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ESDM Syllabus

Syllabi of Courses

for

Roll-out of Skill Development in ESDM sector

Under the "Scheme for Financial assistance to select States/UTs for Skill Development in ESDM sector"

of

Department of Electronics and Information Technology

Ministry of Communications & Information Technology,
Government of India

1 Summary of ESDM Course List from ESSCI/ NIELIT / TSSC

S.No.		L1-2			L3			L4			L5			Total			Vertical Total
		NIELIT	ESSCI*	TSSC*	NIELIT	ESSCI*	TSSC*	NIELIT	ESSCI*	TSSC*	NIELIT	ESSCI*	TSSC*	NIELIT	ESSCI*	TSSC*	
1	Consumer Electronics					1		1	1					1	2	0	3
2	IT/OA (Computers and peripherals)	1				1			1			1		1	3	0	4
3	Telecom Segment						1			4			1	0	0	6	6
4	Components													0	0	0	0
5	Industrial Electronics Segment				1						1			2	0	0	2
6	Medical Electronics Segment				3						1			4	0	0	4
7	Electronic Product Design				1				1					1	1	0	2
8	Communication electronics		2											0	2	0	2
9	Embedded System & VLSI													0	0	0	0
10	E-Waste Management													0	0	0	0
11	Optical Electronics													0	0	0	0
12	Solar Photovoltaic Segment								1					0	1	0	1
	Level per Certifying Agency Total	1	2	0	5	2	1	1	4	4	2	1	1	**9**	**9**	**6**	24
	Level Wise Total	3			7			9			4			24			

* ESSCI and TSSC - As per NSQF Levels

2 ELECTRONICS SECTOR SKILLS COUNCIL OF INDIA(ESSCI)

2.1 Consumer Electronics

ESDM Courses

Level Code:	III	**Vertical Name:**	Consumer Electronics

Course Code:	ELE/Q3102	**Course Name:**	2.1.1 Field Technician – Air conditioner

Objective of the Course:

To train the person, who installs the air conditioner and interacts with customers to diagnose the problem and assess possible causes. Once the problem and causes have been identified, the individual rectifies minor problems or replaces faulty modules for failed parts or recommends factory repairs for bigger faults.

Learning Outcomes:

NOS # ELE/N3101 - Engage with customer for service:

1. Interact with the customer prior to visit
2. Interact with customer at their premises
3. Suggest possible solutions to customer
4. Achieve productivity and quality as per company's norms

NOS # ELE/N3108 - Install Air Conditioner

1. Undertake pre-installation site visit
2. Remove packaging and check accessories
3. Place the air conditioner at identified location
4. Check air conditioner's functioning
5. Complete the documentation
6. Interact with supervisor or superior
7. Achieve productivity and quality as per company's norms

NOS # ELE /N3109 - Repair dysfunctional Air conditioner

1. Understand the symptoms in the air-conditioner and identify the fault
2. Replace dysfunctional module in the air conditioner unit
3. Confirm functionality of the repaired unit
4. Achieve productivity and quality as per company's norms

NOS # ELE/N9901 - Interact with colleagues

1. Interact with supervisor or superior
2. Coordinate with colleagues

Expected Job Roles:

Filed Technician – Air Conditioner

Duration of the Course (in hours)	120 hours
Minimum Eligibility Criteria and pre-requisites, if any	10^{th} Passed

Professional Knowledge:

NOS # ELE/N3101 - Engage with customer for service:

KB1. company's products and recurring problems reported in consumer appliances
KB2. how to communicate with customers in order to put them at ease
KB3. basic electrical and mechanical modules of various appliances
KB4. electronics involved in the type of appliance

Knowledge of the company / organization and its processes

NOS # ELE/N3102 - Install the Air Conditioner

KB1. Installation-site requirements (structural requirements, ventilation, etc.)
KB2. Different types of air conditioners such as window, split, cassette etc.
KB3. different features and functionalities of various models
KB4. safety precautions to be taken while installing

NOS # ELE/N3103 - Repair dysfunctional Air Conditioner

KB1. different types of air conditioners, e.g., window, split air, cassette conditioners and differences in their operation
KB2. features of different air conditioners of the company
KB3. functioning of the appliance and its various modules
KB4. method of air conditioning, its use and functioning of sealed system
KB5. Basics of types of refrigerants such as R12, R22, R134a, R290, R600a, R410, R32 use of different brazing sticks, types of brazing torches and their application
KB6. types of brazing torches, types of fluxes and their application
KB7. basic electronics (knowledge of components such as diode, transformer, LED, photo transistor, capacitor, resistor, inductor, thermisters)
KB8. functioning of various electromechanical parts of the air conditioner

Professional Skill:

1. **Interpersonal skills**
2. **Communication skills**
3. **Behavioural skills**
4. **Reading, writing and computer skills**
5. **Teamwork and multitasking**
6. **Documentation Skills**
7. **Reflective thinking**
8. **Critical Thinking**
9. **Decision Making**

Core Skill:

1. **Air conditioner operation**
2. **Using tools and machines**
3. **Fault diagnosis skills**

Detailed Syllabus of Course

Module. No	Module. Name	Minimum No. of Hours
	As per the NOSs listed in the Qualification pack	
	Total Theory / Lecture Hours:	48
	Total Practical / Tutorial Hours:	72
	Total Hours:	120

Recommended Hardware:	1. Different type of Air conditioner 2. Multi-meter & Oscilloscope 3. Electrical Drill 4. Clamp meter, tube cutter, tube bender, vacuum pump, weigh scale, gas cylinder, temperature meter, pressure gauges
Recommended Software:	NA
Text Books:	NA
Reference Books:	NA

ESDM Courses

Level Code:	IV	**Vertical Name:**	Consumer Electronics

Course Code:	ELE/Q3105	**Course Name:**	2.1.2 Field Engineer - RACW

Objective of the Course:

To train the person, who interacts with customers to install the appliance and diagnose the problem to assess possible causes of malfunction. Once the problem and causes have been identified, the individual rectifies minor problems or replaces faulty modules for failed parts or recommends factory repairs for bigger faults.

Learning Outcomes:

NOS # ELE/N3101 - Engage with customer for service:

1. Interact with the customer prior to visit
2. Interact with customer at their premises
3. Suggest possible solutions to customer
4. Achieve productivity and quality as per company's norms

NOS # ELE/N3112 - Install newly purchased refrigerator

1. Remove packaging and check accessories
2. Place the appliance to appropriate location
3. Check refrigerator's functioning
4. Complete documentation
5. Interact with superior
6. Interact with and train service technicians
7. Achieve productivity and quality as per company's standards

NOS # ELE /N3113 - Attend to service complaints - refrigerator

1. Understand the symptoms and identify the fault
2. Replace dysfunctional module in the refrigerator unit
3. Confirm functionality of the repaired unit

4. Achieve productivity and quality as per company's standards
5. Interact with and train technicians

NOS # ELE /N3114 - Install newly purchased air conditioner

1. Undertake pre-installation site visit
2. Remove packaging and check accessories
3. Place the air conditioner at identified location
4. Check air conditioner's functioning
5. Complete the documentation
6. Interact with supervisor or superior
7. Interact with and train service technicians
8. Achieve productivity and quality as per company's norms

NOS # ELE /N3115 - Attend to service complaints – Air Conditioner

1. Understand the symptoms in the air-conditioner and identify the fault
2. Replace dysfunctional module in the air conditioner unit
3. Confirm functionality of the repaired unit
4. Interact with and train service technicians
5. Achieve productivity and quality as per company's norms

NOS # ELE /N3116 - Install newly purchased washing machine

1. Remove packaging and check accessories
2. Place the washing machine at appropriate location
3. Check washing machine's functioning
4. Complete documentation
5. Interact with superior
6. Interact with and train service technicians
7. Achieve productivity and quality as per company's standards

NOS # ELE /N3117 - Attend to service complaints –washing machine

1. Understand the symptoms and identify the fault
2. Repair the washing machine
3. Confirm functionality of the repaired unit
4. Achieve target as per company's policy
5. Interact with and train service technicians

NOS # ELE/N9901 - Interact with colleagues

1. Interact with supervisor or superior
2. Coordinate with colleagues

Expected Job Roles:

Filed Engineer - RACW

Duration of the Course (in hours)	120 hours
Minimum Eligibility Criteria and pre-requisites, if any	8^{th} Std Passed (Minimum 2 years as helper for 8_{th}/ 9_{th} passed)

Professional Knowledge:

NOS # ELE/N3101 - Engage with customer for service:

KB1. company's products and recurring problems reported in consumer appliances
KB2. how to communicate with customers in order to put them at ease
KB3. basic electrical and mechanical modules of various appliances
KB4. electronics involved in the type of appliance

Knowledge of the company / organization and its processes

NOS # ELE/ NOS # ELE/N3112 - Install newly purchased refrigerator:

KB1. Installation site requirements (structural requirements, ventilation, etc.)
KB2. different types of refrigerators such as traditional, frost-free, Peltier
KB3. different features and functionalities of various models
KB4. safety precautions to be taken while installing
KB5. manual-based procedure of installing the refrigerators
KB6. packaging waste disposal procedures
KB7. use of test equipment and tools such as multi-meter, oscilloscope
KB8. other products of the company

NOS # ELE /N3113 - Attend to service complaints - refrigerator

KB1. different types of refrigerators, e.g., frost free, direct cool and peltier refrigerators and differences in their operation
KB2. features of different refrigerators of the company
KB3. refrigeration cycle and functioning of the appliance and its various modules
KB4. method of refrigeration, its use and functioning of refrigerator sealed system
KB5. types of refrigerants such as R12, R22, R134a, R290, R600a, R410, R32 use of different brazing sticks, types of brazing torches and their application
KB6. types of brazing torches, types of fluxes and their application
KB7. basic electronics (knowledge of components such as diode, transformer, LED, photo transistor, capacitor, resistor, inductor, thermistor, ICs
KB8. functioning of various electromechanical parts of the refrigerator
KB9. fundamentals of electricity such as ohms law, difference between ac and dc, calculation of energy consumption of appliances, understanding of domestic wiring, understanding of series and parallel connections

NOS # ELE /N3114 - Install newly purchased air conditioner

KB1. Installation site requirements (structural requirements, ventilation, etc.)
KB2. different types of air conditioners such as window, split, cassette etc.
KB3. different features and functionalities of various models
KB4. safety precautions to be taken while installing
KB5. manual-based procedure of installing the air conditioner

NOS # ELE /N3115 - Attend to service complaints – Air Conditioner

KB20. Basics of types of refrigerants such as R12, R22, R134a, R290, R600a, R410, R32 use of different brazing sticks, types of brazing torches and their application
KB21. types of brazing torches, types of fluxes and their application
KB22. basic electronics (knowledge of components such as diode, transformer, LED, transistor, capacitor, resistor, inductor, thermistor, ICs
KB23. functioning of various electromechanical parts of the air conditioner
KB24. fundamentals of electricity such as ohms law, difference between ac and dc, calculation of energy consumption of appliances, understanding of domestic wiring, understanding of series and parallel connections
KB25. troubleshooting knowledge with respect to air conditioners
KB26. hazards, their causes and prevention/personal safety
KB27. frequently occurring faults such as poor/no cooling, noisy unit, condensation water over flowing
KB28. components/modules of the air conditioner and their prices
KB29. energy ratings such BEE rating and concepts of e waste

NOS # ELE /N3116 - Install newly purchased washing machine

KB1. installation-site requirements (structural and plumbing requirements)
KB2. different types of washing machines such as front load and top load
KB3. different features and functionalities of various models
KB4. safety precautions to be taken while installing
KB5. manual-based procedure of installing the washing machine

NOS # ELE /N3117 - Attend to service complaints –washing machine

KB7. troubleshooting knowledge with respect to washing machine
KB8. types of switches such as thermal, mechanical, electronic, magnetic, electromagnetic, electromechanical, pressure optical and bimetal
KB9. fundamentals of motors, types of motors and their working methods
KB10. functioning of components and parts such as solenoids and plungers

Professional Skill:

1. **Interpersonal skills**
2. **Communication skills**
3. **Behavioural skills**
4. **Reading, writing and computer skills**
5. **Teamwork and multitasking**
6. **Documentation Skills**
7. **Reflective thinking**
8. **Critical Thinking**
9. **Decision Making**

Core Skill:

1. **Refrigerator operation**
2. **Air conditioner operation**
3. **Using tools and machines**
4. **Fault diagnosis skills**

Detailed Syllabus of Course

Module. No	Module. Name	Minimum No. of Hours
	As per the NOSs listed in the Qualification pack	
	Total Theory / Lecture Hours:	48
	Total Practical / Tutorial Hours:	72
	Total Hours:	120

Recommended Hardware:

1. Different type of Air conditioner
2. Different types of Refrigerator
3. Different types of Washing machine
4. Multi-meter & Oscilloscope
5. Electrical Drill
6. Clamp meter, tube cutter, tube bender, vacuum pump, weigh scale, gas cylinder, temperature meter, pressure gauges

Recommended Software:

NA

Text Books:

NA

Reference Books:

NA

2.2 Communications Electronics

ESDM Courses

Level Code:	II	**Vertical Name:**	Communication Electronics

Course Code:	ELE/Q8101	**Course Name:**	2.2.1 DTH Set-top-box Installer and Service Technician

Objective of the Course:

To train the person who installs the set-top box at customer's premises; addresses the field serviceable complaints and coordinates with the technical team for activation of new connections

Learning Outcomes:

NOS # ELE/N8105 - Install and repair DTH set-top box

1. Collect the customer's site details and carry necessary equipment and products
2. Install the set top box (DTH) at customer's site
3. Provide field service and resolve faults in case of complaint
4. Collect documents and forms filled by customer as per company's policy
5. Achieve productivity and quality targets as prescribed by company

NOS # ELE/N8102 - Comprehend customer's requirement

1. Interact with the customer prior to visit
2. Interact with customer at their premises
3. Suggest possible solutions to customer
4. Achieve productivity and quality as per company's norms

NOS # ELE/N9951 - Interact with other employees

1. Interact with supervisor or superior
2. Coordinate with colleagues

Expected Job Roles:

DTH Setp-top Box Installer and Service Technician

Duration of the Course (in hours)	120 hours

Minimum Eligibility Criteria and pre-requisites, if any	8th Standard Passed

Professional Knowledge:

NOS # ELE/N8101 - Install and repair DTH set-top box

KB1. basics of Geo stationery satellite and Other Communication Satellite
KB2. azimuth, elevation and polarisation
KB3. spectrum utilization
KB4. optimum signal strength/ signal quality for good reception
KB5. basics of input/output functions and block diagram of the set top box
KB6. functions of the set top box and remote control
KB7. structure of cable, parameters and the implications on signal
KB8. basic functioning of tuners
KB9. functioning of Low Noise Block Down Convertor (LNBC)
KB10. basics of digital signals and difference in analogue and digital
KB11. transmission of television signals and functioning of television sets
KB12. specifications of different kind of inputs available on TV sets such as RF, AV, RGB, VGA, USB and HDMI
KB13. digital signal processing chain including CAS and SMS

NOS # ELE/N8102 - Comprehend customer's requirement

KA1. company's policies on: customer care
KA2. company's code of conduct
KA3. organisation culture and typical customer profile
KA4. company's reporting structure
KA5. company's documentation policy

KB1. company's products and recurring problems reported in consumer appliances
KB2. how to communicate with customers in order to put them at ease
KB3. basic electrical and mechanical modules of various products
KB4. electronics involved in the type of product
KB5. models of different appliances and their common and distinguishing features
KB6. etiquette to be followed at customer's premises
KB7. precautions to be taken while handling field calls and dealing with customers
KB8. relevant reference sheets, manuals and documents to carry in the field

NOS # ELE/N9951 - Interact with other employees

KB1. how to communicate effectively
KB2. how to build team coordination

Professional Skill:

i. **Interpersonal skills**
ii. **Communication skills**
iii. **Behavioural skills**
iv. **Reading, writing and computer skills**
v. **Teamwork and multitasking**
vi. Documentation Skills
vii. **Reflective thinking**
viii. Critical Thinking
ix. **Decision Making**

Core Skill:

1. **Installation and Repair Skills**
2. **Using tools and machines**

Detailed Syllabus of Course

Module. No	Module. Name	Minimum No. of Hours
	As per the NOSs listed in the Qualification pack	
	Total Theory / Lecture Hours:	48
	Total Practical / Tutorial Hours:	72
	Total Hours:	120

Recommended Hardware:

1. Set top box
2. Dish
3. Television
4. Drilling machine, satellite meter, multi-meter, Angle meter
5. Lead tester, spanner, cutter
6. RF strength meter, QAM meter

Recommended Software:	NA
Text Books:	NA
Reference Books:	NA

ESDM Courses

Level Code:	II	**Vertical Name:**	Communication Electronics

Course Code:	ELE/Q8102	**Course Name:**	2.2.2 DAS Set-top-box Installer and Service Technician

Objective of the Course:

To train the person who installs the set-top box at customer's premises; addresses the field serviceable complaints and coordinates with the technical team for activation of new connections

Learning Outcomes:

NOS # ELE/N8101 - Install and repair DAS set-top box

1. Collect the customer's site details and carry necessary equipment and products
2. Install the set top box (DAS) at customer's site
3. Provide field service and resolve faults in case of complaint
4. Collect documents and forms filled by customer as per company's policy
5. Achieve productivity and quality targets as prescribed by company

NOS # ELE/N8102 - Comprehend customer's requirement

1. Interact with the customer prior to visit
2. Interact with customer at their premises
3. Suggest possible solutions to customer
4. Achieve productivity and quality as per company's norms

NOS # ELE/N9951 - Interact with other employees

1. Interact with supervisor or superior
2. Coordinate with colleagues

Expected Job Roles:

DAS Setp-top Box Installer and Service Technician

Duration of the Course (in hours)	120 hours

Minimum Eligibility Criteria and pre-requisites, if any	8th Standard Passed

Professional Knowledge:

NOS # ELE/N8101 - Install and repair DAS set-top box

KB1. optimum signal strength/ signal quality for good reception
KB2. basics of input/output functions and block diagram of the set top box
KB3. functions of the set top box and remote control
KB4. structure of cable, parameters and the implications on signal
KB5. basic functioning of tuners
KB6. basics of digital signals and difference in analogue and digital
KB7. transmission of television signals and functioning of television sets
KB8. specifications of different kind of inputs available on TV sets such as RF, AV, RGB, VGA, USB and HDMI
KB9. digital signal processing chain including CAS and SMS
KB10. basics of Digital TV signal distribution through HFC network including elements of fibre, coaxial chain and devices such as nodes, amplifier, taps, splitter, etc., from head ends to input point of consumer premises for DAS
KB11. concepts of modulation, demodulation, encryption, decryption, decoding, signal ingress, cross modulation, tuning, amplifying, coupling, attenuation, equalisation, digitising, etc., and their purposes
KB12. commonly used terms and their meanings such as ECM, EMM, EPG-SDT, MPEG

NOS # ELE/N8102 - Comprehend customer's requirement

KA1. company's policies on: customer care
KA2. company's code of conduct
KA3. organisation culture and typical customer profile
KA4. company's reporting structure
KA5. company's documentation policy

KB1. company's products and recurring problems reported in consumer appliances
KB2. how to communicate with customers in order to put them at ease
KB3. basic electrical and mechanical modules of various products
KB4. electronics involved in the type of product
KB5. models of different appliances and their common and distinguishing features
KB6. etiquette to be followed at customer's premises
KB7. precautions to be taken while handling field calls and dealing with customers
KB8. relevant reference sheets, manuals and documents to carry in the field

NOS # ELE/N9951 - Interact with other employees

KB1. how to communicate effectively
KB2. how to build team coordination

Professional Skill:

i.	**Interpersonal skills**
ii.	**Communication skills**
iii.	**Behavioural skills**
iv.	**Reading, writing and computer skills**
v.	**Teamwork and multitasking**
vi.	**Documentation Skills**
vii.	**Reflective thinking**
viii.	**Critical Thinking**
ix.	**Decision Making**

Core Skill:

1. **Installation and Repair Skills**
2. **Using tools and machines**

Detailed Syllabus of Course

Module. No	**Module. Name**	**Minimum No. of Hours**
	As per the NOSs listed in the Qualification pack	
	Total Theory / Lecture Hours:	48
	Total Practical / Tutorial Hours:	72
	Total Hours:	120

Recommended Hardware:

1. Set top box
2. Television
3. Drilling machine, satellite meter, multi-meter
4. Lead tester, spanner, cutter
5. RF strength meter, QAM meter

Recommended Software:	NA
Text Books:	NA
Reference Books:	NA

2.3 IT Hardware

ESDM Courses

Level Code:	IV	**Vertical Name:**	IT Hardware

Course Code:	ELE/Q4601	**Course Name:**	2.3.1 Field Technician – Computing and Peripherals

Objective of the Course:

To train the person who is responsible for attending to customer complaints, installing newly purchased products, troubleshooting system problems and, configuring peripherals such as printers, scanners and network devices.

Learning Outcomes:

NOS # ELE/N4601 - Engage with customer

1. Interact with the customer prior to visit
2. Understand customer's requirements on visit or prior to visit
3. Suggest possible solutions
4. Complete the documentation
5. Achieve productivity and quality as per company's norms

NOS # ELE/N4602 - Install, configure and setup the system

1. Understand the installation requirement and install the hardware
2. Configure and install the peripherals
3. Check system functionality
4. Set up the software
5. Complete the installation task and report
6. Interact with customer
7. Interact with superior
8. Achieve productivity and quality as per company's norms

NOS # ELE/N4603 - Troubleshoot and replace faulty module

1. Receive and understand the customer complaint registered at customer care
2. Identify system problems on firld visit
3. Replace faulty module after diagnosis
4. Interact with customer
5. Report to Superior

NOS # ELE/N9909 - Coordinate with colleagues and co-workers

1. Interact with supervisor or superior
2. Coordinate with colleagues

Expected Job Roles:

Field Technician - Computing and Peripherals

Duration of the Course (in hours)	120 hours
Minimum Eligibility Criteria and pre-requisites, if any	12th passed

Professional Knowledge:

NOS # ELE/N4601 - Engage with customer

KB1. company's products and recurring problems reported
KB2. how to communicate with customers in order to put them at ease
KB3. basic electronics of system hardware
KB4. hardware maintenance
KB5. functions of electrical and mechanical parts/ modules
KB6. behavioural aspects and etiquette to be followed at customer's premises
KB7. precautions to be taken while handling field calls and dealing with customers
KB8. Relevant reference sheets, manuals and documents to carry in the field

NOS # ELE/N4602 - Install, configure and setup the system

KB1. basic electronics involved in the hardware
KB2. different types of IT hardware products and functionalities
KB3. functions of electrical and mechanical parts/ modules
KB4. typical customer profile
KB5. company's portfolio of products and that of competitors
KB6. installation procedures given in the manuals
KB7. different types of equipment assembled in a pack (one system)
KB8. different types of peripherals and their standard installation procedure
KB9. specification and the procedures to be followed for setting up the system
KB10. voltage and power requirement for different hardware devices
KB11. memory, input, output and storage devices
KB12. different modules in system such as SMPS, drivers, hard disk, battery, mother board
KB13. different module in the peripheral and their functions
KB14. how to operate the system and other hardware peripherals

NOS # ELE/N4603 - Troubleshoot and replace faulty module

KB1. company's portfolio of products
KB2. different types of IT hardware products and functionalities

KB3. different electrical and mechanical modules in the product
KB4. basic electronics of the hardware
KB5. different models of devices and their repair procedures
KB6. different equipments assembled in a pack (one system)
KB7. peripherals and their standard operating procedure for disassembling and re-assembling
KB8. procedures to be followed for trouble shooting and standards to follow
KB9. voltage and power requirement for different hardware devices
KB10. memory, input, output and storage devices

NOS # ELE/N9909 - Coordinate with colleagues and co-workers

KA1. company's policies on: incentives, delivery standards, and personnel management
KA2. importance of the individual's role in the workflow
KA3. reporting structure

KB1. how to communicate effectively
KB2. how to build team coordination

Professional Skill:

i. **Interpersonal skills**
ii. **Communication skills**
iii. **Behavioural skills**
iv. **Reading, writing and computer skills**
v. **Teamwork and multitasking**
vi. Documentation Skills
vii. **Reflective thinking**
viii. Critical Thinking
ix. **Decision Making**

Core Skill:

1. **Installation and Repair Skills**
2. **Hardware and Software operation skills**
3. **Computer system and peripheral hardware related skills**
4. **Using tools and machines**

Detailed Syllabus of Course

Module. No	**Module. Name**	**Minimum No. of Hours**
	As per the NOSs listed in the Qualification pack	

Total Theory / Lecture Hours:		48
Total Practical / Tutorial Hours:		72
Total Hours:		120

Recommended Hardware:

1. Computer, Laptop
2. Soldering iron, multimeter, POST cards
3. Printer, Scanner

Recommended Software:

NA

Text Books:

NA

Reference Books:

NA

ESDM Courses

Level Code: V **Vertical Name:** IT Hardware

Course Code: ELE/Q4606 **Course Name:** 2.3.2 Field Technician – Networking and Storage

Objective of the Course:

To train the person who responsible for attending to customer complaints, installing newly purchased products, troubleshooting system problems and, configuring hardware equipment such as servers, storage and other related networking devices

Learning Outcomes:

NOS # ELE/N4601 - Engage with customer

1. Interact with the customer prior to visit
2. Understand customer's requirements on visit or prior to visit
3. Suggest possible solutions
4. Complete the documentation
5. Achieve productivity and quality as per company's norms

ELE/N4612 Install, configure and setup the networking and storage system

1. Understand the installation requirement and install the hardware
2. Configure and setup the network, servers and storage system
3. Check system functionality
4. Set up the software
5. Complete the installation task and report
6. Interact with customer
7. Interact with superior
8. Achieve productivity and quality as per company's norms

ELE/N4613 Troubleshoot and fix equipment

1. Receive and understand the customer complaint registered at customer care
2. Identify system problems on field visit
3. Replace faulty module after diagnosis
4. Coordinate with Remote Technical Helpdesk for assistance
5. Interact with customer
6. Report to Superior

NOS # ELE/N9909 - Coordinate with colleagues and co-workers

1. Interact with supervisor or superior
2. Coordinate with colleagues

Expected Job Roles:

Field Technician – Networking and Storage

Duration of the Course (in hours)	120 hours
Minimum Eligibility Criteria and pre-requisites, if any	Diploma

Professional Knowledge:

NOS # ELE/N4601 - Engage with customer

KB1. company's products and recurring problems reported
KB2. how to communicate with customers in order to put them at ease
KB3. basic electronics of system hardware
KB4. hardware maintenance
KB5. functions of electrical and mechanical parts/ modules
KB6. behavioural aspects and etiquette to be followed at customer's premises
KB7. precautions to be taken while handling field calls and dealing with customers
KB8. Relevant reference sheets, manuals and documents to carry in the field

ELE/N4612 Install, configure and setup the networking and storage system

KB1. basic electronics involved in the hardware
KB2. different types of IT hardware products and functionalities
KB3. functions of electrical and mechanical parts/ modules
KB4. typical customer profile
KB5. company's portfolio of products and that of competitors
KB6. installation procedures given in the manuals
KB7. different types of servers, storage, networking devices offered by the company
KB8. different types of servers and storage hardware equipment and their standard installation procedure
KB9. specification and the procedures to be followed for configuration and setting up the server system
KB10. design architecture for system configuration
KB11. networking of devices
KB12. different types of networking devices, their functionality
KB13. operate and load networking drivers

ELE/N4613 Troubleshoot and fix equipment

KB1. company's portfolio of products

KB2. different types of IT hardware products and functionalities
KB3. different electrical and mechanical modules in the product
KB4. basic electronics of the hardware
KB5. different models of devices and their repair procedures
KB6. standard operating procedure for disassembling and re-assembling of hardware equipment
KB7. procedures to be followed for trouble shooting and standards to follow
KB8. voltage and power requirement for different hardware devices
KB9. servers, storage and network devices
KB10. ERP software application and its installation procedure

NOS # ELE/N9909 - Coordinate with colleagues and co-workers

KA1. company's policies on: incentives, delivery standards, and personnel management
KA2. importance of the individual's role in the workflow
KA3. reporting structure

KB1. how to communicate effectively
KB2. how to build team coordination

Professional Skill:

i. **Interpersonal skills**
ii. **Communication skills**
iii. **Behavioural skills**
iv. **Reading, writing and computer skills**
v. **Teamwork and multitasking**
vi. Documentation Skills
vii. **Reflective thinking**
viii. Critical Thinking
ix. **Decision Making**

Core Skill:

1. **Installation and Repair Skills**
2. **Hardware and Software operation skills**
3. **Networking, Servers and storage hardware related skills**
4. **Using tools and machines**

Detailed Syllabus of Course

Module. No	Module. Name	Minimum No. of Hours
	As per the NOSs listed in the Qualification pack	

Total Theory / Lecture Hours:	48
Total Practical / Tutorial Hours:	72
Total Hours:	120

Recommended Hardware:

1. Computer, Laptop, networking devices
2. Soldering iron, multimeter, POST cards
3. Servers

Recommended Software:

NA

Text Books:

NA

Reference Books:

NA

ESDM Courses

Level Code:	III	**Vertical Name:**	IT Hardware

Course Code:	ELE/Q4609	**Course Name:**	2.3.3 Installation Technician – Computing and Peripherals

Objective of the Course:

To train the person who is responsible for installing newly purchased products, troubleshooting system problems and, configuring peripherals such as printers, scanners and network devices

Learning Outcomes:

NOS # ELE/N4601 – Engage with customers:

1. Interact with the customer prior to visit
2. Understand customer's requirements on visit or prior to visit
3. Suggest possible solutions
4. Complete the documentation
5. Achieve productivity and quality as per company's norms

NOS # ELE/N4602 – Install, configure and setup hardware system

1. Understand the installation requirement and install the hardware
2. Configure and install the peripherals
3. Check system functionality
4. Set up the software
5. Complete the installation task and report
6. Interact with customer
7. Interact with superior
8. Achieve productivity and quality as per company's norms

NOS # ELE /N9909 – Coordinate with Colleagues and Co-workers

1. Interact with superior or Supervisor
2. Coordinate with colleagues

Expected Job Roles:

Installation Technician – Computing and Peripherals

Duration of the Course (in hours)	120 hours
Minimum Eligibility Criteria and pre-requisites, if any	10th Std Pass

Professional Knowledge:

NOS # ELE/N4601 - Engage with customer

KB1. company's products and recurring problems reported
KB2. how to communicate with customers in order to put them at ease
KB3. basic electronics of system hardware
KB4. hardware maintenance
KB5. functions of electrical and mechanical parts/ modules
KB6. behavioural aspects and etiquette to be followed at customer's premises
KB7. precautions to be taken while handling field calls and dealing with customers
KB8. Relevant reference sheets, manuals and documents to carry in the field

NOS # ELE/N4602 - Install, configure and setup the system

KB1. basic electronics involved in the hardware
KB2. different types of IT hardware products and functionalities
KB3. functions of electrical and mechanical parts/ modules
KB4. typical customer profile
KB5. company's portfolio of products and that of competitors
KB6. installation procedures given in the manuals
KB7. different types of equipment assembled in a pack (one system)
KB8. different types of peripherals and their standard installation procedure
KB9. specification and the procedures to be followed for setting up the system
KB10. voltage and power requirement for different hardware devices
KB11. memory, input, output and storage devices
KB12. different modules in system such as SMPS, drivers, hard disk, battery, mother board
KB13. different module in the peripheral and their functions
KB14. how to operate the system and other hardware peripherals

NOS # ELE/N9909 - Coordinate with colleagues and co-workers

KA1. company's policies on: incentives, delivery standards, and personnel management
KA2. importance of the individual's role in the workflow
KA3. reporting structure

KB1. how to communicate effectively
KB2. how to build team coordination

Professional Skill:

1. **Interpersonal skills**
2. **Communication skills**
3. **Behavioural skills**
4. **Reading, writing and computer skills**
5. **Teamwork and multitasking**
6. **Documentation Skills**
7. **Reflective thinking**
8. **Critical Thinking**
9. **Decision Making**

Core Skill:

1. **Installation and Repair Skills**
2. **Hardware and Software operation skills**
3. **Computer system and peripheral hardware related skills**
4. **Using tools and machines**

Detailed Syllabus of Course

Module. No	Module. Name	Minimum No. of Hours
	As per the NOSs listed in the Qualification pack	
	Total Theory / Lecture Hours:	48
	Total Practical / Tutorial Hours:	72
	Total Hours:	120

Recommended Hardware:

1. Screw driver, Ratchets, Spring driver, Speciality wrenches, inspection fixtures, wire cutter, pliers, tester, spanner, CRO, multi meter
2. Pattern generation, colour analyser, multi-meter
3. ESD Gloves, Apron and Straps

Recommended Software:	NA
Text Books:	NA
Reference Books:	NA

2.4 Solar Electronics

ESDM Courses

Level Code:	IV	**Vertical Name:**	Solar Electronics
Course Code:	ELE/Q5901	**Course Name:**	2.4.1 Solar Panel Installation Technician

Objective of the Course:

To train the person, who checks the installation site, understands the layout requirement as per design, assesses precautionary measures to be taken, installs the solar panel as per customer's requirement and ensures effective functioning of the system post installation.

Learning Outcomes:

NOS # ELE/N5901 Check site conditions, collect tools and raw materials

1. Understand the work requirement
2. Check out and assess the site condition
3. Understand the installation requirement
4. Collect materials required for installation
5. Ensure quality material usage and appropriate handling mechanism

NOS # ELE/N5902 Install the solar panel

1. Understand the installation and material usage procedure
2. Assess mounting requirements
3. Install the solar panel
4. Connect the system and check for functioning
5. Report and document completion of work
6. Follow quality and safety procedures

NOS # ELE/N9952 Coordinate colleagues at work

1. Interact with supervisor or superior
2. Coordinate with colleagues

NOS # ELE/N9953 Ensure safety at workplace

1. Follow standard safety procedures while handling an equipment
2. Participate in company's safety drills and workshops

Expected Job Roles:

Solar Panel Installation Technician

Duration of the Course (in hours)	120 hours
Minimum Eligibility Criteria and pre-requisites, if any	12th Standard passed

Professional Knowledge:

NOS # ELE/N5901 Check site conditions, collect tools and raw materials

KB1. basics on solar energy and power generation systems
KB2. use and handling procedure of solar panels
KB3. energy storage, control and conversion
KB4. basic electrical system and functioning
KB5. mechanical equipment and its functioning
KB6. maintenance procedure of equipment
KB7. site survey, design and evaluation of various parameters
KB8. tools involved in installation of system
KB9. quality and process standards
KB10. occupational health and safety standards

NOS # ELE/N5902 Install the solar panel

KB2. solar energy system components such as panels, batteries, charge controllers, inverters
KB3. significance of volts, amps and watts: series and parallel connection
KB9. voltage requirement of various equipment
KB10. panel mounting and inclination and angle of tilt
KB11. placement of solar panel mounting
KB12. sunlight and direction assessment
KB13. site surveying methods and evaluation parameters
KB14. tools involved in installation of system

NOS # ELE/N9952 Coordinate colleagues at work

KA1. company's policies on: incentives, delivery standards, and personnel management
KA2. importance of the individual's role in the workflow
KA3. reporting structure

KB1. how to communicate effectively
KB2. how to build team coordination

NOS # ELE/N9953 Ensure safety at workplace

KB1. how to maintain the work area safe and secure
KB2. how to handle hazardous material
KB3. how to operate hazardous tools and equipment
KB4. emergency procedures to be followed such as fire accidents, etc.

Professional Skill:

i. **Communication skills**
ii. **Reading, writing and computer skills**
iii. **Teamwork and multitasking**
iv. **Reflective thinking**
v. **Analytical thinking**
vi. Critical Thinking
vii. **Decision Making**

Core Skill:

1. **Panel Installation Skills**
2. **Using Tools and Machines**
3. **Handling Safety Equipment**

Detailed Syllabus of Course

Module. No	Module. Name	Minimum No. of Hours
	As per the NOSs listed in the Qualification pack	
	Total Theory / Lecture Hours:	48
	Total Practical / Tutorial Hours:	72
	Total Hours:	120

Recommended Hardware:

1. Different types of Solar panels
2. Screw driver, inspection fixtures, wire cutter, pliers, tester, spanner
3. Different types of Battery

Recommended Software:	NA
Text Books:	NA
Reference Books:	NA

2.5 PCB Assembly

ESDM Courses

Level Code:	IV	**Vertical Name:**	PCB Assembly
Course Code:	ELE/Q5202	**Course Name:**	2.5.1 Pick and Place Assembly Operator

Objective of the Course:

To train the person, who programs, operates and maintains the automated pick-and-place machine for placing different types of components on the surface of PCBs for soldering.

Learning Outcomes:

NOS # ELE/N5102 - Operate pick-and-place machine

1. Program and load the pick and place machine
2. Load components and operate the machine for assembling on PCBs
3. Check visually and ensure after assembly cycle is complete
4. Undertake preventive maintenance on the machine
5. Achieve productivity and quality standards

NOS # ELE/N9919 - Work with superiors and colleagues

1. Interact with supervisor or superior
2. Coordinate with colleagues

NOS # ELE/N9920 - Follow safety procedures

1. Understand potential sources of accidents
2. Use safety gear to avoid accidents
3. Understand the safety procedures followed by the company

Expected Job Roles:

Pick and Place Operator

Duration of the Course (in hours)	120 hours
Minimum Eligibility	12th Standard Passed

Criteria and pre-requisites, if any	

Professional Knowledge:

NOS # ELE/N5102 - Operate pick-and-place machine

KB1. basic electronics and component identification
KB2. pick-and-place machine functioning and controls
KB3. basic programming and loading
KB4. setting up, loading pick-and-place machine
KB5. techniques of cleaning stencil
KB6. colour codes and polarity of components
KB7. regulation of operating speed and temperature
KB8. LEDs and special mounting tecnique, junction temperature, types of assembly, metal core PCB, spike correction
KB9. operation of LED mounting machine
KB10. Electro-static discharge (ESD) precautions
KB11. manual soldering and rework of SMT components
KB12. PCB design basics
KB13. commonly ocuring machine defects

NOS # ELE/N9917 - Interact with superiors and colleagues

KA1. company's policies on: incentives, delivery standards, and personnel management
KA2. work flow involved in company's process
KA3. importance of the individual's role in the workflow
KA4. reporting structure

KB1. how to communicate effectively
KB2. how to build team coordination

NOS # ELE/N9918 - Follow safety standards

KB1. how to maintain the work area safe and secure
KB2. how to handle hazardous material
KB3. how to follow safety procedures while operating hazardous tools and equipment
KB4. emergency procedures to be followed such as fire accidents and fire safety education
KB5. how to use machines and tools without causing bodily harm
KB6. first aid execution
KB7. disposal of hazardous chemicals, tools and materials by following prescribed environmental norms or as per company policy

Professional Skill:

i. **Communication skills**
ii. **Reading, writing and computer skills**
iii. **Teamwork and multitasking**
iv. **Reflective thinking**
v. Critical Thinking
vi. **Decision Making**

Core Skill:

1. **Operating Machines and Material Handling**
2. **Using Tools and Machines**
3. **Problem Solving & trouble shooting**
4. **Arithmetic and Geometry Skills**
5. **Handling Safety Equipment**

Detailed Syllabus of Course

Module. No	Module. Name	Minimum No. of Hours
	As per the NOSs listed in the Qualification pack	
	Total Theory / Lecture Hours:	48
	Total Practical / Tutorial Hours:	72
	Total Hours:	120

Recommended Hardware:

1. Pick and Place system
2. Sample PCB boards
3. Sample components
4. Solder paste and Flux
5. Calipers, microscope, screwdrivers, pliers, cutters, stencils, feeders, supporting pins, and other SMT tools

Recommended Software:	NA
Text Books:	NA
Reference Books:	NA

3 National Institute of Electronics and Information Technology (NIELIT)

3.1 Consumer Electronics

S. No.	Course ID	Name of the Course	Level
1	L4 CE1 GO	Diploma in Installation & Repair of Consumer Electronics Products	L4

National Institute of Electronics and Information Technology

ESDM Courses

Level Code:	L4	**Vertical Name:**	Consumer Electronics
Course ID:	**L4 CE1 GO**	**Course Name:**	3.1.1 Diploma in Installation & Repair of Consumer Electronics Products

Objective of the Course:

Objective of this course is to give knowledge and competencies regarding Installation, Servicing, Repair, Fault Diagnosis and Error Remover for Consumer Electronics Product like LCD-LED TV and Monitor, Cable TV and DTH Services, Induction Stove etc.

Learning Outcomes:

After successful competition of this course, participant will be acquainted with the necessary Hardware and Software skills for Installation, Repair, Maintenance and Trouble shooting of Consumer Electronics Product. Participants will be a "Ready to Observe" product for Consumer Electronics Product manufacturing sector or may be self-employed.

Expected Job Roles:

Participants Job Role includes

- Support Technician for Multi-National and National Desktop PCs Manufacturers
- Can Work In Call Centre for After Sale Support
- can be also absorbed in Local Markets
- Can start their own Small Scale business and can be self employed

Duration of the Course (in hours)	350 Hours
Minimum Eligibility Criteria and pre-requisites, if any	ITI or 12th pass

Professional Knowledge:

The individual on the job needs to know and understand:

PK1. Knowledge of spare management and repair & return process for faulty components

PK2. Protection equipment (anti-static wrist bands, shoes, dress, packaging, and other appropriate insulations) that are required to be used

PK3. First aid requirements in case of electrical shocks, cuts and other common injuries

PK4. Functionality and features/working of Consumer Electronics Products

PK5. Consumer Electronics Products specific Console Control and user interface

PK5. Functionality of hardware components of Consumer Electronics Products

PK6. Procedure to dismantle and assemble Consumer Electronics Products

PK7. Range of tools and testing equipment (multi meters, frequency generators etc) available and their functionality

PK8. ESD hazards and their effect on electronic components

PK9. Standard fault-finding (troubleshooting) techniques

PK10. Basic computer knowledge to be able to run diagnostic tools

PK11. Functionality of hardware components, software applications, screen, touchpad etc.

PK12. Consumer Electronics Products software related problems and their possible solutions

PK13. Standard repairing process

Professional Skill:

The individual on the job needs to know and understand:

Consumer Electronics Product Equipment operating Skills

PS1. Use and access all features and applications Consumer Electronics Product

PS2. Operate Consumer Electronics Product testing equipment's

PS3. Connect Consumer Electronics Product's PCB to PC/test equipment for diagnostics

PS4. **Consumer Electronics Product repairing skills**

PS5. Undertake fault diagnostic

PS6. Interpret test results to identify and localize faults

PS7. Utilize appropriate mechanisms and tools to rectify the faults

PS8. Utilize appropriate communication channels to escalate unresolved problems

PS9. Test Consumer Electronics Product to confirm and resolve of the reported fault

PS10. Undertake corrective repairs by software porting/updates

Undertake checks to confirm that the problem is resolved

PS11. **Consumer Electronics Product Component Handling skills**

PS12. Safely dismantle/assemble Consumer Electronics Product using the right tools

PS13. Safe remove/replace components using right tools

Compliance to ESD protection measures

PS14. **Consumer Electronics Product Software Skills**

PS15. Identifying correct software version/modules

Ascertain correct and complete porting/update of software in the Consumer

PS16. Electronics Product

PS17. **Consumer Electronics Product Troubleshooting Skills**

PS18. How to approach a defect

Make use of standard OEM specified troubleshooting steps Interpret intermediate results and progress fault rectification accordingly

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 Consumer Electronics Product 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. **Time Management Skills** CS7. Prioritize and execute tasks in a high-pressure environment CS8. Use and maintain resources efficiently and effectively **Analytical Skills** CS9. Analyse (and understand) Manufacturing Process based on Company need CS10. Interpret reports, readings and numerical data CS11. Keep up to date with new technology and performance issues **Other Skills** CS12. Create and maintain effective working relationships and team environment through CS13. collaboration CS14 Take initiatives and progressively assume increased responsibilities Share knowledge with other team members and colleagues

Detailed Syllabus of Course

Module. No	Modules	Minimum No. of Hours (Theory/Practical)
1.	**LCD-LED TV and Monitor: -** Basic Principle, Working and Operation of LCD-LED TV and Monitor, Installation, Repair Maintenance and Serving and Practice, Fault Diagnosis and Error Remover Techniques and Practices	25/80
2.	**Cable TV and DTH Services: -** Basic Principle, Working and Operation of Cable TV and DTH Services, Installation and Checking, Repair Maintenance, Serving and Practice, Fault Diagnosis and Error Remover Techniques and Practices.	25/70
3.	**VCD-DVD Player and Home Theatre System: -** Basic Principle, Working and Operation of VCD-DVD Player and Home Theatre System, Installation, Repair, Maintenance, Serving and Practice, Fault Diagnosis and Error Remover Techniques and Practices.	25/50

4.	**FM Radio- Cordless Phone-Hair Dryer: -** Basic Principle, Working and Operation of FM Radio-Cordless Phone-Hair Dryer, Installation, Repair, Maintenance, Serving and Practice, Fault Diagnosis and Error Remover Techniques and Practices.	10/25
5.	**Induction Stove and Microwave Oven: -** Basic Principle, Working and Operation of Induction Stove and Microwave Oven, Installation, Repair, Maintenance, Serving and Practice, Fault Diagnosis and Error Remover Techniques and Practices.	15/25
	Total Theory / Lecture Hours:	100
	Total Practical / Tutorial Hours:	250
	Total Hours:	350

Recommended Hardware:

For a Batch of 50 No's

- Trainer Kits of all Consumer Product as mentioned in Detail Syllabus of Course Content: 10 No's Each
- For those Consumer Electronics Product whose Trainer Kits are not Available product will be purchased and dismantle by Trainer for individual Practice: 10 No's each.
- Complete Electronics-Electrical Tool Kit: 10 No's Each

Recommended Software:

As prescribed and provided by Consumer Electronics Product Manufacturer. No need to purchase externally and can be downloaded from respective manufacturer web sites

Text Books:

BPB Publication Books on Installation Repair, Maintenance and Servicing of Consumer Electronic Products in Hindi

Reference Books:

User Manual as provided by Consumer Electronics Product Manufacturer.

3.2 Electronic Product Design

S. No.	Course ID	Name of the Course	Level
1	**L3 EP1 AS**	**Certificate Course in Electronic Product Testing**	L3
2	**L4 EP3 GO**	**Diploma in Computer Aided Electronic Product Packaging Design**	L4
3	**L5 EP2 CE**	**Electronic Product Supervisor**	L5

National Institute of Electronics and Information Technology

ESDM Courses

Level Code:	L3	**Vertical Name:**	Electronic Product Design
Course ID:	**L3 EP1 AS**	**Course Name:**	3.2.1 Certificate Course in Electronic Product Testing

Objective of the Course:

This course has been designed to provide the knowledge and expertise of Systematic Testing of selected Electronics Products along with Communicative English and soft Skills and Basic IT skills required for good performance in any job in the modern world.

Learning Outcomes:

To systematically test electronic equipments using appropriate tools and equipments.
Have good Communicative English skills, soft Skills & Basic IT Skills

Expected Job Roles:

Technician-In Electronic Products Testing / QA Areas

Duration of the Course (in hours)	360 Hrs
Minimum Eligibility Criteria and pre-requisites, if any	10^{th} / 12^{th} Pass with Science background

Professional Knowledge:

1. Fundamentals of electricity & Electronics
2. Use of Tools and Test and Measuring equipments such as CRO, Multimeter, Signal Generator,LCR meter etc
3. Handling of Different electronics Components and Electrostatic discharge
4. Awareness of Types of Product testing ,Safety Standards & Certificates
5. Awareness of Quality standards, Calibration of Equipments etc
6. Specifications of Products and their testing Procedures

7.Basic knowledge of working principle of Different Electronic Products
8.Understanding of internal modules and major components used in the Product
9. Testing of Electronic Components
9. Safety rules, policies and procedures

Professional Skill:

1.Systematic Approach to Testing of Products
2. Use of Tools and Test and Measuring equipments such as CRO, Multimeter, Signal Generator, LCR meter etc
3. Fault Diagnosing skills- Detect basic electrical faults such as improper earthing, defective power chord, connector or wiring defects, loose connections etc.,
4. Good Soldering & de-soldering Skills
5. Use oscilloscope for diagnosing faults
6. Sound Judgement based on quality Standards and Company Policy

Core Skill:

1. Reading and writing skills
2. To record the details of tests & Measurements and Observations
3. to know and understand: how to read product and module serial numbers and interpret details such as make, date, availability , how to note problems on job sheet and details of work done.
4. To read and understand Product manuals
5. to read and understand warnings, instructions and other text material on product labels, and components
6. Safety Habits

Detailed Syllabus of Course

Communication and Soft skills

Module. No	**Module Name**	**Minimum No. of Hours**
Module 1.	**Personal Skills** Knowing Oneself, Confidence Building, Defining Strengths, Thinking Creatively, Personal Values, Time and Stress Management	**10 hrs**

Module 2.	**Social Skills** Appropriate and Contextual Use of Language, Nonverbal Communication, Interpersonal Skills, Problem Solving, Understanding Media, Public Speaking	**30 hrs**
Module 3.	**Professional Skills** Organizational Skills, Team Work, Business/Technical Communication, Job Oriented Skills, Professional Etiquette	**30 hrs**
Module 4.	**Training for Language Proficiency Tests** Integrated Skills, Integrated Skills, Integrated Skills, Practice Exercises, Practice Tests	**20 hrs**
Module 5.	**Preparing and Presenting a Project** Brainstorming, Gathering, Selecting, Processing, Cohesive and Coherent Organization, Drafting and Revising, Presentation of the Project	**10 hrs**

Theory / Lecture Hours: 100

IT Skills

Module. No	**Module Name**	**Minimum No. of Hours**
Module 1.	Introduction to internet, Office Writer, Emails Module Project and Evaluation	16 hrs
Module 2.	Operating Systems , Edit Images, Presentations, Internet Security, Chat and Social Networking ,Malayalam in Computer, Module Project and Evaluation	24 hrs
Module 3.	Computer Networks, Spreadsheet, Online Services, Interoperability, Module Project and Evaluation	24 hrs
Module 4.	Final Project and Evaluation	16 hrs

Practical / Tutorial Hours: 80

	Module. Name	Minimum No. of Hours
Module 1.	Fundamentals of Electricity and Electronics 1. Identification of basic electronic components, ICs, PCBs, Battery &Sensors. 2. Basics of electricity, wave form , frequency value, peak value, average value of voltage and current 3. Awareness of tools, testing and measuring instruments – CROs, Multimeter, Power supplies, LCRs, Signal Generator and Power Analyzer.	25
Module 2.	Soldering Practices 1. Handling of components, Instruments etc. ESD – (Electrostatic discharge). 2. Basics of SMD, its soldering and desoldering 3. Basics of Transformer , ICs ,thyristors and IGBT testing Pin configuration of some important ICs used in SMPS,UPS and Inverters, testing of Induction cookers	15
Module 3.	Types of Product Testing Acceptance Testing, Type Testing , Safety Testing, Identification of legends, symbols, colour codes, Safety, safety standards, safety certificates (CE, UL and VDE) Effect of environmental testing(refer to IEC 60068-1 for guidance), General awareness of quality standards, quality management systems & documentation, Awareness on ISO 17025, ISO 9001, Calibration and Uncertainty of measurements, Awareness on disposal of Electronic waste	20

Module 4.	Testing Procedures(Practical) Testing of Basic Electronic Components Resistor (Parameter to be measured: Resistance Value), Capacitor(Parameter to be measured: Capacitance Value, IR at rated Voltage), Inductor(Parameter to be measured: Inductance Value, DC Resistance), Diode(Parameter to be measured: Resistance in forward direction and reverse direction), Transistors-PNP and NPN (Parameter to be measured: Each PN Junction shall be tested as in diode testing), Transformer basics, ICs, Thyristors and IGBT testing, Pin configuration of some important ICs used in SMPS,UPS and Inverters, testing of Induction cookers 2. Switch Mode Power Supply (Applicable Standard : IS 14886) Safety Testing(Earth Leakage current Test, Dielectric Test, Short Circuit Protection), 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) 3. Tubular Batteries (Applicable standard : IS 1651) Test for Capacity, Test for voltage during discharge 4. Personal Computer (Applicable Standard : IS 14896) Safety Testing (Earth Leakage current Test, Dielectric Test) Performance Testing (Microprocessor used, RAM expansion Capacity, Clock Rate and RAM Capacity, Effect of	90

	Power Supply variations) 5. Invertor (Applicable Standard : IS 13314) Visual Inspection, High Voltage Test, Insulation Resistance Test, No –Load Test, Output Test 6. UPS (Applicable Standard : IEC 62040-3) 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 7. Electronic Ballast (Applicable Standard : IS 13021) Operating Supply Voltage, Total Circuit Power, Circuit Power factor, Supply Current 8. Safety Testing of Household Appliance (Applicable Standard : IS 302-1) Definitions and Terminology, Protection against Shock, Power Input and Current, Leakage Current and Electric Strength at Operating Temperature, Earthlings 9. Testing of Electric Iron/Electric Kettle (Applicable Standard : IS 302-2) Ground bond resistance, Touch Current, Temperature (Thermostatic Cut off) Power Consumption. 10. Audio Amplifier (Applicable Standard : IEC 60065) 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 test, Touch Current	
	Intership/ Practical training	30

Total Course Theory / Lecture Hours: 160

Total Course Practical / Tutorial Hours: 200

Total Course Hours: 360

Recommended Hardware:	Electronics lab in Polytechnic Colleges
Recommended Software:	Nil
Text Books:	Students and Faculty Guides prepared by ASAP in association with the Training Service Providers and industries.
Reference Books:	
Evaluation criteria:	Training is conducted with industry support in Polytechnic colleges in the State. **MoU signed with ESSCI for the conduct of Course** **Evaluation by ESSCI**

3.3 Industrial Automation

S. No.	Course ID	Name of the Course	Level
1	L4 IA1 CA	Diploma in Repair & Maintenance Industrial Instrumentation & Automation System	L5

National Institute of Electronics and Information Technology

ESDM Courses

Level Code:	L5	**Vertical Name:**	Industrial Automation
Course ID:	**L 5 IA1 CA**	**Course Name:**	3.3.1 Diploma in Repair & Maintenance of Industrial Instrumentation &Automation System

Objective of the Course:

To develop the competency to install, operate & maintain industrial instruments and automation systems.

Learning Outcomes :

On completion of the course the participants will be able to:-

1. Understand P & ID and other trade related codes and standards
2. Identify a particular instrument in plant from P&ID.
3. Demonstrate the working of different field instruments/sensor.
4. Install, calibrate, operate and maintain all control loop elements.
5. Develop and test PLC programs.
6. Identify the requirements of open loop and closed loop stability.

Expected Job Roles:

As Technician in Process Industries.

Duration of the Course (in hours)	400
Minimum Eligibility Criteria and pre-requisites, if any	ITI / Diploma / BSc

Professional Knowledge:

The individual on the job needs to know and understand:

PK1. Protection equipment that are required to be used

PK2. First aid requirements in case of electrical shocks, cuts and other common injuries

PK3. Have basic knowledge of electrical and electronic components

PK4. Standard fault-finding techniques

PK5. Standard repairing process

PK5. Range of tools and testing equipments available and their functionality

PK6. Principle of operation and features/working of instruments

PK7. Knowledge to dismantle and assemble the faulty instrument

PK8. Basic computer knowledge to be able to run diagnostic tools in case of smart instruments

PK9. Range of instrument related problems and their possible solutions

PK10. Knowledge of spare management and repair

PK11. Vendor specific configuration and user interfaces

PK12. Functionality of hardware components and software applications.

Professional Skill:

The individual on the job needs to know and understand:

Instrument operating Skills

PS1. Use and access all instrument features and applications

PS2. Operate instrument calibration equipments and testing equipments

PS3. Connect instrument to PC for diagnostics for smart instruments

PS4. Initialize PC based diagnostic tools

Instrument repairing skills

PS5. Undertake fault diagnostic

PS6. Interpret test results to identify and localize faults

PS7. Utilize appropriate mechanisms and tools to rectify the faults

PS8. Utilize appropriate communication channels to rectify unresolved problems

PS9. Test instruments to confirm the rectification of the reported fault

PS10. Interpret diagnostic test results to identify and localize faults

PS11. Connect instrument to PC using connectors/cables

PS12. Undertake corrective repairs by software if any.

PS13. Undertake checks to confirm that the problem is resolved

Instrument Handling skills

PS14. Safely dismantle/assemble instrument using the right tools

PS15. Safe remove and replace components using right tools

PS16. Compliance to ESD protection measures

Software Skills

PS17. Identifying correct software version for the modules for smart instruments

PS18. Execute basic software commands for calibration and use diagnostic tools

PS19. Use vendor specific software by navigating through it based on screen commands.

Troubleshooting Skills

PS20. How to approach a defect

PS21. Make use of standard OEM specified troubleshooting steps

PS22. Interpret intermediate results and progress fault rectification accordingly

PS23 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 higher officials**
CS5.	**Respond appropriately to queries**
CS6.	**Communicate with other team members to understand instrument performance issues**
CS7.	**Communicate in the local language**
CS8.	**Convey proposed solution to the customers and higher officials if necessary**
CS9.	**Time Management Skills**
CS10.	**Prioritize and execute tasks in a high-pressure environment**
	Use and maintain resources efficiently and effectively
CS11.	**Analytical Skills**
CS12.	**Analyse (and understand) performance issues of the instrument**
CS13.	**Interpret reports, readings and numerical data**
	Keep up to date with new technology and performance issues
CS14.	**Other Skills**
	Create and maintain effective working relationships and team environment
CS15.	**through collaboration**
CS16.	**Take initiatives and progressively assume increased responsibilities**
	Share knowledge with other team members and colleagues

Detailed Syllabus of Course

Module. No	Modules	Min. No. of hours
1.	**Fundamentals** **Plan and perform routine trade activities** • Examine types of trade related personal protective equipment o Head protection - hard hat o Eye protection - goggles and face shield o Hearing protection - Ear plugs & Ear muffs o Hand protection - Types of gloves and mitts o Clothing - Types of materials suitable to work environment o Foot protection - safety boots with suitable soles o Personal Breathing Apparatus • Maintain safe work environment o Safe housekeeping practices o Appropriate recycling and disposal procedures • Use and maintain hand and power tools o Trade specific hand and power tools • Examine mounting and installation hardware and practices o Manufacturer instructions o Types of mounting hardware (uni-strut, clamps, u-bolts…) o Location for installation of mounting hardware **Scope of Instrumentation** • Scope and necessity of Instrumentation • functional block diagram of measurement system • calibration and calibration standards o basic, secondary and working standards	**12**

	• the metric system o base and supplementary units o derived units o Multiplying factors (milli,micro, nano…….Mega,Giga…). • Instrument Characteristics • Instrument performance terminology o Repeatability and Accuracy o Zero, span and Linearity errors • Types of errors. • Standard Signals • Different number bases o Binary o Octal o Hex **Explain codes, standards and regulations** • Examine work-related safety regulations and publications o OHS Regulation o General Requirements of OHS o Chemical and biological agents o Noise, vibration, radiation and temperature o Tools machinery and equipment safety o Ladders, scaffolds and temporary work platforms o Rigging, cranes and hoists o Mobile equipment o Electrical safety o Oil and gas industries **Identify electrical hazards and apply safe work practices** Packaging & Enclosures of Instrumentation System o Safety Measures ▪ Measurement Categories o Nature of Environment & Safety Measures ▪ Enclosures of electric equipment for Non-	

	Hazardous location • International standards ▪ Enclosures of electric equipment for Hazardous location • International standards o Intrinsically Safe Equipment o Design Consideration of Enclosures for Different Market Segments • Examine regulations o Sizing of wire, fuses and circuit breakers o Overloads and Inrush current o Proper installation and grounding of electrical equipment **Use trade related schematics and drawings** • Examine types of schematics and drawings o P&ID and Loop wiring diagrams • Examine symbols and conventions o ISA and SAMA symbols • Use basic schematics and drawings o P&ID, Loop drawings	
2.	**Installation and Maintenance of Measuring and Indicating Devices** **Calibrate and service indicating and recording instruments** • Types of recording devices o Chart recorders ▪ Electronic • Indicating devices o Digital displays o Analog displays o Configurable ▪ LCD • Calibrate and service indicating devices	**140**

	o Gauges o Bourdon tube ▪ Helical ▪ Spiral o Bellows ▪ Diaphragm capsule o Accessories ▪ Pigtail siphons ▪ Damping mechanisms ▪ Chemical seals o Measuring element and range o Fill fluid specifications o Differential measuring devices o Device calibration using principles of zero, span and angularity adjustments as they relate to links and levers • Service recording devices (Electronic) o Identification of measuring element and input measurement scale o Power supply o Troubleshooting procedures (instrument specific - according to manuals) **Introduction to pressure measurement** • Types of pressure o Absolute, Differential, Gage, Vacuum o Conversion tables o Pressure conversion formulas o Steam tables (relationship between temperature and pressure) o Head correction calculation • Types of pressure measuring devices and transmitters o Pneumatic	

	o Electronic ▪ Analog ▪ Digital o Pressure Transmitters • Installation of pressure measuring devices o Manufacturers' specifications o Selection of device o Air / power supply requirements o Location of device o Isolation of device o Connection of device to process o Connection of device to control system o Sealants and gaskets • Configure / calibrate pressure measuring devices o Device Operation o Primary Calibration Standards o Differential Pressure Measurement o Pascal's Law o Absolute and Atmospheric Pressure o Relationship between Pressure and Column of Liquid o Hydrostatic Head Pressure o U-Tube and Well Manometers o Bourdon Pressure Gage ▪ Spiral and Helical Elements o Bellows and Diaphragm Elements o Calibration / configuration parameters o Interpretation of results o Identification of cause/effect of calibration errors o Adjustments to bring device within calibration parameters o Document calibration results	

	• Maintain device
	  o Manufacturers' recommended maintenance procedures
	Introduction to temperature measurement
	• Define Temperature, Heat and Energy
	• Temperature scales
	  o Fahrenheit
	  o Celsius
	  o Kelvin
	  o Conversions between scales
	• Temperature measuring devices, their operation and Transmitters
	  o Thermometer
	  o Thermocouple
	  o Thermocouple tables
	  o Resistance Temperature Detectors (RTD)
	  ▪ RTD tables
	  o Thermistor
	  o Liquid in Glass and Filled bulb systems
	  o Pyrometer
	  o Semi-conductor mechanical thermal system
	  o Infrared radiation
	  o Fibre Optic
	  o Thermal Expansion Thermometers
	  o Temperature Transmitters
	• Temperature calibrating instruments
	  o Thermometers
	  o Multimeters
	  o Millivolt source
	  o Resistance source
	  o Temperature baths
	  o Dry block calibrators	

	○ Thermocouple simulators ○ Decade box • Installs, calibrates and services temperature measuring devices ○ Manufacturers' specifications ○ Best Practices for selection /location of measuring device ○ Response time ○ Temperature ranges ○ Resolution ○ Thermo well selection and installation ○ Thermocouples ▪ Grounding ▪ Cold junction compensation ▪ Types (J, K…T) ▪ Extension wires ▪ Colour codes (North American and European colour codes) ○ RTDs ▪ Alpha value and Different standards (IEC, DIN etc..) ▪ 2, 3 and 4 wire ▪ 100, 200…1000 ohm ○ Device check / calibration ○ Wheatstone bridge ○ Simulators ▪ Decade box ○ Interpretation of calibration results ○ Cause / effect of calibration error ○ Device adjustments ○ Repairing/replacing device components ○ Verification of operation	

	o Documenting calibration **Introduction to level measurement** • Level measuring devices, their operation and Transmitters o Dip Stick Level Measurement o Basic Sight Glasses o Float and Cable Arrangements o Ultrasonic o Capacitance Probe o Rotating Paddle o Radar Level System o Laser Level System o Interface Measurement o Hydrostatic Pressure o Open Tank Level ▪ Air Bubbler System o Level Transmitters • Calibration instruments used on level measuring devices o Pressure calibrator o Laptop / software o Handheld programmer • Install, calibrate and service level measuring devices o Manufacturers' specifications o Selection /Location of measuring device o Process application o Zero Suppression/Elevation o Process medium o Best practices o Device check / calibration o Interpretation of calibration results o Cause / effect of calibration error o Device adjustments o Repairing/replacing device components	

	o Verification of operation o Documenting calibration **Introduction to density measurement** • Density measuring devices and their operation o Applications and Selection o Hydrometer o Hydrostatic head o Displacers o Radiation Densitometers o Oscillating Coriolis Densitometer o Ultrasonic Sludge and Slurry Densitometers o Gas Densitometers o Effect of temperature on density • Calibration instruments used on density measuring devices o Pressure calibrator o Laptop / software o Handheld programmer • Install, calibrate and service density measuring devices o Manufacturers' specifications o Selection /Location of measuring device o Process application o Process medium o Best practices o Verify operation o Device check / calibration o Interpretation of calibration results o Cause / effect of calibration error o Device adjustments o Repair/replace device components o Documenting calibration **Introduction to weight measurement**	

- Weight measuring devices and their operation
    - Load cells
    - Scales
    - Strain gauges
- Calibration instruments used on weight measuring devices
    - Test weights
    - Wheatstone bridge
    - Laptop / software
    - Handheld programmer (configurator)
- Install, calibrate and service weight measuring devices
    - Manufacturers' specifications
    - Selection /Location of measuring device
    - Process application
    - Best practices
    - Verify operation
    - Device check / calibration
    - Interpretation of calibration results
    - Cause / effect of calibration error
    - Device adjustments
    - Repair/replace device components
    - Documenting calibration

Introduction to flow measurement (volumetric, mass flow)

- Flow measuring devices and their operation
    - Types of Flow
        - Reynolds Number
    - Types of flow meters
        - head type
        - variable area type
        - quantitative flow meters
        - mass flow meters
    - Differential Pressure Flowmeters
        - Concentric and Eccentric Orifices

	▪ Flow Nozzle ▪ Venturi and Pitot Tubes o Target Flowmeter o Rotameter or Variable Area Meter o Magnetic, Vortex, Turbine, and Ultrasonic Flowmeters o Doppler Effect o Flow Tube Vibration and Twist o Coriolis o Thermal Mass Flowmeters o Positive Displacement Flowmeters ▪ Rotary Vane, Oval Gear, and Nutating Disc Designs o Open Channel Flow Measurement ▪ Weirs o Parshall Flume o Solid flow meters • Calibration instruments used on flow measuring devices o Pressure calibrators o Temperature calibrator o Frequency generator o Laptop / software o Handheld programmer • Install, calibrate and service flow measuring devices o Manufacturers' specifications o Selection /Location factors o Pressure taps o Straight pipe requirements o Accuracy requirements o Process application o Process medium o Best practices	

	o Verify operation o Device check / calibration o Interpretation of calibration results o Cause / effect of calibration error o Device adjustments o Repair/replace device components o Documenting calibration	
3.	**Installs & Maintains Safety and Process Monitoring Systems** **Service ESD (emergency shutdown devices)** • Types of ESD control systems o Levels of Shutdown ▪ Unit Shutdown ▪ Process Shutdown ▪ Emergency Shutdown ▪ Emergency Depressurize Shutdown o Types of ESD ▪ Electric ▪ Pneumatic ▪ Hydraulic ▪ Mechanical • Purposes of different types of ESD o Personnel protection o Environmental protection o Equipment protection • ESD testing procedures o Partial Stroke Test o Time test o Valve integrity o Interlock checks (system shut down check) **Service and calibrate personal safety systems** • Personal gas monitors and standard calibration routines o Portable personal gas monitor (Cl, SO2, H2S, O2 ,	**10**

	CO) o Pull tube (Draeger) • Radiation safety devices o Radiation (gamma) survey meter o Personal dosimeter	
4.	**Installs and Maintains Pneumatic Systems** **Air supply systems** • Instrument air systems and equipment o Need for clean, dry air o Air compressors o Air dryers o Air receivers o Air filters • Air distribution systems • Use of relative humidity to infer dew point o Hygrometers o Sling psychrometer o Digital psychrometer o Bulk polymer resistance sensor • Servicing procedures for air supply systems o Servicing requirements o Traps o Dessicant o Pre and post filters **Tubing and fittings** • Types of tubing and installation procedures o Plastic o Stainless steel o Copper o Rubber o Process and pressure requirements o Sizes	**20**

	o Pressure and Temperature Ratings • Tube bending techniques o Calculating dimensions o Manual tube benders o Hydraulic tube benders • Install tubing and fittings o Ferrule fitting o Tightening fittings o Follow P&ID drawings o Select appropriate tubing and fittings **Install and service pneumatic instruments** • Specifications and hazards of pneumatic equipment o Compressed air safety o Pneumatic signal ranges • Types of pneumatic equipment o Transmitters o Converters (I/P) o Positioners o Controllers o Relays • Operating principles of pneumatic equipment o Force balance o Motion balance • Calibrate pneumatic transmitters o Calibration block diagram o Five point calibration check o Shop or field calibration o Force balance calibration procedure o Motion balance calibration procedure o Documentation of calibration results o Manufacturers' specifications for installation	

5.	**Installs and Maintains Electrical and Electronic Systems** **Identification of various Electrical and Electronic components** • Active components • Passive Components • Switches • Plugs • Sockets • Relays/Solenoids/Contactors • Inductive proximity switch • Symbols of electrical components o Switch o Contacts o Solenoids o Relay o LED • Electrical Ladder Diagram • Panel controls • Integrated Circuits o Pin identification and numbering convention o IC handling and installation • Safety o Need for Electrostatic Discharge Protection **Apply basic principles of DC electricity** • operation and applications of various batteries o Lead acid o NiCad o NiMh • Measure electrical current, voltage and resistance o Analog multimeters o Digital Multimeters • Calculate currents, voltages and resistance using Ohm's	**60**

	law o Series circuits o Parallel and combination circuits o Formula E= I x R • Define and reference voltage measurement to circuit common o Difference between ground and circuit common o Multimeter o Oscilloscope and scope meter o Frequency generator o Circuit schematic • Calculate electrical power in watts o Apply Watt's Law to define power rating of appliances o Watts = E x I • Examine resistors, potentiometers and rheostats o Differences o Power ratings o Applications o Colour codes **Apply basic principles of AC electricity** • Define AC electricity o Generation o Polarity and waveform analysis ▪ Peak/RMS voltages • various types of transformers o Step up o Step down o Autotransformer o Isolation o Three phase transformer • Examine the use of capacitors and inductors in AC circuits	

	o Applications o Filtering o Regulating voltage o Power factor correction • Size electrical components for various circuits o Capacitors o Inductors o Resistors o Wire o Fuses • Build and test circuits o Understand various components in circuits ▪ Electromagnetism ▪ Lenz's Law ▪ Inductive Reactance ▪ Inductive Kick ▪ Capacitive Reactance ▪ Capacitor Types ▪ Time Constants and Their Application ▪ Filters and Resonance ▪ Effect of frequency on a circuit o Measuring techniques and equipments • Types of AC circuits o Different classes (based on different standards) • installation procedures for AC equipment o Wiring methods o Support o Grounding o Shielding • Apply proper circuit connection techniques o Soldering o Crimping	

	Introduction to Power Electronics (Only Block diagrams) • SMPS • Convertor • Inverter • UPS • DC and AC Drives	
6.	**Installs and Maintains Final Control Elements** **Service regulators and examine relief valves** • Examine regulators o Purpose o Pressure drops o Types ▪ Relieving ▪ Non- Relieving ▪ Pilot operated o Definitions ▪ Droop ▪ Turndown o Applications ▪ Pressure reducing ▪ Pressure relieving • Examine operation and applications of regulators o Air o Water o Steam o Oil o Gas o Differential • Service and maintain regulators o Components ▪ Diaphragms	**50**

	▪ Bolts ▪ Springs ▪ Seats ▪ Gaskets o Disassembling ▪ Spring compression o Reassemble o Test • Examine relief valves o Applications o Safety Device o Reset Differential o Certification and testing **Service, size and install control valves and actuators** • Examine actuators o Types ▪ Pneumatic ▪ Hydraulic ▪ Electric o Applications ▪ Fail open ▪ Fail close ▪ Fail last o Actions ▪ Spring return ▪ Double–acting o Components ▪ Diaphragms ▪ Plates ▪ Stem connector (coupling) ▪ Bushings ▪ O-rings	

	▪ Pistons ▪ Motors ▪ Springs o Required Operating Environment • Examine control valves o Process applications o Seal / shut off requirements o Flow Characteristics ▪ Quick opening ▪ Linear ▪ Equal percentage o Body Types o Valve sizing o Sliding stem ▪ Globe ▪ Bar stock ▪ Pinch valve o Rotary ▪ Butterfly ▪ E-Disc ▪ Segmented ball ▪ Through-bore ball ▪ Restricted trim o Components ▪ Cages ▪ Plugs ▪ Seats ▪ Stems ▪ Packing • Types and applications of valve packing o Teflon	

	o Graphite o Rope • Install and service control valves o Gaskets o Sealants o Positioning valve in process o Securing valve using appropriate process ▪ Flanged ▪ Screwed ▪ Wafered / Flangeless o Isolation of valve from process o Testing procedures o Stroke to ensure proper operation o Leak testing o Possible faults ▪ Leaking packing ▪ Valve passing ▪ Damaged parts ▪ Incorrect travel o Cleaning / lubricating o Repairing / Rebuilding • Install and service actuators o Matching to valve o Connecting to valve o Valve travel o Bench set o Verifying operation o Correct air supply pressure o Function testing o Possible faults ▪ Leaking diaphragms	

	▪ Broken springs ▪ Damaged/worn O-rings o Removing /replacing components o Cleaning/lubricating components o Assembling/disassembling ▪ Spring compression o Loading on stem connector **Install and service valve positioners** • Valve positioners o Types ▪ Pneumatic ▪ Electronic ▪ Digital ▪ Electro hydraulic ▪ Electro mechanical o Applications o Single Acting o Double Acting o Components ▪ Levers ▪ Nozzles ▪ Flappers ▪ Relays ▪ Auxiliaries ▪ Locks ▪ Boosters ▪ Speed controls o Relation to actuator type / application • Install and service valve positioners o Mounting o Connecting to actuator o Connecting to process control system	

	o Configuring o Set stroke o Set pressures o Match to actuator o Auto tune o Calibrating o Connecting calibration instruments o Calibration parameters o Interpretation of calibration results o Cause/effect of calibration errors o Component maintenance	
7.	**Installs and Maintains Communications, Networking and Signal Transmission Systems** **Install wiring in accordance with different standards** • Examine wiring requirements o Materials o Connections ▪ Crimping ▪ Terminal blocks ▪ Marrettes ▪ Soldering ▪ Protection (heat shrink, taping etc.) o Shielding o Grounding o Grounding loops • Install wiring o Sizing wire o Routing of wiring runs o Stripping wire o Labeling / colour-coding wire o Connecting wire **Trends in control technologies**	**28**

	• Smart Components o Typical smart DP Transmitter o Smart temperature transmitter o Benefits **Service supervisory control and data acquisition (SCADA) systems** • types of SCADA protocols and configurations o Applications o Online history o Remote equipment operation o Network layout o Protocols o Host o Field o Addressing methods • types of SCADA equipment and servers for data acquisition and storage o Radio Telemetry Units (RTU) o Wireless Communications systems o Cellular o Satellite **communication systems** • types of signal transmission systems o Fibre optics o Armoured cable o Non armoured cable o Multimode / single mode transmission o Wired o Coax o UTP o Wireless o Satellite	

	o Blue tooth o RF o IR o IEEE standards • features and limitations of communication protocols o Types of protocols o RS232 o RS422/485 o MODBUS o ASi BUS o Device Net o Profibus o Highway Addressable Remote Transducer(HART) o Foundation Fieldbus H1 & H2 o Ethernet TCP/IP o Addressing methods and components o Potential sources of interference o Related standards, codes, licenses	
8.	**Installs and Maintains Control Systems** **Stand alone Controllers** • Electronic Controllers • Single loop controllers **Programmable Logic Controllers (PLCs)** • Examine types of PLCs o Hardware Architecture o Control Capabilities ▪ Discrete control ▪ Analog control o Compatibility with other process systems o Networks o Protocols	**80**

	• PLC languages and symbols o Structured Text o Instruction list o Ladder Logic o Function block o Sequential function chart • PLC components o CPU o Memory organization o Input interface o Output interface o Power supply o Programming/Monitoring interface o Data Table o User Program **fundamental theories of process operation and equipment** • Common industrial processes o Continuous Process o Batch process **Introduction to control theory** • Basic control theory o Set point / process variable / manipulated variable o Relation of output to input o Steady state value and dynamic component o Control loop gains / loop stability • Control modes o On / Off control o Differential Gap o Proportional only o Integral only o Proportional plus Integral o PID -Proportional, Integral, Derivative	

	▪ Reset rate / Reset time ▪ Series / parallel o Interactive / non-interactive / rate on PV • Controller action o Direct acting o Reverse acting • Controller operating modes o Automatic o Manual o Remote o Local o Supervisory **Introduction to process control techniques and strategies** • Control techniques o Loop tuning o Zeigler Nicholls o Lambda o Tuning from manual output changes • Basic control strategies o Feedback control ▪ Process Dynamics • Lags • Dead Time o Feed forward control o Cascade control o Ratio Control o Gap action control o Multi variable control **Implement process control strategies** • Implement process control strategies o Determining required controller action based on process and valve action	

	o Consulting loop diagrams o Override o Interlocks o Limits o Select relays o Loop impact on overall process o Alarming o control strategy design o Implementation on live processes o Upset recovery	
	Total Theory / Lecture Hours:	150
	Total Practical / Tutorial Hours:	250
	Total Hours:	400

Recommended Hardware:

- Personal Protective equipments for demonstration
- Electronic Chart recorder
- Indicating devices- Digital, Analog and LCD
- Bourdon tube and bellows
- Pressure transmitter (conventional 4 - 20 mA)
- Pressure calibrator
- Multimeter
- Thermometer
- Thermocouple simulator
- Resistance source
- Temperature bath
- Thermocouple (J)
- RTD (Pt 100)
- Capacitance probe for level measurement
- Ultrasonic Levelsensor

- Level transmitter
- Hydrometer
- Load cell
- Orifice plate
- Magnetic flow meter
- Portable gas monitor
- Hygrometer
- I to P converter
- Positioner
- Pneumatic relay
- Compressor
- Electro mechanical relay
- Contactor
- Solenoid
- Electric actuator
- Pneumatic control valve
- Pressure regulator
- Soldering Kit
- Crimping tool
- Marretes, wire terminator
- Standard tool box (Mechanical and Electrical)
- SCADA
- PLC
- Fieldbus cable
- Function generators
- Computers/ Laptop with associated softwares

Recommended Software:	Software compatible for different types of instruments

Text Books:

- Instrument Engineers Handbook: Process Measurement and Analysis, Liptak, Bela G, CRC Press
- Instrument Engineers Handbook: Process Control and Optimization,, Liptak, Bela G, CRC Press
- Instrument Engineers Handbook. Process Software and Digital Networks, Liptak, Bela G, CRC Press
- Advanced temperature measurement and control, McMillan, Gregory K.
- Control instrument mechanisms, Warren, John E
- Fundamentals of industrial control, Coggan, Donald A
- Hydraulics and Pneumatics, Parr, E.A
- Digital Fundamentals, Floyd, Thomas L.
- Industrial Flow Measurement, Spitzer, David W.
- A Guide to the Automation Body of Knowledge, Trevathan, Vernon L., Ed.
- Wireless communication systems/ Design and construction, Eren, Halit.
- Practical Industrial Safety, Risk Assessment and Shutdown Systems, Macdonald, Dave.
- Linear Position Sensors, Nyce, David S
- Practical Data Communication for Instrumentation and Control, Park, John
- Practical Industrial Data Networks, Mackay, Steve
- Fundamentals of Electronics DC/AC Circuits, Terrel, David L
- Basic Math for Electronics, Cooke and Adams
- Instrumentation, PTEC
- Fundamentals of Process Control Theory, Murrill, Paul W
- Experiments of Digital Fundamentals, Buchla, David
- Principals of Electric Circuits, Floyd
- Instrumentation and Process Control, Bartlet, Terry
- Pneumatic Instrumentation, Patrick, Dale R & Steven R
- Industrial Instrumentation, Faulk, Sutko

- Fundamentals of Instrumentation, Thomson, Delmar Learning
- Elements of Data Processing Math, Price, Winston T & Miller, Merlin
- Electricity 3, Alerich, Walter N & Keljik, Jeff
- Process Industrial Instrumentation and Control Hand Book, Considine, Douglas M
- Instruments for Process Measurement and Control, Anderson, Norman A
- Fundamentals of Electric Circuits, Bell, David A
- Basic Fluid Power, Rease, Dudley A
- Fundamentals of Analytical Chemistry, Skoog, Douglas A & West, Donald M
- Elements of Physics, Shortley and Williams
- Electrical Machines, Drives and Power Systems, Wildi, Theodore
- Process Control Instrument Technologies, Johnson, Curtis D
- Low Pressure Boilers, Steingress, Frederick M
- Fundamentals of Physics Heath, Macnaughton and Martindale

Reference :

- ANSI/ISA5.1-2009 – Instrumentation Symbols and Identification
- ANSI/ISA5.4-1991 – Instrument loop Diagrams
- ANSI/ISA5.06.01-2007- Functional Requirements Documentation for Control Software Applications
- ANSI/ISA20-1981 – Specification Forms for Process Measurement and Control Instruments, Primary Elements and Control Valves

- ISA-TR20.00.01-2007 – Specification Forms for Process Measurement and Control Instruments Part1: General Considerations Updated with 27 New Specification forms in 2004-2005
- Canadian Electrical Code, Part 1, 20th Edition. CSA, January 2006
- Industrial Hydraulics manual, Eaton Corporation
- Closed loop electro hydraulic systems manual, Vickers, Incorporated Training Center
- www.abb.com
- www.boschrexroth.
- www.control.com
- www.controlglobal.com/whitepapers
- www.controlsweekly.com
- www.cpecn.com
- www.cvs-controls.com
- www.cyberlaboratory.com
- www.documentation.emersonprocess.com
- www.emersonprocess.com
- www.enmet.com
- www.fisherregulators.com
- www.flowcontrolnetwork.com
- www.foxboro.com
- www.galvanic.com
- www.gongol.net
- www.graceindustries.com
- www.honeywell.com
- www.iceweb.com.au/Technical/LevelTechnologies.html
- www.invensys.com
- www.isa.org
- www.joliettech.com

- www.metsoautomation.com
- www.modelingandcontrol.com
- www.multimediahrd.com
- www.omega.com
- www.ohsonline.com
- http://source.theengineer.co.uk/
- www.raesystems.com
- www.scadalink.com
- www.smar.com/PDFs/Catalogues/FBTUTCE.pdf
- www.smar.com/PDFs/Catalogues/HARTTUTCE.PDF
- www.spitzerandboyes.com
- www.vegacontrols.co.uk
- www.worksafebc.com
- www.yokogawa.com
- www.zoneni.com
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3.4 Industrial Electronics

S. No.	Course ID	Name of the Course	Level
1	L3 IE1 LU	Repair & Maintenance of Power Supply, Inverters & UPS	L3

National Institute of Electronics and Information Technology

ESDM Courses

Level Code:	L3	**Vertical Name:**	Industrial Electronics
Course ID:	**L3 IE1 LU**	**Course Name:**	3.4.1 Repair & Maintenance of Power Supply, Inverter & UPS

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. Constant Voltage transformer, General Circuit diagram of CVT, Working
PK7. 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 Factor affecting charging, Cause of battery failure, diagnosis and testing, visual
PK14. 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
PS2. etc.
PS3. Understand use of Electronics Component such as Diodes, Transistors, ICs etc.
Use of Test and Measurement Equipment
PS4. **Soldering skills**
PS5. Understand Soldering Requirements
PS6. Operation of Equipment required for Soldering
Use of Desoldering Pump
PS7. **Stabilizer and CVT Repairing Skill**
PS8. Working principle, types of stabilizer
PS9. Transformer employed in stabilizer, multiwinding/multitaped transformer
PS10. Understanding General Circuit diagram of CVT, Working principle of CVT
PS11. Finding fault in Stabilizer and CVT
Replace faulty components in Stabilizer and CVT
PS12. **Inverter and UPS Repairing Skill**
PS13. Working principle of Inverter and UPS
PS14. Working Principle of Rectifier
Finding fault in Inverter and UPS
Replace faulty components in Inverter and UPS
PS15. **Troubleshooting Skills**
PS16. How to approach a defect
PS17. Make use of standard OEM specified troubleshooting steps
PS18. Interpret intermediate results and progress fault rectification accordingly
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

CS7. performance issues

CS8. Communicate in the local language

Convey proposed solution to the customers

CS9. **Time Management Skills**

CS10. Prioritize and execute tasks in a high-pressure environment

Use and maintain resources efficiently and effectively

CS11. **Analytical Skills**

CS12. Analyse (and understand) customer complaints

CS13. Interpret reports, readings and numerical data

Keep up to date with new technology and performance issues

CS14. **Other Skills**

CS15. Create and maintain effective working relationships and team environment through

CS16. collaboration

Take initiatives and progressively assume increased responsibilities

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 Resistors, Capacitors and Inductors, their identification, types and application Semiconducting Devices: Diodes, its type, characteristics and applications	15 / 15

	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	20 / 30

	employed in rectifier 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	15 /15

	Customer Communication, Convey proposed solution to the customer, responding queries Communication with supervisor, Report for unresolved problems Time Management and Team Skills	

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 types20 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

3.5 Medical Electronics

S. No.	Course ID	Name of the Course	Level
1	L3 ME2 SJ	Repair & Maintenance of Dental Equipment	L3
2	L3 ME3 SJ	Repair & Maintenance of ECG & ICCU Equipment	L3
3	L3 ME4 SJ	Repair & Maintenance of Imaging Equipment	L3
4	L5 ME1 SJ	Post-Diploma in Repair & Maintenance of Hospital Equipment	L5

National Institute of Electronics and Information Technology

ESDM Courses

Level Code:	L-3	**Vertical Name:**	Medical Electronics
Course ID:	**L3 ME2 SJ**	**Course Name:**	3.5.1 Repair & Maintenance of Dental equipment

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 and Maintenance of Dental Equipment

Duration of the Course (in hours)	350 Hours
Minimum Eligibility Criteria and pre-requisites, if any	Candidate should be 10th Pass and not less than 16 years of age

Professional Knowledge:

a) Basics of Mechanical Foundry Equipments
b) Working of Motor, Drilling.
c) Basic concept of suction apparatus.
d) Have understanding related to medical Lights, Shadow less lights.
e) Basics of X-rays.
f) Understanding of basics of dental machines.
g) Basic Knowledge of Dental tools.
h) Basic Of active and passive components
i) Types of components with its working.
j) Working and usage of OP AMP 741.
k) Basics of ultrasonic s waves ,concepts and Units

Professional Skill:

a) Knowledge and hands on experience with designing of circuits
b) Working and designing of PCB's
c) Basics of dental chairs usage
d) Concepts of hydraulics and Suction system,
e) Working and Concept Of TTL .
f) Understanding and theory related to ultrasonics, Internal circuitry.

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.	Basics understanding of Dental Chair	50
2.	Tools & Aids for servicing & maintenance, Hard & soft tools	200
3.	Soft Skills	100
	Total Theory / Lecture Hours:	250
	Total Practical / Tutorial Hours:	100
	Total Hours:	350

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

National Institute of Electronics and Information Technology

ESDM Courses

Level Code:	L-3	**Vertical Name:**	Medical Electronics
Course ID:	**L3 ME3 SJ**	**Course Name:**	3.5.2 Repair & Maintenance of ECG and ICCU Equipment

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 and Maintenance of Clinical Equipment (ECG &ICCU)

Duration of the Course (in hours)	350 Hours
Minimum Eligibility Criteria and pre-requisites, if any	Candidate should be 10th Pass and not less than 16 years of age

Professional Knowledge:

a) Should have the understanding of Use of CRO, Multimeter, Measurement of voltage, current, resistance
b) Testing of diodes,resisitors
c) Basic Knowledge about the waveforms.
d) PCB repairing and locating the faults.
e) Know basic medical terminologies like ECG,EEG,EMG
f) Working of BP kit,measuremnt principle .
g) Knowledge of transistors, types and working, usage.
h) Knowledge of electromechanical components, relays, switches.

Professional Skill:

a) Testing and working of resistors, capacitors, transistors, diodes, Inductors, OPAMP,
b) Working Of ECG amplifiers, ECG instrumentation
c) Knowledge about ECG, Defibrillators, pulse oximeters , ICCU equipments.
d) Basics of Non invasive blood pressure, Soldering, seven segment display.
e) Identification of PCB fuses
f) Performance evaluation of components

Core Skill:

a) Analytical strong competency.
b) Practical Evaluation and understanding of the basics.
c) Strong approach towards the theoretical and practical applications.
d) Eagerness and curiosity to learn more.

Detailed Syllabus of Course

Module. No	**Modules**	**Minimum No. of Hours**
1.	Tools and servicing maintenance of Hard and soft.	75
2.	Familiarization and working with components, ECG , ICCU equipments	175
3	Soft Skills	100
	Total Theory / Lecture Hours:	250
	Total Practical / Tutorial Hours:	100
	Total Hours:	350

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

National Institute of Electronics and Information Technology

ESDM Courses

Level Code:	L-3	**Vertical Name:**	Medical Electronics
Course ID:	**L3 ME4 SJ**	**Course Name:**	3.5.3 Repair & Maintenance of Imaging Equipment (X-Ray & Ultrasound machine)

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 and Maintenance of Imaging Equipment (X-Ray & Ultrasound machine)

Duration of the Course (in hours)	350 Hours
Minimum Eligibility Criteria and pre-requisites, if any	Candidate should be 10th Pass and not less than 16 years of age

Professional Knowledge:

a) Basics of Mechanical Foundry Equipments
b) Working of Motor, Drilling.
c) Basic concept of suction apparatus.
d) Have understanding related to medical exposure of X-Rays.
e) Basics of X-rays.
f) Understanding of basics of dental machines.
g) Basic Knowledge of Medical computer usage and applications in imaging field
h) Basic Of active and passive components
i) Types of components with its working.
j) Working and usage of OP AMP 741.
k) Basics of ultrasonic s waves ,concepts and Units

Professional Skill:

a) Knowledge and hands on experience with designing of circuits
b) Working and designing of PCB's
c) Basics of XRay units,
d) Concepts of hydraulics and Suction system,
e) Working and Concept of xray Tubes, collimator.
f) Understanding of basics of optics.
g) Knowledge of Spectrum.
h) Basics of Non Invasive Xrays.

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 Building Blocks of Bio-Medical Equipment	40
2.	Imaging Equipment	80
3.	Bio-Medical Instrumentation and Measurement	30
4.	On Job Training	100
5	Soft Skills	100
	Total Theory / Lecture Hours:	250
	Total Practical / Tutorial Hours:	100
	Total Hours:	350

Recommended Hardware:

Recommended Software:

Text Books:

Reference Books:

National Institute of Electronics and Information Technology

ESDM Courses

Level Code:	L-5	**Vertical Name:**	Medical Electronics
Course ID:	**L5 ME1 SJ**	**Course Name:**	3.5.4 Post Diploma in Repair & Maintenance of Hospital Equipment

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 and pre-requisites, if any	Candidate should be Diploma Holder or BSc. Graduate and not less than 21 years of age

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:	

3.6 Office Automation, IT & Networking

S. No.	Course ID	Name of the Course	Level
1	L1 OA1 LU	Installation & Maintenance of Photocopiers and Printers	L1
2	L3 IT2 LU	Desktop Publishing with Screen Printing	L3

National Institute of Electronics and Information Technology

ESDM Courses

Level Code:	L1	**Vertical Name:**	Office Automation, IT &Networking (IT)
Course ID:	**L1 OA1 LU**	**Course Name:**	3.6.1 Installation & Maintenance of Photocopiers and Printers

Objective of the Course:

This course has been designed to provide an introduction to installation and maintenance of Photocopiers and Printers. The participant will be able to troubleshoot problems of Photocopiers and Printers.

Learning Outcomes:

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

- Basic Electricity, Electrical and Electronic Components
- Soldering and De-soldering Techniques
- Tools and Equipment used
- Repair and maintain Photocopiers and Printers
- Troubleshooting Techniques

Expected Job Roles:

Photocopier and Printer Repair Technician

Duration of the Course (in hours)	200
Minimum Eligibility Criteria and pre-requisites, if any	8th 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
PK4. appropriate insulations) that are required to be used
PK5. First aid requirements in case of electrical shocks, cuts and other common injuries
PK5. Soldering and De-Soldering Techniques
PK6. Principle of Operation of Photocopier
PK7. Dismantling and assembling of paper feed mechanism, paper tray, Thermal unit
PK8. and Toner Unit.
PK9. Identify the various sensors used in the copier and their fixtures.
PK10. Paper trays, Paper feed mechanism and the sensors used for paper movement
PK11. Periodic cleaning and servicing of copier machines
PK12. Printers and their types
PK13. Thermal Printers and Inkjet Printer, their Working Principle
PK14. Laser Printers and its operation
PK15. Different Parts of Printer
PK16. Cartridges, toner, drum, their use and its replacement
PK17. Overall fault finding and repair of Printer
PK18. Standard fault-finding (troubleshooting) techniques
PK19. Component testing methods
PK20. 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
PS2. etc.
PS3. Understand use of Electronics Component such as Diodes, Transistors, ICs etc.
Use of Test and Measurement Equipment
PS4. **Soldering skills**
PS5. Understand Soldering Requirements
PS6. Operation of Equipment required for Soldering
Use of Desoldering Pump
PS7. **Photocopier Repairing Skill**
PS8. Understand Operation of Photocopier
PS9. Dismantling and assembling of paper feed mechanism, paper tray, Thermal unit
PS10. and Toner Unit.
PS11. Identify the various sensors used in the copier and their fixtures.
PS12. Fault finding and repairing in electrostatic high voltage unit.
PS13. Dismantling and fitting of drum unit- cleaning of drum unit
PS14. Dismantling and refitting of Carriage unit , mirror unit and light unit
Periodic cleaning and servicing of copier machines
PS15. Overall fault finding and repair a photo copier machine.
PS16. **Printer Repairing Skill**
PS17. Understand Working Principle of Thermal Printers and Inkjet Printer
PS18. Understand Operation of Laser Printers
PS19. Different Parts of Printer and their use
Cartridges, toner, drum, their use and its replacement
PS20. Overall fault finding and repair of Printers
PS21. **Troubleshooting Skills**
PS22. How to approach a defect
PS23. Make use of standard OEM specified troubleshooting steps
Interpret intermediate results and progress fault rectification accordingly
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

CS7. performance issues

CS8. Communicate in the local language

Convey proposed solution to the customers

CS9. **Time Management Skills**

CS10. Prioritize and execute tasks in a high-pressure environment

Use and maintain resources efficiently and effectively

CS11. **Analytical Skills**

CS12. Analyse (and understand) customer complaints

CS13. Interpret reports, readings and numerical data

Keep up to date with new technology and performance issues

CS14. **Other Skills**

CS15. Create and maintain effective working relationships and team environment through

CS16. collaboration

Take initiatives and progressively assume increased responsibilities

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	5/ 5
2.	**Electronic and Electrical components** Active and Passive Components Resistors, Capacitors and Inductors, their identification, types and application Semiconducting Devices: Diodes, its type, characteristics and applications Transistors, Integrated Circuits	10/ 10

	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** 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.	**Photocopiers** Principle of Operation of Photocopier Dismantling and assembling of paper feed mechanism, paper tray, Thermal unit and Toner Unit. Identify the various sensors used in the copier and their fixtures. Fault finding and repairing in electrostatic high voltage unit. Dismantling and fitting of drum unit- cleaning of drum unit Dismantling and refitting of Carriage unit , mirror unit and light unit Paper trays, Paper feed mechanism and the sensors used for paper movement Periodic cleaning and servicing of copier machines Overall fault finding and repair a photo copier machine.	20 / 20

6.	**Printers** Printers and their types. Thermal Printers and Inkjet Printer, their Working Principle Laser Printers and its operation Different Parts of Printer Cartridges, toner, drum, their use and its replacement Overall fault finding and repair of Printers	25 / 25
7.	**Safety and Security Procedures** Reporting incidents, system failures, power failures etc., protection equipment First aid requirement in case of electrical shocks and other injuries	05 / 05
8.	**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:	**100** hrs
	Total Practical / Tutorial Hours:	**100** hrs
	Total Hours:	**200** hrs

Recommended Hardware:

For a batch size of 50Nos

1. Resistance of different value and Wattage ratings 20 nos. each
2. Capacitor of different types20 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. LED of different colours 20 nos. each
7. 3 Pin Voltage Regulators 05 nos. each

8.	Logic GATE ICs 10 nos. each
9.	Tool Kit 05 sets
10.	Digital Multimeter 05 nos.
11.	CRO 02 nos.
12.	Soldering Iron 05 nos.
13.	Solder Wire 250 gms
14.	Soldering Flux 100 gms.
15.	Microwatt Soldering Iron 02 nos
16.	Desoldering Station 02 nos.
17.	Desoldering Pump 05 nos.
18.	Project Board 05 nos.
19.	Multistand Connecting wire 01 Coil each
20.	Single stand connecting wire 01 coil each
21.	Photocopier (Mono) 01 nos.
22.	Photocopier Color 01 nos.
23.	Different types of Printers 01 no each

Recommended Software:

Printer Drivers etc.

Text Books:

1. MES - Electronics - Repair & Maintenance of Photocopier and Fax Machine (With DVD) - NIMI
2. Easy Laser Printer Maintenance and Repair Paperback - Stephen J. Bigelow

Reference Books:

user/service manuals

4 TELECOM SECTOR SKILL COUNCIL(TSSC)

4.1 Telecom (Passive Infrastructure)

TSSC - ESDM Courses
(Tower Technician)

Level Code:	4	**Vertical Name:**	Telecom (Passive Infrastructure)
Course Code:	TEL/Q4100	**Course Name:**	4.1.1 Tower Technician

Objective of the Course:

The person should be able to maintain tower sites which are live 24x7, maintain and repair level-1 faults/issues at telecom tower site, undertake preventive and corrective maintenance of the site equipment (Generator, Battery Banks, ACs, SMPS) and analyse & report/escalate faults.

Learning Outcomes:

By the end of the training, the person should be able to perform the following activities:

Site safety and hygiene
Preventive Maintenance of site equipment
Site Management
Reporting and Documentation
Corrective Maintenance of site equipment

Expected Job Roles:

Tower Technician

Duration of the Course (in hours)	180 Hours
Minimum Eligibility Criteria and pre-requisites, if any	10+2 and/or ITI Diploma in Electrical/Mechanical

Professional Knowledge:

Functional knowledge of all site equipment, system components, special tools & equipments used for system repairs

Professional Skill:

Planning and Execution Relationship Building Analytical Skills Technical Skills

Core Skill:

Comprehension Skills Reading Skills Oral Communication Skills

Detailed Syllabus of Course

Module. No	Module. Name	Minimum No. of Hours
01		
	Total Theory / Lecture Hours:	180
	Total Practical / Tutorial Hours:	90
	Total Hours:	90

Recommended Hardware:	D G Set, Air Conditioner, Power Interface Unit (PIU), SMPS, Battery bank

Recommended Software:	NIL
Text Books:	Training Material for students supported through affiliated Training Providers.
Reference Books:	NIL

4.2 Telecom (Handset)

TSSC - ESDM Courses
(Handset Repair Engineer)

Level Code:	4	**Vertical Name:**	Telecom (Handset)
Course Code:	TEL/Q2201	**Course Name:**	4.2.1 Handset repair Engineer (Level II)

Objective of the Course:

The person should be able to perform handset / tablet repair including hardware and software components and testing the handset for adequacy post repair.

Learning Outcomes:

By end of the training, the person should be able to perform the following activities:

Obtain handsets / tablets from customer/ relevant teams
Arrange for tools and spares
Undertake Handset repair activities
Safety requirements (Equipment & Self)
Record parameters and generate compliance reports
Determine change requirement
Test effectiveness & close activity

Expected Job Roles:

Handset Repair Engineer (Level II)

Duration of the Course (in hours)	120
Minimum Eligibility Criteria and pre-requisites, if any	10+2 / ITI

Professional Knowledge:

Functionality / features of handset, specific operating system (OS), hardware components like chipsets, processor etc., basic knowledge of GSM / CDMA, Windows & Android OS.
Test equipments
Handset repairing process, procedures
Troubleshooting techniques (software, fault finding)

Professional Skill:

Equipment operating Skills
Handset Repairing Skills
Handset/Component Handling skills
Troubleshooting Skills
Software Skills
Tablet Repairing Skills
Tablet Handling Skills

Core Skill:

Reading, Writing and Communication Skills
Time Management Skills
Analytical Skills
Interpersonal Skills
Oral Communication (Listening & Speaking Skills)

Detailed Syllabus of Course

Module. No	**Module. Name**	**Minimum No. of Hours**
1.	Introduction and Job role overview	10
2.	Communication Skills	6
3.	Procedures / processes for repair	15
4.	Problem solving, Fiber testing and splicing	76
5.	Health and Safety & Reporting and Documentation	9
	Total Theory / Lecture Hours:	54
	Total Practical / Tutorial Hours:	66
	Total Hours:	120

Recommended Hardware:

Test Bench, test equipment (multimeters, frequency generators etc); Setup for end-to-end diagnostics and repair, software jigs

Recommended Software:	NIL
Text Books:	Training material for students supported through affiliated training partners.
Reference Books:	NIL

4.3 Telecom (Network Managed Services)

TSSC - ESDM Courses
(Optical Fiber Splicer)

Level Code:	3	**Vertical Name:**	Telecom (Network Managed Services)
Course Code:	TEL/Q6400	**Course Name:**	4.3.1 Optical Fiber Splicer

Objective of the Course:

The person should be able to undertake the efficient splicing of the optical fibre cables and support in optical fibre installation including fibre joint testing.

Learning Outcomes:

By the end of the training, the person should be able to carry out all activities pertaining to a role of Optical Splicer. Broadly these include the following:

Prepare cable for splicing operations
Ensure availability of tools and spares for splicing and testing
Perform splicing operations
Carry out route Inspection for laying of fiber
Coordinate trenching, cable laying, jointing and cable blowing activities
Test effectiveness & close activity
Health and Safety
Record parameters and generate compliance reports

Expected Job Roles:

Optical Fiber Splicer

Duration of the Course (in hours)	120 Hours
Minimum Eligibility Criteria and pre-	8th

requisites, if any	

Professional Knowledge:

Principle of OFC Communication Characteristics of OFC Important parameters of OFC Communication Optical Test Equipments Optical Cable Laying methods, procedures and processes

Professional Skill:

Equipment Operating Skills OFC splicing and splice testing skills Technical Interpretation Skills Problem Solving Skills

Core Skill:

Basic Reading and Writing Skills Communication Skills Basic Project Management Skills Interpretation Skills Interpersonal Skills

Detailed Syllabus of Course

Module. No	**Module. Name**	**Minimum No. of Hours**
1.	Introduction and Job Role Overview	8
2.	Communication, Reading & Writing Skills	4
3.	Details of Fiber splicing, Cable Laying	102
4.	Health and Safety & Reporting and Documentation	6
	Total Theory / Lecture Hours:	43 Hours
	Total Practical / Tutorial Hours:	77 Hours
	Total Hours:	120 Hours

Recommended Hardware:	Optical Splicing Equipment Optical test equipment like OTDR, light meter and power meter
Recommended Software:	NIL
Text Books:	Training material for students supported through affiliated Training Providers.
Reference Books:	NIL

TSSC - ESDM Courses
(Optical Fibre Technician)

Level Code:	4	**Vertical Name:**	Telecom (Network Managed Services)
Course Code:	TEL/Q6401	**Course Name:**	4.3.2 Optical Fiber Technician

Objective of the Course:

The person should be able to guide/oversee 'Optical Fibre Splicer' and optical cable rollout activities and in carrying out efficient optical splicing, test its effectiveness by undertaking periodic preventive maintenance activities and ensuring effective fault management in case of fault occurrence and support installation and commissioning of optical fiber cables as per route plan.

Learning Outcomes:

By end of the training, the person should be able to perform the following activities:

Carry out Inspection of route plan and obtain necessary clearances
Arrange for tools and spares
Coordinate trenching, cable laying, jointing and cable blowing activities
Test effectiveness & close activity
Obtain maintenance schedule and patrol assigned route section
Carry out maintenance testing of dark/ spare OFC, equipments at points of Presence (POPs)
Carry out planned repairs to the OFC
Carry out maintenance of equipments at Points of Presence (POPs)
Handling fault notifications on prompt basis
Fault localization and rectification

Expected Job Roles:

Optical Fiber Technician

Duration of the Course (in hours)	120 Hours
Minimum Eligibility	10+2

Criteria and pre-requisites, if any	

Professional Knowledge:

Principle of OFC Communication
Characteristics of OFC
Important parameters of OFC Communication
Optical Test Equipments
Optical Cable Laying methods, procedures and processes

Professional Skill:

Equipment Operating Skills
OFC splicing and splice testing skills
Technical Interpretation Skills
Problem Solving Skills
Managerial Skills

Core Skill:

Basic Reading and Writing Skills
Communication Skills
Basic Project Management Skills
Interpretation Skills
Interpersonal Skills

Detailed Syllabus of Course

Module. No	**Module. Name**	**Minimum No. of Hours**
1.	Introduction and Job Role Overview	8
2.	Communication, Reading & Writing Skills	4
3.	Details of Fiber splicing, Cable Laying	77
4.	Fault Notification, Rectification	6
5.	Cable maintenance & Problem solving	18
6.	Health and Safety & Reporting and Documentation	5
	Total Theory / Lecture Hours:	57
	Total Practical / Tutorial Hours:	63

Total Hours:	120

Recommended Hardware:	Optical Splicing Equipment Optical test equipment like OTDR, light meter and power meter
Recommended Software:	NIL
Text Books:	Training material for students supported through affiliated Training Providers.
Reference Books	NIL

TSSC - ESDM Courses
(Installation Engineer – SDH & DWDM/L2 & L3 Devices)

Level Code:	5	**Vertical Name:**	Telecom (Network Managed Services)
Course Code:	TEL/Q6300 or TEL/Q6301	**Course Name:**	4.3.3 Installation Engineer – SDH & DWDM/L2-L3 Devices

Objective of the Course:

An Installation engineer is responsible for installing SDH DWDM/L2-L3 equipment in the site and carrying out site acceptance testing. As an optional responsibility the engineer may need to undertake commissioning of the site based on network topology.

Learning Outcomes:

By end of the training, the person should be able to perform the following activities:

Installation of Equipment
Acceptance Testing of Equipment
Commissioning of Equipment

Expected Job Roles:

Installation Engineer
Testing & Commissioning Engineer

Duration of the Course (in hours)	120 Hrs
Minimum Eligibility Criteria and pre-requisites, if any	Diploma

Professional Knowledge:

Basics of Telecom equipment & categories. Transmission media – Optical, Electrical. Equipment Safety (Earthing/lightning protection etc) Types of cables and connectors Site installation checklist and critical punch points. Installation procedures Acceptance Test process and procedures Commissioning of equipment and handing over Occupational Health & Safety

Professional Skill:

Equipment Installation/Operating Skills Testing & Calibration skills Technical Interpretation Skills Analytical Skills Problem Solving Skills Managerial Skills

Core Skill:

Basic Reading and Writing Skills Communication Skills Basic Project Management Skills Interpretation Skills Interpersonal Skills

Detailed Syllabus of Course

Module. No	**Module. Name**	**Minimum No. of Hours**
1.	Equipment Installation	40
2.	Equipment Acceptance	40
3.	Equipment Commissioning	40
	Total Theory / Lecture Hours:	40
	Total Practical / Tutorial Hours:	80
	Total Hours:	120

Recommended Hardware:	SDH/DWDM Equipment or L2/L3 Equipment All requisite Installation material including cables and connectors Tools and equipment
Recommended Software:	System Software <will be bundled with equipment>
Text Books:	Training material for students supported through affiliated Training Providers.
Reference Books	NIL

4.4 Service Providers

TSSC - ESDM Courses
(Broadband Technician)

Level Code:	4	**Vertical Name:**	Service Providers
Course Code:	TEL/Q0102	**Course Name:**	4.4.1 Broadband Technician

Objective of the Course:

The person is responsible for installation, configuration and testing of CPE (modem, routers, and Switches) for broadband access. He also establishes connectivity between CPE and end-user device (CPU, Laptop, tablets, Smart/IP TV etc.) at customer premises and carries out basic trouble-shooting for identifying, localizing & rectifying cable, connectivity and equipment fault in coordination with NOC.

Learning Outcomes:

By the end of the training, the person should be able to perform the following activities:

Prepare and undertake for wiring and equipment installation
Configure CPE, establish connectivity between CPE and end user device
Establish connectivity with service provider gateway
Record configuration setting and testing steps for customer
Locate and trouble shoot cable & connector fault
Rectify the faults with cable, connectors and CPE
UPS Installation and its handling
Complete documentation and clean-up worksite

Expected Job Roles:

Broadband Technician

Duration of the Course (in hours)	120-150 Hours approx.
Minimum Eligibility Criteria and pre-requisites, if any	10+2

Professional Knowledge:

Knowledge of Customer Premise Equipment (CPE), Cable Laying, Connectorisation, structured cabling norms Basic concepts of Network topologies, TCP/IP, Broadband Network Elements, Gateways, IP Address, Subnet masks, Ethernet and MAC Address, IPv4, IPv6 Identification of cables and cable pairs and their maintenance Basic knowledge of EMI / EMC Basic knowledge of UPS and its handling

Professional Skill:

Equipment installation / Task Management Skills Technical interpretation Equipment Configuration / Operating Skills Problem solving skills Analytical Skills Planning and Execution

Core Skill:

Basic Reading & Writing Skills Communication Skills Reading Skills Oral communication Skills

Detailed Syllabus of Course

Module. No	Module. Name	Minimum No. of Hours
1	System wiring and equipment installation at customer premises	30 / 40
2	Configuration of equipment and establishing Broadband connectivity	30 / 40
3	Trouble-shoot to localize and rectify faults	30 / 40
4	UPS installation & Domestic Power Supply checks	30 / 40
	Total Theory / Lecture Hours:	120-150 Hours
	Total Practical / Tutorial Hours:	
	Total Hours:	

Recommended Hardware:

Recommended Software:	NIL
Text Books:	Training material for students supported through affiliated training partners.
Reference Books:	NIL