

**Information Booklet cum Syllabus**  
**Of**  
**Certificate Course in Design and Manufacturing**  
**of Transformer**



**National Institute of Electronics and Information Technology**

An Autonomous Scientific Society under  
Ministry of Electronics and Information Technology, Government of India

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**1. About Course**

The transformer in the simplest way can be described as a thing that steps up or steps down voltage. In a step-up transformer, the output voltage is increased and in a step-down transformer, the output voltage is decreased. The step-up transformer will decrease the output current and the step-down transformer will increase the output current for keeping the input and the output power of the system equal.

**2. NIELIT**

National Institute of Electronics and Information Technology, NIELIT, (Erstwhile DOEACC Society) is an autonomous scientific society of the Ministry of Electronics & Information Technology, Government of India. The Society is registered under the Societies Registration Act, 1860. NIELIT was set up to carry out Human Resource Development and related activities in the area of Information, Electronics & Communications Technology (IECT). NIELIT is engaged both in Formal & Non-Formal Education in the areas of IECT besides development of industry-oriented quality education and training programs in the state-of-the-art areas. NIELIT has endeavored to establish standards to be the country's premier institution for Examination and Certification in the field of IECT. It is also one of the National Examination Body, which accredits institutes/organizations for conducting courses in IT and Electronics in the non-formal sector.

**3. Objective of Course**

The objective of this course is to impart to the candidate the knowledge of designing and manufacturing technique of low power Transformer. The course covers the topic such as working principle of transformer, design strategy, testing and basics of manufacturing technique including, the application prospective of Low power transformer.

After completing this course, the incumbent will be able to:

- Understand the working of transformer.
- Types of transformer.
- Design methodology
- Testing, and
- Manufacturing technique of transformer.

**4. Job Roles of Course**

After successful completion of the course the candidates shall be employed in the industries for following occupations:

- Manufacturing of transformer
- Testing of transformer
- Self-employment

**5. Eligibility**

10+2/Diploma in any stream

**6. Total duration of the Course**

30 Hours (Theory: 10 hours, Practical/Tutorial: 20hours)

## 7. Course Details

### 7.1.Course Outline and Objective of Each Unit

S. No.	Unit Name	Duration (Theory) in Hours	Duration (Practical) in Hours	Total Learning Hours	Learning Objectives
1.	Introduction to electrical quantity, AC voltage and current, DC voltage and current, Resistance, conductance, resistivity / conductivity. Ohms Law, KVL and KCL, Power in DC and AC circuits, Concept of power factor.	02	01	03	After completing this unit, Learner will be able to <ul style="list-style-type: none"> <li>• Measurement of AC Voltage and Current</li> <li>• Measurement of DC Voltage and Current</li> <li>• Measurement of resistance.</li> </ul>
2.	Introduction to measuring Devices. Measurement of voltage, current and resistance using Digital Multimeter	01	02	03	After completing this unit, Learner will be able to measure various electrical quantities with the help of: <ul style="list-style-type: none"> <li>• Oscilloscope,</li> <li>• Multimeter</li> </ul>
3.	Introduction, Hysteresis loss, Induced EMF and Eddy Current, Turn Ratio, Transformer on Load, Equivalent Circuit. Power Handling Capacity of transformer, losses in transformer, winding utilization factor	02	1	03	After completing this unit, Learner will be able to: <ul style="list-style-type: none"> <li>• Connect the transformer to the load and check its performance on varying load conditions.</li> <li>• Power measurement of transformer/ measuring power rating</li> </ul>

	, transformer polarities and dot convention				
4.	Introduction to transformer winding machine. Identification of components for transformer design.	01	02	03	After completing this unit, Learner will be able to <ul style="list-style-type: none"> <li>• Understand the concept of transformer winding machine.</li> <li>• Identification of component and their specifications for design of transformer.</li> </ul>
5.	Introduction to design and manufacturing technique, Design of low frequency transformer, design principle of High frequency transformer, Manufacturing process of transformer.	02	01	03	After completing this unit, Learner will be able to: <ul style="list-style-type: none"> <li>• Design strategy/ Steps involved in design of Low Power Transformer.</li> <li>• Designing low power transformer for a given specification.</li> </ul>
6.	Insulated cores, different types of core materials, core shapes, iron core, ferrite core, and winding enclosure material. Insulation system used in transformer, type of insulating material,	02	01	03	After completing this unit, Learner will be able to <ul style="list-style-type: none"> <li>• Identify the Transformer core and its types.</li> <li>• Select the appropriate type of core for a given Spec. of Transformer.</li> <li>• Identification of insulating material.</li> </ul>
7.	Introduction to transformer testing , routine	02	01	03	After completing this unit, Learner will be

	test , electrical test , type test , test for mechanical robustness				able to perform various test on Transformer like: <ul style="list-style-type: none"> <li>• Polarity Test</li> <li>• No load test</li> <li>• Short circuit Test</li> <li>• Full load test</li> </ul>
8.	Design, Assembling and Verification of transformer for following rating: 1.Input Voltage 230V±10%, 50Hzs 2.Output Voltage 0-6V/100mA Efficiency 75%	01	02	03	After completing this unit, Learner will be able to <ul style="list-style-type: none"> <li>• Design of transformer for given Spec.</li> </ul>
9.	Design , Assembling and Verification of transformer for following rating: 1-Input Voltage 230V±10%, 50Hzs 2-Output Voltage 9-0-9V/500mA 3- Efficiency 75%	01	02	03	After completing this unit, Learner will be able to <ul style="list-style-type: none"> <li>• Design and realization of low power transformer for given Spec.</li> </ul>
10.	Quality and Performance Testing of transformer for 1. No load test 2. Short circuit test 3-Full load test	01	02	03	After completing this unit, Learner will be able to perform various test on a given Transformer to evaluate its performance.
<b>Grand Total</b>		<b>15</b>	<b>15</b>	<b>30</b>	

**7.2.Detailed Syllabus**

<b>Unit Name</b>	<b>Contents</b>	<b>Hrs.</b>
UNIT-01	Introduction to electrical quantity, AC voltage and current, DC voltage and current, Resistance, conductance, resistivity / conductivity. Ohms Law, KVL and KCL, Power in DC and AC circuits, Concept of power factor.	03
UNIT-02	Introduction to measuring Devices. Measurement of voltage, current and resistance using Digital Multimeter	03
UNIT-03	Introduction, Hysteresis loss, Induced EMF and Eddy Current, Turn Ratio, Transformer on Load, Equivalent Circuit. Power Handling Capacity of transformer, losses in transformer, winding utilization factor, transformer polarities and dot convention	03
UNIT-04	Introduction to transformer winding machine. Identification of components for transformer design.	03
UNIT-05	Introduction to design and manufacturing technique, Design of low frequency transformer, design principle of High frequency transformer, Manufacturing process of transformer	03
UNIT-06	Insulated cores, different types of core materials, core shapes, iron core, ferrite core, and winding enclosure material. Insulation system used in transformer, type of insulating material,	03
UNIT-07	Introduction to transformer testing, routine test, electrical test, type test, test for mechanical robustness	03
UNIT-08	Design, Assembling and Verification of transformer for following rating: Input Voltage 230V±10%, 50Hzs Output Voltage 0-6V/100mA Efficiency 75%	03
UNIT-09	Design, Assembling and Verification of transformer for following rating: 1-Input Voltage 230V±10%, 50Hzs 2-Output Voltage 9-0-9V/500mA 3- Efficiency 75%	03
UNIT-10	Quality and Performance Testing of transformer for 1. No load test 2. Short circuit test 3-Full load test Steps to connect to the database	03
<b>Total</b>		<b>30</b>

**8. Reference Books/Study Material**

- Electrical Machinery – Khanna Publication – P.S.Bimbhra



## 9. Practical Assignments

<b><u>Assignment 1.</u></b>	<b>UNIT-01</b> 1. Measurement of AC voltage DC voltage using digital multimeter. 2. Measurement of AC current and DC current using digital multimeter. 3. To read the Ohmic value of resistor by color code and verifying the same with digital multimeter.
<b><u>Assignment 2.</u></b>	<b>UNILT-02</b> 1-Measurement of peak value and peak to peak value of periodic electrical quantity (voltage) with the help of oscilloscope. 2-Measurement of time period and frequency of periodic quantity using oscilloscope.
<b><u>Assignment 3.</u></b>	<b>UNILT-03</b> 1-Measurement of output voltage on no load of a transformer. 2- Measurement of output current of transformer under a given load condition .
<b><u>Assignment 4.</u></b>	<b>UNILT-04</b> 1-To Identify parts of transformer winding machine. .
<b><u>Assignment 5.</u></b>	<b>UNIT-05</b> 1. Design a Step-down transformer for given specification
<b><u>Assignment 6.</u></b>	<b>UNIT-06</b> 1-Identify the Transformer core and its types. 2-Identification of insulating material
<b><u>Assignment 7.</u></b>	<b>Unit-07</b> Design, Assembling and Verification of transformer for following rating: 1. Input Voltage 230V±10%, 50Hzs 2.Output Voltage 0-6V/100mA Efficiency 75%
<b><u>Assignment 8.</u></b>	<b>UNIT-08</b> Design , Assembling and Verification of transformer for following rating: 1-Input Voltage 230V±10%, 50Hzs 2-Output Voltage 9-0-9V/500mA 1. 3- Efficiency 75%
<b><u>Assignment 9.</u></b>	<b>UNIT-09</b> Test the transformer for following: 1-No load test 2-Short circuit test3-Full load test