Electronic Product Testing

CREDIT DISTRIBUTION, ELIGIBILITY AND PREREQUISITES OF THE COURSE

Course title& Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (if any)
		Lecture	Tutorial	Practical/ Practice		
Electronic Product Testing	2	0	0	2	Class XII	NIL

Course Learning Objectives

The Learning Objectives of the course are as follows:

- To enable students for testing of various electronic and electrical components and instruments such as diode, transistor, transformer, switches, fuses, cables, CRO, multimeters, voltmeter, ammeters etc.
- To give an insight upon the SMD and its soldering and de-soldering, EDS.
- To help students to have insight knowledge of SMPS, UPS and batteries along with maintenance of consumer electronics gadgets like computers, Audio Amplifiers, Induction Top, Solar Panel etc.
- To enhance their capabilities of assembling, fault diagnosis and rectification in a systematic way. To enrich students about reliability and quality control standards of equipment.

Course Learning Outcomes

After studying this course, the student will be able to:

- Test different types of electronic and electrical components and instruments.
- Practice soldering and de-soldering processes with correct methods.
- Testing of SMPS, UPS, Inverters and batteries.
- Identify faults in consumer electronics gadgets such as audio amplifiers, computers, Induction top, Microwave, solar panel.

Syllabus

Practical

Unit 1 : Introduction **16 hours**

Overview of Basic Measuring Instruments: CROs, Multimeter, Power supplies, LCR meter, Signal Generator and Power Analyzer.

Testing of various Devices: a) Semiconductor Devices: Single and Two junction Devices, Thyristor b) Electrical Devices: Transformers, relays, switches and fuses, cables and connectors, Batteries, Idea about ICs, PCBs, Sensors.

Unit II : Soldering and Power Sources **16 hours**

Basics of soldering: Soldering tools and materials (solder, flux), Types of soldering irons (Wattage, temperature, Tips), Soldering/ disordering station. Concept of ESD (Electrostatic discharge). The SMD (surface mounted Devices) and its soldering and de-soldering

Basics of SMPS (Switch Mode Power Supply), UPS (Uninterrupted power supply), batteries and Inverters along with their block diagram and Pin configuration of some important ICs used in it. Touch current and touch voltage.

Unit III : Appliance Testing and Computer Assembling **12 hours**

Testing of Induction cook Top, microwave, Solar panel; Installation and Requirements, stand alone and Grid connected PV system.
Basics of computer assembling and testing. Brief description about its specifications and costing Factors.

Unit IV : Reliability and Quality Standards **16 hours**
Concept of Reliability: Scope, objectives and factors influencing equipment effectiveness, Acceptance Testing, Type Testing , Safety Testing, Identification of legends, symbols, color codes, Safety, safety standards, safety certificates (CE, UL and VDE), General awareness of quality standards, quality management systems &documentation, Idea of ISO 17025, ISO 9001,Calibration and Uncertainty of measurements, Effect of environmental testing(refer to IEC60068-1 for guidance), Awareness on disposal of Electronic waste

Exercises

1. An overview of testing of basic electronic / electrical components (BNC cable, switches and fuses, Capacitors, Inductors, Transformers, Relays, diodes, transistor, Thyristor, IC, Potentiometer etc.); Design a curve tracer on CRO for component testing.
2. Control the intensity and color of bi-Color LED with the help of POT, SPDT switch and 9V battery.
3. Soldering and De-soldering processes; SMD
4. Safety testing of SMPS (Applicable Standard: IS 14886.
    a. Safety Testing (Earth Leakage current Test, Dielectric Test, Short Circuit Protection)
    b. Performance Testing (Line Regulation, Load Regulation for a variation of Load Min to Max load and vice versa, Efficiency at nominal input and rated load)
5. Tubular Batteries (Applicable standard: IS 1651) Test for Capacity, Test for voltage during discharge
6. Personal Computer (Applicable Standard: IS 14896)
    a. Safety Testing (Earth Leakage current Test, Dielectric Test) Performance Testing (Microprocessor used,
    b. RAM expansion Capacity, Clock Rate and RAM Capacity, Effect of Power Supply variations)
7. Invertor (Applicable Standard: IS 13314)
    a. Visual Inspection, High Voltage Test, Insulation Resistance Test, No –Load Test, Output Test

8. UPS (Applicable Standard: IEC 62040-3)
    a. Steady State Input Voltage Tolerance, Output-Normal Mode – No Load, Output-Normal Mode – Full Load, Output-Stored Energy Mode – No Load, Output- Stored Energy Mode – Full Load, Output-Normal Mode – Over Load, Output-Stored Energy Mode – Over Load Output-Normal Mode – Short Circuit, Output- Stored Energy Mode – Short Circuit, Efficiency and Input Power factor
9. Audio Amplifier (Applicable Standard: IEC 60065)
    a. Audio frequency response at various power levels, Response to various inputs sources like DVD player, IPOD, CD player, etc., audio output power, Power Consumption, Voltage range
10. Solar Panel system: Testing and Efficiency

Suggested Readings

- Nutan Kala Joshi and Swati Nagpal, Basic Electronics with Simulations and Experiments, Khanna Publishers (2021)
- Jesting Yong, Testing Electronic Components (2007)
- Mark de Vinck, Make Getting Started with Soldering; A Hands-on Guide to Making Electrical and Mechanical Connections, Maker Media (2017)
- Mike Judd and Keith Brindley, Soldering in Electronics Assembly, Second Edition, Elsevier (1999)
- Jestine Yong, Troubleshooting Repairing Switch Mode Power Supplies (1995)
- David Griffith, Uninterruptible Power Supplies, CRC Press (1989)
- Thomas Reddy, Lindens Handbook of Batteries, 4th Edition, McGraw Hill
- Kevin Wilson, Essentials Computer Hardware; The Illustrated Guide to Understanding Computer Hardware, Elluminet Press (2018)
- N.S. Reddy, PC Hardware Maintenance and Troubleshooting, NEO Publishing House (2016)
- Handbook of Induction Heating Second Edition Valery Rudnev, Don Loveless, Raymond L. Cook, CRC Press Taylor & Francis Group (2017)
- R. G. Gupta, Audio and Video systems, Tata McGraw Hill (2004)
- A.R. Jha, Solar Cell Technology and Applications, CRC Press (2009)
- Statistical Applications in Process Control (Quality and Reliability), J. Bert Keats, Douglas C. Montgomery, CRC Press (1996)
- Reliability and Quality Management , Ankitsandilya (Author), R.C.Mishra , New Age International Private Limited. (2009)
- E-Waste Management Challenges and Opportunities in India, Varsha Bhaga Ganguly, Routledge India (2021)

Examination scheme and mode:

Evaluation scheme and mode will be as per the guidelines notified by the University of Delhi.