. Vingron, 2012, Springer.
  - Digital Electronics, Subrata Ghoshal, 2012, Cengage Learning.
  - Electronic Devices and circuits, S. Salivahanan & N. S.Kumar, 3<sup>rd</sup> Ed., 2012, Tata Mc-Graw Hill
  - Electronic circuits: Handbook of design and applications, U.Tietze, Ch.Schenk, 2008, Springer
  - Electronic Devices, 7/e Thomas L. Floyd, 2008, Pearson India
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