

Model Curriculum

Mechanic – Electrical/Electronics/ Instrumentation

Mechanic Course – Electrical/Electronics/ Instrumentation

SECTOR: **Infrastructure Equipment**
SUB-SECTOR: **Equipment Service and Spares**

OCCUPATION: **Equipment Maintenance**
REFERENCE ID: **IES /Q 1105 Version 1.0**
NSQF LEVEL: **4**

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Mechanic – Electrical/Electronics/Instrumentation

CURRICULUM / SYLLABUS

This program is aimed at training candidates for the job of a “Mechanic – Electrical/Electronics/Instrumentation”, in the “Infrastructure Equipment” Sector/Industry and aims at building the following key competencies amongst the learner

Program Name	Mechanic Course Electrical/Electronics/Instrumentation		
Qualification Pack Name & Reference ID.	IES/Q 1105		
Version No.	1.0	Version Update Date	30-12 -2015
Pre-requisites to Training	<ul style="list-style-type: none"> • Preferably ITI / Diploma in Electrical/Electronics/Instrumentation • Certification Training in Electrical/Electronics/Instrumentation preferred • Mandatory: should have 2years experience in Electrical/Electronics/ Instrumentation Maintenance 		
Training Outcomes	<p>After completing this programme, participants will be able to:</p> <ul style="list-style-type: none"> • Carry out repairs and maintenance of equipment’s electrical/electronic/ instrumentation systems. In-depth working of electrical/electronic/ instrumentation systems, identification and use of diagnostic tools and equipment to locate faults, techniques for removal of defective components, rectification, re-assembly and testing. • Carryout reporting and documentation. Procedure for reporting and escalating unresolved problems; field visits documentation and parts management. • Comply with workshop health and safety guidelines. Health, safety and environment policies; personal protective equipment, fire-fighting equipment, basic first aid for common injuries at work shop 		

This course encompasses 3 out of 3 National Occupational Standards (NOS) of “Mechanic - Electrical/Electronics/ Instrumentation” Qualification Pack issued by “SSC: Infrastructure Equipment Skill Council”.

Sr. No.	Module	Theory Duration (hh:mm)	Practical Duration (hh:mm)	Key Learning Outcomes	Corresponding NOS Code	Equipment Required
1	Repairs & Maintenance of Equipment's Electrical/ Electronic/ Instrumentation Parts/Systems	22:00	50:00	<p>Organisational Context:</p> <ul style="list-style-type: none"> • Organisation structure, reporting and escalation procedure and time line. • Performance standards and procedures in the company. • Work target and review mechanism / feedback with supervisor • Location and process for storage and disposal of waste. <p>Technical Knowledge:</p> <ul style="list-style-type: none"> • In depth working of equipment's electrical systems & components • Electrical symbols and circuit diagrams – reading & interpretation. • Manufacturer's tech specs and service procedures for electrical systems in use. • Identification and use of various hand tools; and their calibration. • Identification and use of various diagnostic tools and their calibration. • Procedure for removal of electrical parts / 	IES/N 1105	<ul style="list-style-type: none"> • <u>Related equipment's electrical/electronic/instrumentation system with all related components /assemblies/ accessories</u> • All components & assemblies should be functional and mounted on a platform. • Standard tools and lab equipment for dis-assembly and assembly. • Standard electrical/ electronic/ instrumentation diagnostic tools & test equipment. • Cut-outs & models of major parts like starter motor, alternator, relays, switches, solenoids, fuse boxes, instrument panel • Class room with audio-video system • Manufacturers Electrical Service /Repair Manual & Video • Safety video • PPE Items • <u>Lab/workshop</u>

				<p>components from the equipment</p> <ul style="list-style-type: none"> • Procedure for further removing sub- parts/ sub-components. • Technique of laying out removed parts in logical sequence to aid re-assembly • Methods of keeping components parts together after stripping. • Techniques of inspecting removed parts for wear and tear/damage • Techniques used to diagnose faults; sensory & other checks • Methods of fault rectification; viz repairs & refitting, replacement & adjustments. • Techniques of checking new parts like seals, gaskets and filters before fitment. • Techniques of testing in the lab after fitment. • Procedure for re-fitment of electrical parts & components on the equipment • Post repairs & re-fitment, operation test of electrical system / sub assembly. <p>Skills - Core & Professional</p>		
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				<ul style="list-style-type: none"> • Read & understand general instructions/ manuals/ guidelines related to equipment. • Record and document details of repairs and maintenance carried out, on prescribed format. • Interact with customers as necessary to understand problems and issues. • Orally communicate information & instructions to co-workers in a clear and concise manner. • Plan and organise repair tasks with all concerned in most efficient and cost-effective way. <p>Performance Criteria:</p> <p>Breakdown Repair</p> <ul style="list-style-type: none"> • Collect all relevant information /data on the symptoms of the fault. • Select and apply the appropriate diagnostic tools to locate the fault. • Remove the defective part / component safely without damaging other surrounding ones. • Repair or replace the defective components using 		
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				<p>approved tools and procedures as per the manufacturer's manual</p> <ul style="list-style-type: none"> • Reinstatement parts & components and test electrical system for operational efficiency as per manufacturer's guidelines. <p>Maintenance Work</p> <ul style="list-style-type: none"> • Follow maintenance schedule as per manufacturer's manual • Replenish or change consumables as per manufacturer's manual • Clean & test all components for their performance as per the procedure given in the manual. • Verify all safety devices are operating correctly 		
2	Reporting & Documentation	10:00	26:00	<p>Organisational Context</p> <ul style="list-style-type: none"> • Different reporting channels in the company. • Responsibilities and time frame for resolving problems. • Equipment costs and delay implications to company. <p>Technical Knowledge</p> <ul style="list-style-type: none"> • Besides technical knowledge related to repairs and 	IES/N 7701	<ul style="list-style-type: none"> • Formats of various documents for reporting

				<p>maintenance should know.</p> <ul style="list-style-type: none"> • Different types of documents and Company guide lines on filling and processing. • Methods to collect and collate the requisite info from various sources. <p>Skills - Core & Professional</p> <ul style="list-style-type: none"> • In addition to core and generic skills listed above • Interact regularly with team members to work efficiently. • Identify bottle necks and take timely remedial action. <p>Performance Criteria.</p> <p>Report unresolved problems</p> <ul style="list-style-type: none"> • Follow reporting procedure as per company policy. • Escalate problems / incidents in timely manner as per procedure. <p>Prepare field visit report</p> <ul style="list-style-type: none"> • Identify job related documentation to be done • Use prescribed formats and 	
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				<p>record details accurately</p> <ul style="list-style-type: none"> • Complete list of parts to be procured and initiate action • Adhere to suggested time lines as laid down by company • Documents to be made available to appropriate authorities for inspection /audit 		
3	Comply with Workshop Health and Safety Guidelines	04:00	08:00	<p>Organisational Context</p> <ul style="list-style-type: none"> • Health, safety, environmental (HSE) policies and guidelines of the company & their importance • Reporting channel and documentation procedure for all HSE related matters • Contact details of personnel responsible for HSE related matters & in case of emergencies. • Location of workshop store, first aid station and assembly points <p>Technical Knowledge</p> <ul style="list-style-type: none"> • OEMs guidelines for health, safety and security requirements. 	IES/N 7602	<ul style="list-style-type: none"> • PPE Items • Firefighting Equipment • First Aid Kit

			<ul style="list-style-type: none"> • Types, use and importance of Personal Protective Equipment (PPE) • Types of common hazards and risks at workshop and preventive measures. • Safe practices when working with tools and machines • In case of emergencies procedure to stop/ shut down machinery. • Common injuries and appropriate basic first aid treatment. • Firefighting equipment: Basic knowledge of handling and using them. • Guidelines for transport, storage and disposal of hazardous materials and waste • Safety signs/symbols and warnings used in workshops and their meaning <p>Skills - Core & Professional</p> <ul style="list-style-type: none"> • In addition to the core and generic skills listed above • Use correct PPE and other safety gear while in the work shop. <p>Performance Criteria</p>		
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				<ul style="list-style-type: none"> • Comply with safety, health, environment and security related regulations & guidelines at work. • Carry out maintenance operations as per manufacturers and workshop related procedures • Correct use of Personal Protective Equipment (PPE) and other safety gear at work site. • Lift and carry tools and equipment safely using correct procedures • Keep work area free from clutter, waste and spillage • Store tools & equipment at designated places only post use. • Operate fire extinguishers as applicable. • Support in administering basic first aid. • Record and report details as related to operations, incidents or accidents as applicable. 		
Total Duration: <u>36:00</u> <u>84:00</u>			Unique Equipment Required: <ul style="list-style-type: none"> • <u>Electrical/Electronic/Instrumentation System with all related components/assemblies.</u> • Standard tools and equipment for dis-assembly & assembly. • Standard electrical/electronic diagnostic tools and test equipment. • Class room with audio-video projection system. • Manufacturers Electrical Service/Repair Manual & Video. 			

- Safety video.
- PPE Equipment: Helmet, gloves, earplugs, goggles, safety shoes.
- Firefighting equipment and 'How to Use' Charts
- First Aid Box and 'How to Do' Charts.
- Lab/workshop fully equipped for electrical /electronic / instrumentation service and repairs.

Grand Total Course Duration: **120 Hours, 0 Minutes**

*(This syllabus/ curriculum has been approved by **SSC: Infrastructure Equipment Skill Council**)*

Annexure1: Assessment Criteria

Assessment Criteria for Mechanic Electrical/ Electronic/ Instrumentation	
Job Role	Mechanic Electrical/ Electronic/ Instrumentation
Qualification Pack	IES/Q 1105 Version 1.0
Sector Skill Council	Infrastructure Equipment

Sr. No.	Guidelines for Assessment
1	Criteria for assessment for each Qualification Pack will be created by the Sector Skill Council. Each Performance Criteria (PC) will be assigned marks proportional to its importance in NOS. SSC will also lay down proportion of marks for Theory and Skills Practical for each PC
2	The assessment for the theory part will be based on knowledge bank of questions created by the SSC
3	Individual assessment agencies will create unique question papers for theory part for each candidate at each examination/training centre (as per assessment criteria)
4	Individual assessment agencies will create unique evaluation for skill practical for every student at each examination/training centre based on this criteria
5	To pass the Qualification Pack, every trainee should score a minimum of 50% aggregate
6	In case of successfully passing only certain number of NOS's, the trainee is eligible to take subsequent assessment on the balance NOS's to pass the Qualification Pack

NOS	Assessment criteria	Marks Allocation			
		Total Marks	Out Of	Theory	Practical
1. IES/N1105 Carry out repair and maintenance of equipment's electrical/electronic/instrumentation systems	PC1. Collect relevant information on the symptoms and problems associated with the fault	58	2	1	1
	PC2. Select appropriate diagnostic techniques, tools and aids to locate the fault as per service manual		3	0	3
	PC3. Apply appropriate diagnostic techniques, tools and aids to locate the fault		2	1	1
	PC4. Investigate and establish the most likely causes of the fault as per the Standard Operating Plan		1	0	1
	PC5. Inspect the work area is free from hazards as per the safety norm of the organization		3	0	3
	PC6. Inspect the work area and check for the cleanliness and as per the organizational standards		3	0	3
	PC7. Carry out random checks and inspections to keep a check on the quality of work carried out		2	1	1

PC8. Conduct visual inspection/flash test as per service manual
PC9. Verify conformity of mains supply to electrical/manufacture's standards
PC10. Use test equipment to accurately measure and interpret, e.g. voltage, current flow, earth continuity, resistance as per Standard Operating Procedure
PC11. Diagnose faults in infrastructure equipment electronic control systems and components
PC12. Interpret diagnostic results as per manufacturer's manual
PC13. Recommend action to rectify the fault as per Standard Operating Procedure
PC14. Remove, replace or repair the required components, using approved tools and techniques as per the manufacturer's manual
PC15. Ensure to remove, replace or repair the required components without causing damage to components or surrounding structures
PC16. Report any instances where the removal and replacement activities cannot be fully met as per company's policy
PC17. Complete the relevant documentation, in accordance with organizational requirements
PC18. Work safely at all times, complying with health and safety and other relevant regulations, directives and guidelines
PC19. Handle and dispose waste based on environmental guidelines at the work place
PC20. Follow the maintenance schedule as per the operator and maintenance manual
PC21. Check the components of Electrical/Electronics/Instrumentation as per the Service manual
PC22. Replace the components of Electrical/Electronics/Instrumentation system as per manufacturer's manual

1	0	1
1	0	1
2	1	1
1	0	1
1	0	1
2	1	1
2	1	1
2	1	1
2	1	1
1	0	1
3	0	3
1	0	1
1	0	1
1	0	1
2	1	1

PC23. Verify in appropriate sequence for the components of Electrical system as per Service manual

- Starter circuits
- Ignition circuits
- Charging circuits
- Lighting circuits
- Instrumentation
- Spark ignition
- Ancillary circuits
- Battery

PC24. Verify conformity of mains supply to electrical/manufacture's standards.

- flash test
- visual inspection

PC25. Verify correct operation of safety devices, e.g. circuit protection, fuses, safety switches as per manufacturer's manual

PC26. Verify the following to judge the appropriate operation of electronic control and monitoring electronic system components as per service manual

- Transistors
- Capacitors
- Regulators
- Resistors
- Transformers
- Thermistors
- Transmitters
- Electronic control units

PC27. Cleaning of electronic components as per standard operating procedure

PC28. Report any instances where the parts need to be changed/repared as per organization policy

PC29. Replenish / change the consumables as per the manufacturer's manual

PC30. Assemble back, close covers, guards & prepare for taking the trials as per manufacturer's manual

4	1	3
3	0	3
2	1	1
4	1	3
2	1	1
1	0	1
1	0	1
1	0	1

	PC31. Complete the relevant documentation, in accordance with organizational requirements		1	0	1
		Total	58	13	45
2. IES/N7701 Carry out Reporting and Documentation	PC1. Follow reporting procedures as laid down by the employer	17	2	1	1
	PC2. Report and escalate problems/incidents as required in a timely manner as per organizational policy		1	0	1
	PC3. Report to the appropriate authority as per the policy laid down by the employer		2	1	1
	PC4. Identify job related documentation that needs to be completed		2	1	1
	PC5. Prepare parts list that needs to be procured for resolving problem in equipment		3	0	3
	PC6. Use prescribed formats and record details accurately as per the process		2	1	1
	PC7. Complete all documentation as per the policy laid down by the employer		2	1	1
	PC8. Adhere to the suggested timelines as per company's policy		1	0	1
	PC9. Make the documents available to appropriate authorities for inspection as per company's policy		2	1	1
			Total	17	6
3. IES/N7602 Comply with workshop health and safety guidelines	PC1. Comply with safety, health, security and environment related regulations/ guidelines as per organizational/ manufacturer's policy	25	2	1	1
	PC2. Carry out maintenance operations as per the manufacturer's and workshop related health and safety guidelines/ standard operating procedures		3	0	3
	PC3. Follow safety regulations and procedures with regard to service workshop hazards and risks		2	1	1
	PC4. Use appropriate protective clothing/ equipment for specific tasks and work conditions as per service manual		2	1	1
	PC5. Lift and carry tools/equipment/components safely		4	1	3

	using correct procedure as per the service manual			
	PC6. Use appropriate tools in a proper manner as given in the service manual	3	0	3
	PC7. Keep the work area free from clutter and spillage	2	1	1
	PC8. Store equipment and tools back at designated place post use and inspect to make sure they are not left behind	1	0	1
	PC9. Handle the storage and disposal of hazardous materials and waste in compliance with health, safety and environmental guidelines	1	0	1
	PC10. Operate various grades of fire extinguishers, as applicable	2	1	1
	PC11. Support in administering basic first aid and report to concerned team members, as required, in case of an accident	1	0	1
	PC12. Respond promptly and appropriately to an accident/ incident or emergency situation, within limits of your role and responsibility	1	0	1
	PC13. Record and report details related to operations, incidents or accidents, as applicable	1	0	1
	Total	25	6	19

Annexure2

Trainer Pre-requisites for Job role: “Mechanic Electrical/Electronics/Instrumentation” Mapped to Qualification Pack: “IESC/Q 1105 Version 1.0”

Sr. No	Area	Details
1	Description	To deliver accredited training service, mapping to the curriculum detailed above, in accordance with the Qualification Pack “IES/Q 1105 Version 1.0”.
2	Personal Attributes	Aptitude for conducting training, with strong communication and interpersonal skills. Passion for training and developing others; well-organised; and a team player. Eager to learn and keep oneself updated with the latest in the mentioned field.
3	Minimum Educational Qualifications	ITI / Diploma in Electrical/Electronic/Instrumentation
4a	Domain Certification	Certified for Job Role: “ <u>Mechanic Electrical/Electronic/Instrumentation</u> ” mapped to QP: “ <u>IES/Q 1105 – Version 1.0</u> ”. Minimum accepted score 70%. Desired: Certification Training in Electrical/Electronic/Instrumentation Service
4b	Platform Certification	Certified for Job Role: “ <u>Trainer</u> ” mapped to Qualification Pack: SSC/1402. Minimum accepted score 70%.
5	Experience	<ul style="list-style-type: none"> • Around 3 to 4 years’ experience in Electrical/Electronic/Instrumentation service and repairs. • Desirable: Should have conducted Electrical/Electronic/Instrumentation service training programs.



Certificate

CURRICULUM COMPLIANCE TO QUALIFICATION PACK – NATIONAL OCCUPATIONAL STANDARDS

is hereby issued by the

INFRASTRUCTURE EQUIPMENT SKILL COUNCIL

for the

MODEL CURRICULUM

Complying to National Occupational Standards of
Job Role/ Qualification Pack: 'Mechanic Electrical/Electronics/ Instrumentation'
QP No. 'IES/ Q 1105 NSQF Level 4'

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Authorized Signatory
(Infrastructure Equipment Skill Council)



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