Model Curriculum

Setter and Operator – Non-conventional Electro Discharge Machine (Spark Erosion)

SECTOR:	**CAPITAL GOODS**
SUB-SECTOR:	**1. Machine Tools** **2. Dies, Moulds and Press Tools** **3. Plastics Manufacturing Machinery** **4. Textile Manufacturing Machinery**
OCCUPATION:	**Machining**
REF ID:	**CSC/Q0122, V1.0**
NSQF LEVEL:	**4**

Certificate

CURRICULUM COMPLIANCE TO QUALIFICATION PACK – NATIONAL OCCUPATIONAL STANDARDS

is hereby issued by the

CAPITAL GOODS SKILL COUNCIL

for the

MODEL CURRICULUM

Complying to National Occupational Standards of

Job Role/ Qualification Pack: **'Setter and Operator– Non-conventional Electro Discharge Machine (Spark Erosion)'**

QP No. **'CSC/ Q 0122, NSQF Level 4'**

Date of Issuance: April 10th, 2014

Valid up to : August 30th, 2016

Authorised Signatory
Tourism & Hospitality Skill Counicl

TABLE OF CONTENTS

Setter and Operator-Non-conventional Electro Discharge Machine (Spark Erosion)

CURRICULUM / SYLLABUS

This program is aimed at training candidates for the job of a "Setter and Operator Non-conventional Electro Discharge Machine (Spark Erosion)", in the "Capital Goods" Sector/Industry and aims at building the following key competencies amongst the learner

Program Name	**Setter and Operator Non-conventional Electro Discharge Machine (Spark Erosion)**		
Qualification Pack Name & Reference ID. ID	CSC/Q0122, v1.0		
Version No.	1.0	**Version Update Date**	
Pre-requisites to Training	12th Standard passed, preferably		
Training Outcomes	**After completing this programme, participants will be able to:** • **Set a non-conventional electro-discharge machine (spark erosion) for machining operations on metal components :** setting an electro discharge machine (spark erosion) for machining of metal components as per given specifications • **Perform machining operations on metal products using non-conventional controlled electro-discharge machine (spark erosion):** machining of metal components using a non-conventional electro discharge machine (EDM) to modify a range of component shapes via spark erosion, as per given specifications. • **Basic health and safety practices at the workplace:** identify risks and hazards at workplace, use of PPE, and apply good housekeeping practices, etc., • **Work effectively with others:** effectively communicate with others and demonstrate good ethical practices and discipline.		

This course encompasses 4 out of 4 National Occupational Standards (NOS) of "Setter and operator –Non-conventional Electro Discharge Machine (Spark Erosion)" Qualification Pack issued by "Capital Goods Skill Council".

Sr. No.	Module	Key Learning Outcomes	Equipment Required

1	**Set a non-conventional electro-discharge machine (spark erosion) for machining operations on metal components**
	
	Theory Duration
	(hh:mm)
	20:00
	
	Practical Duration
	(hh:mm)
	100:00
	
	Corresponding NOS Code
	CSC/N0122
		• Read and interpret first and third angle component drawings
		• Describe various systems of measurement
		• Convert units from one system of measurement to another
		• Describe various non-conventional EDM machining operations
		• List main features and identify main working parts of the non-conventional EDM
		• Identify main accessories of a non-conventional EDM machine
		• Identify main work holding /positioning devices and explain the method to set up work holding devices and electrodes
		  ○ Pneumatic/Magnetic table
		  ○ Machine vice
		  ○ 3 jaw chuck
		  ○ 4 jaw chuck
		  ○ Ancillary indexing devices
		• Identify different types of electrodes
		  ○ Plain electrodes
		  ○ Profile electrode
		  ○ Hollow electrode
		• Explain the parameters to select electrodes
		• Identify various types of materials ferrous and non-ferrous metals
		  ○ Low medium steel
		  ○ Medium steel
		  ○ High carbon steel
		  ○ Low alloy steels
		  ○ Stainless steel
		  ○ Aluminium and aluminium alloys
		  ○ Bronze etc.
		• Describe physical and mechanical properties of most commonly used ferrous and non ferrous metals
		• Describe settings based on the material
		• List the factors that determine the current density, spark frequency, linear feeds and speed
		• Explain various quality control procedures
		• List the measuring tools used to check the dimensional accuracy
			Training Kit (PowerPoint, Trainer Guide)
			Personal Protective Equipment, protractor, depth/internal/external micrometer, Vernier calliper, vernier height gauge, feeler gauge, feeler gauge, bore/hole gauge, slip gauge, radius gauge, profile gauge, thread gauge, plug gauge, stick micrometer, dial stand and comparator, non conventional EDM

Sr. No.	Module	Key Learning Outcomes	Equipment Required
		○ Protractor ○ Depth/Internal/External micrometer ○ Vernier calliper ○ Height gauge ○ Feeler gauge ○ Bore/hole gauge ○ Slip gauge ○ Radius/profile gauge ○ Thread gauge ○ Plug gauge ○ Stick micrometer ○ Dial stand and comparator etc. • Explain various safety precautions to be followed while operating a non-conventional EDM • List Personal Protective Equipment required • Wear Personal Protective Equipment correctly • Carryout preliminary checks for the readiness of the EDM ○ Machine should be clean ○ Positioning and alignment of the work piece ○ Operation of the lubrication mechanism ○ Coolant level ○ Working of the subsystems • Extract information from valid sources • Set the machine to produce components within all of the quality and accuracy standards, as applicable to the operations performed • Mount and set the required work holding devices, work piece and cutting tools • Produce internal and external profiles of various component features ○ Flat faces ○ Parallel and angular faces ○ Concave feature ○ Convex feature ○ Square/rectangular feature ○ Holes ○ Engraving ○ Cavities ○ Radii/arcs ○ Slots ○ Sharp edges • Check the component for dimensional accuracy and defects ○ Components to be free from damage	

Sr. No.	Module	Key Learning Outcomes	Equipment Required
		○ False cut tools ○ Burrs ○ Scratches and non-specified sharp edges ○ Dimensional tolerance +/- 0.020 mm ○ Flatness and squareness 0.05 mm ○ Angles within +/- 1 degree • Hand over the machine to the operator with proper documentation as per the company policy • Operate the machine in normal and emergency situations • Shut down the equipment to a safe condition on conclusion of the activities • Communicate with people in respectful form and manner in line with organizational protocol • Undertake basic numerical operations, and calculations/ formulae • Identify various basic, compound and solid shapes • Identify problems with work planning, procedures, output and behavior and their implications • Plan, prioritize and sequence work operations as per job requirements • Manage own time for achieving better results • Work in a team in order to achieve better results	
2	**Perform machining operations on metal products using non-conventional controlled electro discharge machine (spark erosion)** **Theory Duration** (hh:mm) 20:00 **Practical Duration** (hh:mm) 100:00 **Corresponding NOS Code** CSC/N0119	• Carryout preliminary checks for the readiness of the EDM ○ The machine should be clean ○ Positioning and alignment of the workpiece ○ Operation of the lubrication mechanism ○ Coolant level ○ Working of the subsystems • Extract information from valid sources • Prepare the work area for the machining operations • Collect workpieces, measuring tools, positioning and holding devices from the concerned authority • Check for the calibration status of the measuring tools and use only calibrated measuring instruments • Set workpieces as per job requirements using appropriate positioning and/or holding devices and	Training Kit (PowerPoint, Trainer Guide), Personal Protective Equipment, protractor, depth/internal/external micrometer, Vernier calliper, vernier height gauge, feeler gauge, feeler gauge, bore/hole gauge, slip gauge, radius gauge, profile gauge, thread gauge, plug gauge, stick micrometer, dial stand and comparator, non conventional EDM

Sr. No.	Module	Key Learning Outcomes	Equipment Required
		support mechanisms • Manipulate the machine tool controls safely and correctly in line with operational procedures • Produce machined components with required features o Flat faces o Parallel and angular faces o Concave feature o Convex feature o Square/rectangular feature o Holes o Engraving o Cavities o Radii/arcs o Slots o Sharp edges • Check the component for dimensional accuracy and defects o Components to be free from damage o False cut tools o Burrs o Scratches and non-specified sharp edges o Dimensional tolerance +/- 0.020 mm o Flatness and squareness 0.05 mm o Angles within +/- 1 degree • Carryout documentation as per the company policy • Return all tools and equipment to the correct location on completion of the machining activities • Leave the work area in a safe and tidy condition on completion of job activities • Communicate with people in respectful form and manner in line with organizational protocol • Undertake basic numerical operations, and calculations/ formulae • Identify various basic, compound and solid shapes • Identify problems with work planning, procedures, output and behaviour and their implications • Plan, prioritize and sequence work operations as per job requirements • Manage own time for achieving better results • Work in a team in order to achieve better results	

Sr. No.	Module	Key Learning Outcomes	Equipment Required
3	**Health and safety** **Theory Duration** (hh:mm) 10:00 **Practical Duration** (hh:mm) 08:00 **Corresponding NOS Code** CSC/N1335	• Explain the importance of personal protective equipment (PPE) required for gas cutting operation • State the causes for accidents • Identify job site hazardous work and state possible causes of risk or accident at the workplace • Explain the importance of '5S' at the workplace	Training kit (Trainer guide, PowerPoint) Leather gloves, leather apron, welding screen – helmet types, hand screen welding and safety shoes
4	**Fire Safety** **Theory Duration** (hh:mm) 05:00 **Practical Duration** (hh:mm) 30:00 **Corresponding NOS Code** CSC/N1335	• Explain types of fires - Class A, B, C and D • Select appropriate fire extinguisher to control fire • Use PASS method to operate a fire extinguisher • Follow fire safety signs and safe evacuation method in case of a fire • Identify the location of assembly point, fire exit, fire alarm • Follow reporting procedure in case of a fire	Training kit (Trainer guide, PowerPoint) Class A, B, C, D and K fire extinguishers
5	**Emergencies, rescue and first aid procedure** **Theory Duration** (hh:mm) 09:00 **Practical Duration** (hh:mm) 18:00 **Corresponding NOS Code** CSC/N1335	• Follow electrical safety procedures • Use approved method to rescue a person from electrocution • State the importance of first aid • Identify the contents of a first aid kit and their application • Administer first aid in case of bleeding, burns, choking, electrical shock, poisoning, etc. • Use of CPR process • Bandage wounds • Explain stages of crisis and crisis management • Prepare an incident report	Training kit (Trainer guide, PowerPoint) First aid kit with all contents
6	**Work effectively with others** **Theory Duration** (hh:mm) 20:00 **Practical Duration** (hh:mm) 60:00	• Explain the importance of team work and team dynamics • State 4Cs of working in a team • Explain types of communication • Apply effective communication technique • Overcome barriers to effective communication • Demonstrate active listening skills • Demonstrate good customer service	Training kit (Trainer guide, PowerPoint)

Sr. No.	Module	Key Learning Outcomes	Equipment Required
	Corresponding NOS Code CSC/N1336	skills • Explain the importance of ethical behaviour in your day-to-day work • State the importance of discipline in life and apply the same at workplace	
	Total Duration **Theory Duration 84:00** **Practical Duration 316:00**	**Unique Equipment Required:** Personal Protective Equipment, protractor, depth/internal/external micrometer, Vernier calliper, vernier height gauge, feeler gauge, feeler gauge, bore/hole gauge, slip gauge, radius gauge, profile gauge, thread gauge, plug gauge, stick micrometer, dial stand and comparator, non, Class A, B, C, D and K fire extinguishers, PPE, First aid kit with all contents	

Grand Total Course Duration: **400 Hours, 0 Minutes**
*(This syllabus/ curriculum has been approved by **Capital Goods Skill Council)***

Trainer Prerequisites for Job role: "Setter and operator –Non-conventional Electro Discharge Machine (Spark Erosion)" mapped to Qualification Pack: "CSC/Q0122 v1.0"

Sr. No.	Area	Details
1	**Description**	Perform setup operations on Non-conventional Electro- Discharge Machine (spark erosion) and to produce a range of component shapes, as per given specifications.
2	**Personal Attributes**	Basic communication, numerical and computational abilities. Openness to learning, ability to plan and organize own work and identify and solve problems in the course of working. Understanding the need to take initiative and manage self and work to improve efficiency and effectiveness.
3	**Minimum Educational Qualifications**	Diploma /Degree in Mechanical Engineering
4a	**Domain Certification**	Certified for Job Role: "Setter and operator Non-conventional Electro Discharge Machine (Spark Erosion)" mapped to QP: "CSC/Q0122, v1.0". Minimum accepted score is 80%
4b	**Platform Certification**	Recommended that the Trainer is certified for the Job Role: "Trainer", mapped to the Qualification Pack: "MEP/Q0102". Minimum accepted as per respective SSC guidelines is 80%.
5	**Experience**	• 3-4 years of industry experience in the relevant field • 3-4 years of teaching experience

Annexure: Assessment Criteria

Assessment Criteria	
Job Role	Setter and operator –Non-conventional Electro Discharge Machine (Spark Erosion)
Qualification Pack	CSC/Q00122, v1.0
Sector Skill Council	Capital Goods Skill Council

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 below)
4	Individual assessment agencies will create unique evaluations for skill practical for every student at each examination/training canter based on this criteria
5	To pass the Qualification Pack, every trainee should score a minimum of 70% in every NOS
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.

Assessable Outcome	Assessment Criteria	Total Mark (400)	Out Of	Marks Allocation	
				Theory	Skills Practical
1.CSC/N0122 Set a non-conventional electro-discharge machine (spark erosion) for machining operations on metal components	PC1.work safely at all times, complying with health and safety, environmental and other relevant regulations and guidelines	100	3	1	2
	PC2.check that all safety mechanisms are in place and that the equipment is set correctly for the required operations		3	1	2
	PC3.adhere to procedures or systems in place for health and safety, including personal protective equipment and other relevant safety regulations and procedures to contribute to a safe work Environment		4	1	3
	PC4.wear the appropriate protective clothing and equipment, and keep the work area clean and tidy		2	0	2
	PC5.follow safe practice/approved setting up procedures at all times		3	1	2
	PC6.ensure that all tools, equipment, power tool cables, extension leads are in a safe and usable condition		2	0	2
	PC7.ensure that the components used are free from foreign objects, dirt or other contamination		2	0	2
	PC8.conduct a preliminary check of the readiness of the electro discharge machine		3	1	2
	PC9.obtain job specification from a valid and approved source		2	0	2
	PC10.set the machine to produce components within all of the quality and accuracy standards, as applicable to the operations performed		5	2	3
	PC11.determine what has to be done and how the machine will be set to achieve this		3	1	2
	PC12.prepare the electro-discharge machine in readiness for production		2	0	2
	PC13.mount and set the required Work holding devices, work piece and cutting tools		4	2	2
	PC14.position and secure work pieces to machine table using appropriate means		4	2	2
	PC15.select and mount appropriate electrodes for roughing and finishing		5	2	3
	PC16.set the machine tool operating parameters to achieve the component Specification		6	2	4
	PC17.set up the machine in accordance with instructions and specifications		6	2	4
	PC18.set up the machine to produce internal and external profiles of various component features		4	0	4
	PC19.set up to machine components made from various materials		5	2	3
	PC20.conduct a trial runs and adjust parameters and positioning till output is as per required specifications		5	2	3
	PC21.hand-over the machine after setup to the		3	0	3

Assessable Outcome	Assessment Criteria	Total Mark (400)	Out Of	Marks Allocation	
				Theory	Skills Practical
	machine operator along with relevant instructions and documentation				
	PC22.complete relevant documentation as per organizational procedure		3	1	2
	PC23.switch the non-conventional EDM machine on and off in normal and emergency situations		3	0	3
	PC24.return the old cutting tools, work holding device, fixtures, instruments, drawings and verified tapes and programs back to store, safely and correctly		3	0	3
	PC25.ensure that there is no damage to the electrode/fixture while doing the setting activities		3	0	3
	PC26.complete documentation during and post operations and submit as per organizational procedures		3	1	2
	PC27.deal promptly and effectively with problems within their control, and seek help and guidance from the relevant people if they have problems that they cannot resolve		3	0	3
	PC28.shut down the equipment to a safe condition on conclusion of the activities		2	0	2
	PC29.return all tools and equipment to the correct location on completion of the non-conventional EDM machining activities		2	0	2
	PC30.leave the work area in a safe and tidy condition on completion of the fitting activities		2	0	2
	Total		**100**	**24**	**76**
2.CSC/N0119 Perform machining operations on metal products using Non conventional Electro-Discharge Machine (Spark Erosion)	PC1.comply with health and safety, environmental and other relevant regulations and guidelines at work	**100**	3	1	2
	PC2.adhere to procedures and guidelines for personal protective equipment (PPE) and other relevant safety regulations while performing Operations		4	1	3
	PC3.work following laid down procedures and instructions		3	1	2
	PC4.ensure work area is clean and safe from hazards		2	0	2
	PC5.ensure that all tools, equipment, power tool cables, extension leads are in a safe and usable condition		2	0	2
	PC6.ensure that machine guards are in place and are correctly adjusted		2	0	2
	PC7.conduct a preliminary check of the readiness of the electro discharge machine		3	0	3
	PC8.obtain job specification from a valid and approved source		2	0	2
	PC9.read and establish job requirements from the job specification document accurately		3	0	3
	PC10.report and rectify incorrect and inconsistent		4	1	3

Assessable Outcome	Assessment Criteria	Total Mark (400)	Out Of	Marks Allocation	
				Theory	Skills Practical
	information in job specification documents as per 2o4rganization procedures				
	PC11.prepare the work area for the machining operations as per procedure or operational specification		4	1	3
	PC12.ensure that all measuring equipment is calibrated and approved for usage		2	0	2
	PC13.ensure that the components used are free from foreign objects, dirt or other contamination		2	0	2
	PC14.obtain correct work pieces/raw materials and consumables as per job requirements		3	1	2
	PC15.obtain appropriate tools and equipment as per job requirements		3	1	2
	PC16.set work pieces as per job requirements using appropriate positioning and/or holding devices and support mechanisms		5	1	4
	PC17.manipulate the machine tool controls safely and correctly in line with operational procedures		6	2	4
	PC18.obtain and use the appropriate documentation (eg. job instructions, drawings, quality control documentation)		2	0	2
	PC19.ensure that machine settings are adjusted as and when required to maintain the required accuracy		3	0	3
	PC20.produce component shapes on a range of materials		4	0	4
	PC21.produce machined components with the required features		4	0	4
	PC22.produce components with dimensional accuracy, form and surface finish within all the relevant quality and accuracy standards as is applicable to the operations performed		6	2	4
	PC23.check the quality of the output as per required standards using visual checks and measurement of dimensional parameters		5	1	4
	PC24.complete documentation during and post operations as per organizational procedures		3	1	2
	PC25.return all tools and equipment to the correct location on completion of the fitting activities		2	0	2
	PC26.leave the work area in a safe and tidy condition on completion of job activities		2	0	2
	PC27.carry out sampling checks at suitable intervals		4	0	4
	PC28.ensure that the components produced meet the required specification for quality and accuracy		3	1	2
	PC29.use appropriate gauges or instruments to carry out the necessary checks, during production, for testing accuracy parameters		5	1	4
	PC30.deal promptly and effectively with problems within span of responsibility and control		4	0	4

Assessable Outcome	Assessment Criteria	Total Mark (400)	Out Of	Marks Allocation	
				Theory	Skills Practical
	and report those that cannot be solved				
	Total		**100**	**16**	**84**
3.CSC/N1335 Use basic health and safety practices at the workplace	PC1.use protective clothing/equipment for specific tasks and work conditions	**100**	5	2	3
	PC2.state the name and location of people responsible for health and safety in the workplace		3	1	2
	PC3.state the names and location of documents that refer to health and safety in the workplace		3	1	2
	PC4.identify job-site hazardous work and state possible causes of risk or accident in the workplace		5	2	3
	PC5.carry out safe working practices while dealing with hazards to ensure the safety of self and others state methods of accident prevention in the work environment of the job role		4	2	2
	PC6.state location of general health and safety equipment in the workplace		3	2	1
	PC7.inspect for faults, set up and safely use steps and ladders in general use		5	2	3
	PC8.work safely in and around trenches, elevated places and confined areas		5	2	3
	PC9.lift heavy objects safely using correct procedures		5	2	3
	PC10.apply good housekeeping practices at all times		4	2	2
	PC11.identify common hazard signs displayed in various areas		5	2	3
	PC12.retrieve and/or point out documents that refer to health and safety in the workplace		3	1	2
	PC13.use the various appropriate fire extinguishers on different types of fires correctly		4	1	3
	PC14.demonstrate rescue techniques applied during fire hazard		4	1	3
	PC15.demonstrate good housekeeping in order to prevent fire hazards		3	1	2
	PC16.demonstrate the correct use of a fire extinguisher		4	1	3
	PC17.demonstrate how to free a person from electrocution		4	1	3
	PC18.administer appropriate first aid to victims where required eg. in case of bleeding, burns, choking, electric shock, poisoning etc.		4	1	3
	PC19.demonstrate basic techniques of bandaging		3	1	2
	PC20.respond promptly and appropriately to an accident situation or medical emergency in real or simulated environments		4	1	3
	PC21.perform and organize loss minimization or rescue activity during an accident in real or simulated environments		3	1	2
	PC22.administer first aid to victims in case of a		3	1	2

Assessable Outcome	Assessment Criteria	Total Mark (400)	Out Of	Marks Allocation	
				Theory	Skills Practical
	heart attack or cardiac arrest due to electric shock, before the arrival of emergency services in real or simulated cases				
	PC23.demonstrate the artificial respiration and the CPR Process		3	1	2
	PC24.participate in emergency procedures		3	2	1
	PC25.complete a written accident/incident report or dictate a report to another person, and send report to person responsible		4	1	3
	PC26.demonstrate correct method to move injured people and others during an emergency		4	1	3
	Total		**100**	**36**	**64**
4.CSC/N1336 Work effectively with others	PC1.accurately receive information and instructions from the supervisor and fellow workers, getting clarification where required	**100**	10	3	7
	PC2.accurately pass on information to authorized persons who require it and within agreed timescale and confirm its receipt		10	3	7
	PC3.give information to others clearly, at a pace and in a manner that helps them to understand		10	3	7
	PC4.display helpful behavior by assisting others in performing tasks in a positive manner, where required and possible		10	3	7
	PC5.consult with and assist others to maximize effectiveness and efficiency in carrying out tasks		10	3	7
	PC6.display appropriate communication etiquette while working		10	3	7
	PC7.display active listening skills while interacting with others at work		10	3	7
	PC8.use appropriate tone, pitch and language to convey politeness, assertiveness, care and professionalism		10	3	7
	PC9.demonstrate responsible and disciplined behaviors at the workplace		10	3	7
	PC10.escalate grievances and problems to appropriate authority as per procedure to resolve them and avoid conflict		10	3	7
	Total		**100**	**30**	**70**
	Grand Total		**400**	**106**	**294**
	Percentage Weightage:			**26**	**74**
	Minimum Pass% to qualify (aggregate):		**70**		