



GOVERNMENT OF TAMILNADU

DIRECTORATE OF TECHNICAL EDUCATION, CHENNAI-25

STATE PROJECT COORDINATION UNIT

(Established under Canada India Institutional Cooperation Project)

CURRICULUM

Course Name	UPS SERVICING AND MAINTENANCE
Course Code	EC/2020/001
Course Duration	60 Hours
Minimum Eligibility Criteria	10 th /+2/ITI/Diploma/Graduate
Pre-requisites (if any)	-
Course Objectives	<p>Training module has been designed for the participants to</p> <ul style="list-style-type: none"> Acquire knowledge about components and Types of Uninterrupted Power Supply (UPS). Learn the Inspection, Testing of UPS functions and Practice the Installation of UPS and Its Accessories. Learn the Concept of Earthing, startup and maintenance of UPS system. Acquire knowledge about Test and maintenance of storage batteries.
Course Outcomes	<p>At the end of training, the trainees will be able to</p> <ul style="list-style-type: none"> Identify the components in the Uninterruptible Power Supply (UPS) Explain the functionalities and operations of each component of UPS Perform installation, testing and maintenance of UPS System including storage Batteries. Repair and Diagnose the Problem of all kinds of faults in Inverter, UPS and rectify the faults using tools and equipment.
Expected Job Roles	UPS Service Engineer

TEACHING AND SCHEME OF EXAMINATION

Course Code	Course Name	Hours		Assessment Marks		Duration of Examination
				Min	Max	
EC/2020/001	UPS SERVICING AND MAINTENANCE	Theory	24	10	20	3 Hours
		Practical	36	40	80	
		Total	60	50	100	

EC/2020/001 - UPS SERVICING AND MAINTENANCE

DETAILED SYLLABUS

Unit No	Modules	No.of.Hours	
		Theory	Practical
I	Introduction to UPS	15 Hours	
1.1	Block diagram of UPS, Definition of Rectifier, Battery, Inverter, Static Bypass	10	05
1.2	Types of UPS – Online & OFF line		
1.3	Types of Batteries – Leas Acid, VRLA SMF, Nickel Cadmium, Lithium ion		
1.4	Selection of UPS capacity, Pre-installation checklist, Suitable rom preparation as per UPS GA diagram		
1.5	Understanding of Single Line Diagram		
1.6	Input/Output cable sizing , Input/Output Breaker sizing		
1.7	Ensure ventilation and require service space, Soldering and De-soldering techniques		
1.8	Tools and Equipments required for servicing and Maintenance works		
II	UPS Inspection and Testing	15 Hours	
2.1	Practical: Inspection: Visual checkup of PCBs, Resistors, Inductors, Capacitors & Transformers.	05	10
2.2	Practical: To check the transportation damage, To check the power cable tightness & insulation quality.		
2.3	Practical: To check the control cable connectors tightness and soldering quality, Check the battery capacity as per sizing.		
2.4	Testing of Power supply Unit - Checking of control points measurements.		
2.5	Practical: Checking the Overload, Short circuit, Under voltage, Overvoltage test		
2.6	Practical: Checking of Battery series connection, Verification of battery interlink connection.		

III	Installation of UPS	20 Hours	
3.1	Ensuring the UPS/Battery Positioning as per the standard layout	05	15
3.2	Conforming the cable sizing and breaker sizing		
3.3	Practical: Testing the power supply (Voltage, Hz, Phase sequence), Checking the individual open cell voltage of batteries		
3.4	Practical: Checking of Water level, Checking the Earthing healthiness by megger, Neutral to Earthing value check		
3.5	UPS Power UP as per OEM procedure, UPS Output voltage configuration as per customer requirement		
3.6	Practical: Battery Float voltage configuration as per battery OEM recommendations, Battery Charging current setting as per battery OEM recommendation.		
IV	Maintenance of UPS	10 Hours	
4.1	Maintain dust free environment in UPS Room, Maintain room temperature to get better battery life	04	06
4.2	Proper Understanding of Do's and Don's		
4.3	Practical: Maintaining proper tools while carrying service activity		
4.4	Practical: Maintain Lockout &Tagout procedure while carrying maintenance activity		
Total Theory and Practical Hours		24	36
Total hours		60	

HARDWARE REQUIREMENT

S.NO	LIST OF TOOLS /EQUIPMENTS
1	UPS
2	Battery
3	Multimeter/Clamp Meter
4	Electrical Tools Set
5	MCB & Cables

SOFTWARE REQUIREMENT

NIL

REFERENCE BOOKS

S.NO	NAME OF THE BOOK	AUTHOR	PUBLISHER
1	Uninterruptible Power Suppliers	John Platts John St.Aubyn	Peter Peregrinus Ltd
2	Uninterruptible Power Suppliers	William Knight Alexander King	The McGraw-Hill Companies
3	Power Electronics Handbook	F.F. Mazada	Elsevier
4	Converters, Applications & design	Nedmohn, Tore M. Undeland, Riobbins	John Wiley & Sons, 2003
5	Power Electronics	P.S Bhimbra	P.S Bhimbra
6	Power Electronics Circuits, Devices and Applications	M.H. Rashid	Prentice Hall, 1993
7	Power Electronics	MD Singh K.B Khanchandani	Tata Mcgraw-Hill Publishing Company Limited, 1998

ASSESSMENT AND CERTIFICATION

S.No	Criteria for assessment
1.	A trainee will be assessed based on the performance in End Examination for Theory and Practical conducted internally in the CIICP Project Polytechnic College for a duration of 3 hours
2.	A trainee must have 75% of attendance to appear for End examination in Theory and Practical.
3.	The assessment for theory part will be based on the marks scored in the end examination on the knowledge bank of questions (1 word/objective type questions)
4.	The assessment for practical part will be based on the marks scored in the end examination conducted by the CIICP Project Polytechnic and assessed by the Examiners approved by Strategic Plan Implementation Committee (SPIC) of the project polytechnic.
5.	The passing criteria for successful completion of training is every trainee should score 50% of marks in theory and practical examination.
6.	On successful completion of training, certificate will be issued to the participants by the Directorate of Technical Education through the Project Polytechnics.

END EXAMINATION

ALLOCATION OF MARKS

S.NO	Description	Max. Marks
1.	Theory Examination	20
2.	Practical Examination	
	a) Objective and Circuit Diagram	20
	b) Procedure and Connections / Execution	20
	c) Result and Viva	20
	d) Record	20
Total Marks		100

THEORY MODEL QUESTION PAPER

EC/2020/001 - UPS SERVICING AND MAINTENANCE

(Maximum Marks: 20)

(N.B: Answer any Twenty questions)

20x1= 20 Marks

1. Define UPS.
2. Define Inverter.
3. Define Rectifier.
4. What is the use of battery in UPS?
5. Name the types of UPS.
6. Define Online UPS.
7. Define Offline UPS.
8. Write any two types of batteries.
9. Write the formula for the selection of UPS capacity.
10. Write any four Pre- installation checklist parameters.
11. Write the formula to calculate hydrogen release and room volume.
12. Write the formula to calculate critical volume and time to reach critical level of hydrogen concentration.
13. Write the formula to calculate ventilation rate.
14. Write the formula to calculate fan sizing.
15. Name the component used to assemble any electronic project.
16. Write any two tools used in Industrial UPS maintenance.
17. Name the tests used to verify the state of battery charge.
18. Name the instrument used to measure specific gravity of liquid against that of water.
19. Draw the wiring diagram of 4 batteries connected in series with Inverter/UPS.
20. How will you test the open cell voltage of batteries?
21. Write the formula to calculate output voltage accuracy.
22. How to measure ac voltage?
23. How will you extend UPS battery life?
24. Write the formula to calculate battery charging time.
25. Write the formula to calculate ventilation rate.