ESDM Courses

Repair & Maintenance of Power Supply, Inverter & UPS (NIELIT/ESSCI/TSSC)

Level Code:	L3	Vertical Name:	Industrial Electronics

Course ID:	NL/S/L3/C003 EL/S/L3/C022 TL/S/L3.C033	Course Name:	2.6.2 Repair & Maintenance of Power Supply, Inverter & UPS (NIELIT/ESSCI/TSSC)

Objective of the Course:

This course has been designed to provide knowledge of repair and maintenance of Power Supply, Inverter and UPS. The participant will be able to troubleshoot problems of CVT, Inverter and UPS

Learning Outcomes:

At the end of the course the participants will be having knowledge of:-

- Electrical and Electronics Component
- UPS parts and repair
- Inverter, CVT and its operation, parts and installation
- Tools and Equipment used in Repair and Maintenance of Inverter, UPS etc.
- Troubleshooting Techniques

Expected Job Roles:

Inverter Repair Technician, UPS Repair Technician, Power Supplies Repair Technician

Duration of the Course (in hours)	350
Minimum Eligibility Criteria and pre-requisites, if any	10^{th} Pass/ITI

Professional Knowledge:

The individual on the job needs to know and understand:

PK1. Knowledge of Electronic and Electrical Components
PK2. Resistors, Capacitors and Inductors, their identification, types and application
PK3. Protection equipment (anti-static wrist bands, shoes, dress, packaging, and other appropriate insulations) that are required to be used
PK4. First aid requirements in case of electrical shocks, cuts and other common injuries
PK5. Soldering and De-Soldering Techniques
PK5. Need of stabilizer, working principle, types of stabilizer
PK6.
PK7. Constant Voltage transformer, General Circuit diagram of CVT, Working principle of CVT
PK8. EMI/RFI filter, Surge Suppressor, Repairing of CVT
PK9. Introduction to Inverter, Block diagram of Inverter
PK10. UPS, Working principle, specifications, explanation with the help of block diagram
PK11. Find the total Load and Select suitable Inverter/UPS
PK12. Range of tools and testing equipment available and their functionality
PK13. Construction of Battery, Case Cover plates, Separator, Cells, Electrolyte, etc
PK14. Factor affecting charging, Cause of battery failure, diagnosis and testing, visual inspection, Heavy load test
PK15. Standard fault-finding (troubleshooting) techniques
PK16. Component testing methods
PK17. Troubleshooting through circuit diagram
Removal and Replacement of faulty Component

Professional Skill:

The individual on the job needs to know and understand:

Electrical and Electronic Component Identification and Use Skills

PS1. Understand use of Electrical Component such as cable, switches, transformers etc.

PS2. Understand use of Electronics Component such as Diodes, Transistors, ICs etc.

PS3. Use of Test and Measurement Equipment

Soldering skills

PS4. Understand Soldering Requirements

PS5. Operation of Equipment required for Soldering

PS6. Use of Desoldering Pump

Stabilizer and CVT Repairing Skill

PS7. Working principle, types of stabilizer

PS8. Transformer employed in stabilizer, multiwinding/multitaped transformer

PS9. Understanding General Circuit diagram of CVT, Working principle of CVT

PS10. Finding fault in Stabilizer and CVT

PS11. Replace faulty components in Stabilizer and CVT

Inverter and UPS Repairing Skill

PS12. Working principle of Inverter and UPS

PS13. Working Principle of Rectifier

PS14. Finding fault in Inverter and UPS

Replace faulty components in Inverter and UPS

Troubleshooting Skills

PS15. How to approach a defect

PS16. Make use of standard OEM specified troubleshooting steps

PS17. Interpret intermediate results and progress fault rectification accordingly

PS18. Utilize appropriate tools to rectify faults

Core Skill:

The individual on the job needs to know and understand how to:

Reading skills

CS1. Read and understand technical manuals, work orders and reports

CS2. Read and understand organizational health and safety instructions

Writing Skills

CS3. Fill up record sheets clearly, concisely and accurately as per company procedures

Communication Skills

CS4. Clearly communicate relevant information to supervisors

CS5. Respond appropriately to queries

CS6. Communicate with customer/customer facing teams to understand handset performance issues

CS7. Communicate in the local language

CS8. Convey proposed solution to the customers

Time Management Skills

CS9. Prioritize and execute tasks in a high-pressure environment

CS10. Use and maintain resources efficiently and effectively

Analytical Skills

CS11. Analyse (and understand) customer complaints

CS12. Interpret reports, readings and numerical data

CS13. Keep up to date with new technology and performance issues

Other Skills

CS14. Create and maintain effective working relationships and team environment through collaboration

CS15. Take initiatives and progressively assume increased responsibilities

CS16. Share knowledge with other team members and colleagues

Detailed Syllabus of Course

Sl. No.	Modules	Min: No. of Hours
		Theory/ Practical
1.	Introduction to Electricity Electric Charge, Voltage, Electric Current Ohm's Law, Electric Potential, Cell Serial and Parallel Circuit, their effect on Voltage and Current Transformer, Use and Operation	5 / 5
2.	Electronic and Electrical components Active and Passive Components	15 / 15

	Resistors, Capacitors and Inductors, their identification, types and application Semiconducting Devices: Diodes, its type, characteristics and applications Transistors, Integrated Circuits Study of a transistor, use of a transistor as an amplifier and as a switch. Analog ICs, 555 timer, IC741, characteristics of 741 Digital ICs, ICs for logic gates, Truth table verification of logic gates Connectors Fuse, types, Use of Fuses and its rating Relays and Switches Panel Components Digital electronics – gates and its application, multiplexers, de-multiplexers, counter	
3.	Soldering/ de- soldering techniques Soldering Iron, Soldering wire, Soldering Flux, Soldering method, Zero defect soldering Desoldering pump, Temperature controlled soldering station, Hands-on-practices of Soldering)	10 / 10
4.	Tools and equipment use for Repairing and maintenance of Electrical Equipment Screw Driver Set Tweezers, Different Types of Tweezers, Nose Pliers, Wire Cutter Hot air gun Liquid solder pest, Magnifying Lamp and Measuring Tools Brush, CRO, Nipper Test and Measurement Equipment, Multimeter Operation etc.	10 / 10
5.	Stabilizer and CVT Need of stabilizer, working principle, types of stabilizer Autocut and automatic stabilizer, Servo Stabilizer, Study of Control Circuit of Stabilizer Transformer employed in stabilizer, multiwinding/multitaped transformer Introduction to Constant Voltage transformer, General Circuit diagram of CVT, Working principle of CVT EMI/RFI filter, Surge Suppressor, Repairing of CVT	20 / 30
6.	Inverter and UPS Introduction to Inverter, Block diagram of Inverter Rectifier, its type and working principle, PIV of Diode, Filter employed in rectifier	20 / 30

	Battery charger circuit, working of Inverter Oscillator, type of Oscillator, Square wave Generator PWM, DC to AC Convertor/Invertor, Designing an investor, Circuit using PWM UPS, Working principle, specifications, explanation with the help of block diagram UPS Installation Find the total Load and Select suitable Inverter/UPS	
7.	Battery Battery types, Primary Cell, Secondary Cell, Wet- charged, Dry-charged, Low maintenance Construction of Battery, Case Cover plates, Separator, Cells, Electrolyte, etc Lead Acid battery, Electrochemical reaction, N1-CD battery, Capacity rating, CCA, RC, AH & Power(watt) Factor affecting charging, Cause of battery failure, diagnosis and testing, visual inspection, Heavy load test	10 / 20
8.	Troubleshooting techniques Basic troubleshooting method, Getting into troubleshooting, selected instruments for troubleshooting Component testing methods, Testing of components in circuits , Logical steps of fault finding, Troubleshooting through circuit diagram Removal and Replacement of faulty component	40 / 60
9.	Safety and Security Procedures Reporting incidents, system failures, power failures etc., protection equipment First aid requirement in case of electrical shocks and other injuries	5 / 5
10.	Reading, Writing and Communication Skills Understanding Technical Manuals, Reports, Work orders etc. Understanding Organizational health and safety instructions Types of documentation in organization, their importance, Company guidelines and norms, activities after maintenance process Spare management, Service Level Agreements (SLAs) Fill-up forms, record sheets, log book etc. as per company procedures Customer Communication, Convey proposed solution to the customer, responding queries Communication with supervisor, Report for unresolved problems Time Management and Team Skills	15 /15

Total Theory / Lecture Hours:	150 hrs
Total Practical / Tutorial Hours:	200 hr
Total Hours:	350 hrs

Recommended Hardware:

For a batch size of 50Nos

1. Resistance of different value and Wattage ratings 20 nos. each
2. Capacitor of different types 20 nos. each
3. Transistors – BC 546, BC 547, SL 100, 2N3055 10 nos. each
4. Rectifier Diode 20 Nos.
5. Zener Diode of different values 10 nos. each
6. Step down Transformers of different ratings 04 nos. each
7. LED of different colours 20 nos. each
8. 3 Pin Voltage Regulators 05 nos. each
9. Logic GATE ICs 10 nos. each
10. Tool Kit 05 sets
11. Digital Multimeter 05 nos.
12. CRO 02 nos.
13. Soldering Iron 05 nos.
14. Solder Wire 250 gms
15. Soldering Flux 100 gms.
16. Microwatt Soldering Iron 02 nos
17. Desoldering Station 02 nos.
18. Desoldering Pump 05 nos.
19. Inverter 2 set
20. UPS 2 set
21. Stabilizer/CVT 5 nos
22. Battery Charger 1 No.

Recommended Software:

NA

Text Books:

1. Basic Electronics - Repair & Maintenance of Power supply, Invertor & UPS – NIMI Published by National Instructional Media Institute, Chennai
2. Switching Power Supply Design, 3rd Ed. by Abraham Pressman (Author),
3. Uninterruptible Power Supplies Alexander King, William Knight McGraw Hill Professional

Reference Books:

- user/service manuals

ESDM Courses

Post Diploma in Repair & Maintenance of Hospital Equipment (NIELIT)

Level Code:	L5	Vertical Name:	Medical Electronics
Course ID:	NL/S/L5/C008	Course Name:	2.10.4 Post Diploma in Repair & Maintenance of Hospital Equipment (NIELIT)

Objective of the Course:

Have knowledge about the various devices used in medical field.
Have an awareness of the safety aspects of medical instruments.
Understand the basics of how the signals are obtained from the body that is to be measured by various machines.

Learning Outcomes:

Have knowledge about various devices used in medical field
Have the basic understanding of how the signals are obtained from the body
Be aware of the safety aspects in this field.

Expected Job Roles:

Operation & Maintenance of Hospital Equipment

Duration of the Course (in hours)	400 Hours
Minimum Eligibility Criteria	Diploma/B.Sc

and pre-requisites, if any

Professional Knowledge:

a) Basic knowledge regarding ECG electrodes
b) ECG working, Waveform generation.
c) Calibration and testing Of ECG Equipment
d) Working principles of Analytical Instrument.
e) Working and analysis of pH meter
f) Basics of diagnostic equipment.
g) Diagnostics Technique and various physiology system

Professional Skill:

a) Have knowledge of working of microscope, standard Procedure,
b) Have understanding about the terms and definition like pH meter ,pH value, basics of chemistry
c) Have basic understanding of human Physiology, and various human systems.
d) Basics of bioelectric Potentials and measurements in human body

Core Skill:

a) Basic understanding and co-ordinating skills.
b) Basic Numeracy and co-ordination.
c) Should have a strong determination and curiosity to learn new things
d) Adaptable with the environment.
e) Should have understanding and adaptability with new concepts.
f) Blending with the technical aspects.

Detailed Syllabus of Course

Module. No	Modules	Minimum No. of Hours
1.	Basic Block of Biomedical Equipment	30
2.	ECG Machine and analytical	30

3.	Diagnostic Equipment	30
4.	Biomedical instrumentation	30
5.	Hands on Experience	200
6	Soft Skills	30
	Total Hours:	350

Recommended Hardware:	
Recommended Software:	
Text Books:	
Reference Books:	