

**TITLE of course: BASIC INSTRUMENTATION PHYSICS****Nodal Department of HEI to run course:****Broad Area/Sector:** Electrical and Electronics**Sub Sector:** Electrical and Electronics**Nature of course:** Progressive**If Progressive:** Level I**Suggestive Sector Skill Council:** Electronics Sector Skill council of India**Aliened NSQF Level:** .....**Expected Course Fees:** Free/Paid**Stipend to student expected from Industry:** .....**Number of Seats:****Course Code:** .....**(Credits-3: Theory-01, Practical-02)****Max. Marks: Internal + External (25+75)****Min. Passing Marks:****Name of proposed Skill/Training Partner:****Job prospects (Expected Fields of occupation):** Instrumentation industries, Educational Institutions, self-employment: assembling/servicing/ of electrical/electronic equipment.

<b>Syllabus</b>					
<b>Unit</b>	<b>Topics</b>	<b>General/Skill component</b>	<b>Theory/Practical/ OJT/Internship/Training</b>	<b>No. of Theory Hours</b>	<b>No. of Skill Hours</b>
<b>I</b>	<b>BASICS OF MEASUREMENTS</b>	<b>Need for instrumentation, General instrumentation system, Static and dynamic characteristics of instruments, loading effects of series and shunt connected instruments, Calibration of instruments, Errors in measurements.</b>	<ol style="list-style-type: none"> <li><b>1. Conversion of ammeter into voltmeter.</b></li> <li><b>2. Assemble simple DC circuit containing resistors and voltage source. Use a digital multi-meter to measure the voltage, current and resistance across various components. Predict the loading effect caused by the use of a DC voltmeter and a DC ammeter</b></li> </ol>	<b>5</b>	<b>10</b>
<b>II</b>	<b>ANALOG AND DIGITAL INSTRUMENTS</b>	<b>DC galvanometer, voltmeter, ammeter, PMMC and moving iron instruments, AC millivoltmeter, DC potentiometer, Digital Multi-meter, Specifications of a multi-meter and their significance, Specifications of an Electronic Voltmeter, Comparison of analog and digital instruments.</b>	<ol style="list-style-type: none"> <li><b>1. Calibration of galvanometer into ammeter and voltmeter.</b></li> <li><b>2. To design a multirange ammeter and voltmeter</b></li> <li><b>3. To measure unknown voltage using DC potentiometer.</b></li> </ol>	<b>6</b>	<b>20</b>

III	BRIDGE CIRCUITS AND VIRTUAL INSTRUMENTATION	<p>DC bridges: Current sensitive and voltage sensitive bridges, Null type and deflection type bridge circuits, Applications of DC bridges.</p> <p>AC bridges (Qualitative treatment), Detectors for AC bridges, Applications of AC bridges.</p> <p>Introduction to virtual instrumentation.</p>	<ol style="list-style-type: none"> <li>1. To design a Wheatstone bridge</li> <li>2. To determine an unknown Low Resistance using Carey Foster's Bridge.</li> <li>3. To compare capacitances using de Sauty's bridge.</li> <li>4. (a) To determine the self-inductance of the coil (L) using Anderson's bridge. (b) To calculate the value of inductive reactance (<math>X_L</math>) of the coil at a particular frequency.</li> </ol>	4	30
-----	---	---	---	---	----

#### **Suggested Readings:**

- Theraja, B. L., "A text book in Electrical Technology", S. Chand and Co., India, 2005, 23e.
- Sawhney, A. K., "Electrical and Electronic Measurements and Instruments", Educational and Technical Publishers, India, 1983, 4e.
- Sudhakar, A., Palli, S.S., "Circuits and Networks: Analysis and Synthesis", McGraw Hill, India, 2015, 5e.
- Ghosh, A.K., "Introduction to Measurements and Instrumentation", PHI Learning Pvt. Ltd., India, 2009, 3e.
- Worsnop, B.L., Flint, H.T., "Advanced Practical Physics for Students", Methuen & Co., Ltd., London, 1962, 9e.
- Prakash, I. & Ramakrishna, "Text Book of Practical Physics", Kitab Mahal, India, 2011, 11e.

#### **Suggested Digital platforms/ web links for reading and Online Virtual Lab Experiments**

- Uttar Pradesh Higher Education Digital Library:  
<http://heecontent.upsdc.gov.in/Home.aspx>
- Swayam Prabha-DTH Channel: <https://www.swayamprabha.gov.in/index.php/home>
- <https://bop-iitk.vlabs.ac.in/exp/carey-foster-bridge/>
- <https://vlab.amrita.edu/index.php?sub=1&brch=192&sim=859&cnt=1>
- <https://vlab.amrita.edu/>
- <http://vlabs.iitkgp.ac.in/be/#>
- [https://phet.colorado.edu/sims/html/ohms-law/latest/ohms-law\\_en.html](https://phet.colorado.edu/sims/html/ohms-law/latest/ohms-law_en.html)
- [https://phet.colorado.edu/sims/html/circuit-construction-kit-dc-virtual-lab/latest/circuit-construction-kit-dc-virtual-lab\\_en.html](https://phet.colorado.edu/sims/html/circuit-construction-kit-dc-virtual-lab/latest/circuit-construction-kit-dc-virtual-lab_en.html)
- [https://phet.colorado.edu/sims/html/circuit-construction-kit-dc/latest/circuit-construction-kit-dc\\_en.html](https://phet.colorado.edu/sims/html/circuit-construction-kit-dc/latest/circuit-construction-kit-dc_en.html)

**Suggested OJT/Internship/Training/Skill partner: Institution**

**Suggested Continuous Internal Evaluation (CIE) Methods:**

**Assessment Criteria for Outcomes: Theory/MCQ/Practical/Project/Viva**

**Theory:** Test / Quiz / Assignment / Seminar/ Class Interaction.

**Practical:** Record File (depending upon the no. of experiments performed out of the total assigned experiments)/ Viva Voce/ Class Interaction

**Course Prerequisites:** To study this course, a student must have the subject: Physics in 12<sup>th</sup> / Mathematics in 12<sup>th</sup> / Chemistry in 12<sup>th</sup>.

**Suggested equivalent online Courses**

1. Swayam - Government of India, <https://swayam.gov.in/>
2. National Programme on Technology Enhanced Learning (NPTEL), <https://nptel.ac.in/course.html>

**Any remarks/ Suggestions**

The institution may add/modify the experiments of the same standard in the paper.

Books published in Hindi & other Reference/Text Books may be added to this list by individual institutes.

Other Digital Platforms/Web Links and Equivalent Online Courses may be added by individual institutes.

---