

Model Curriculum

Operator – Computer Numerically Controlled Electro Discharge Machine (Spark Erosion)

SECTOR: CAPITAL GOODS
SUB-SECTOR: 1. Machine Tools
2. Tools Dies and Press Tools
3. Plastics Manufacturing Machinery
4. Textile Manufacturing Machinery
OCCUPATION: Machining
REF ID: CSC/Q0118, V1.0
NSQF LEVEL: 3



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: 'Operator – Computer Numerically Controlled Electro Discharge Machine (Spark Erosion)'

QP No. 'CSC/Q 0118, NSQF Level 3'

Date of Issuance: April 10th, 2014

Valid up to : August 30th, 2016

*Valid up to the next review date of the Qualification Pack or the
Valid up to date mentioned above (whichever is earlier)



Authorised Signatory
Tourism & Hospitality Skill Council

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Operator- Computer Numerically Controlled Electro Discharge Machine (Spark Erosion)

CURRICULUM / SYLLABUS

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

Program Name	Operator –Computer Numerically Controlled Electro Discharge Machine (Spark Erosion)		
Qualification Pack Name & Reference ID. ID	CSC/Q0118, v1.0		
Version No.	1.0	Version Update Date	
Pre-requisites to Training	12 th Standard Pass		
Training Outcomes	<p>After completing this programme, participants will be able to:</p> <ul style="list-style-type: none"> • Operate a computer numerically controlled electro-discharge machine (spark erosion) to machine metal components: perform machining operations on metal products using Computer Numerically Controlled Electro-Discharge machine (spark erosion, wire cut), to modify a range of component shapes, 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 3 out of 3 National Occupational Standards (NOS) of “Operator – Computer Numerically Controlled Electro Discharge Machine (Spark Erosion)” Qualification Pack issued by “Capital Goods Skill Council”.

Sr. No.	Module	Key Learning Outcomes	Equipment Required
1	<p>Operate a computer numerically controlled electro-discharge machine (spark erosion) to machine metal components</p> <p>Theory Duration (hh:mm) 40:00</p> <p>Practical Duration (hh:mm) 100:00</p> <p>Corresponding NOS Code CSC/N0118</p>	<ul style="list-style-type: none"> • Compare manual and CNC machining • Describe various types of CNC electrical discharge machines • Identify main parts of a CNC electro-discharge machine • State the special features of CNC electro-discharge machine • Interpret first angle and third angle drawings • Explain symbols and conventions of BS, ISO, BSEN, DIN etc. • Explain various systems of measurement and convert units from one system of measurement to another • Explain the use of various equipment used in the measurement <ul style="list-style-type: none"> ○ Steel rules ○ Internal micrometer ○ External micrometer ○ Depth micrometer ○ Vernier calliper ○ Protractors ○ Slip gauge ○ Bore gauge ○ Thread gauge ○ Plug gauge ○ Radius/profile gauge ○ Dial test indicator • Interpret various display messages • Demonstrate safety precautions to be followed while operating a CNC machine • Identify safety mechanisms provided in a CNC machine <ul style="list-style-type: none"> ○ Emergency stop buttons ○ Emergency brakes ○ Machine guards ○ Critical check points • State hazards associated CNC machine and take corrective actions to avoid such hazards • Identify various positioning and holding devices <ul style="list-style-type: none"> ○ Clamps ○ Machine vice ○ Angle plate ○ Vee block ○ Fixtures ○ Ancillary indexing device 	<p>Training kit (Trainer guide, PowerPoint), CNC EDM with all accessories, Steel rules, Internal micrometer, External micrometer, Depth micrometer. Vernier calliper, Protractors, Slip gauge, Bore gauge, Thread gauge, Plug gauge, Radius/profile gauge, Dial test indicator, Clamps Machine vice, Angle plate, Vee block. Fixtures, Ancillary indexing device, Personal Protective Equipment</p>

Sr. No.	Module	Key Learning Outcomes	Equipment Required
		<ul style="list-style-type: none"> • Identify various types of electrodes used in the machining • Identify various types of tools used in machining • Describe the method to visually check the condition of electrodes • Explain mode of machine control • State the impact of electrode wear and adjustments to be made • Explain the importance of sparking and arcing in EDM machining • Explain the importance of flushing, flowing and polarity • List Personal Protective Equipment Required for CNC machining • Wear Personal Protective Equipment correctly • Perform preliminary checks and make sure that the machine is in operating condition <ul style="list-style-type: none"> ○ Cleanliness of the machine ○ Referencing zero- return ○ Lubrication and coolant level ○ Functioning of sub systems ○ Right type of electrode • Analyze job specifications and sequence of operations to be carried out • Secure the components using a correct work holding devices • Check for the correct operating program as per the components being produced • Produce component shapes on a range of materials <ul style="list-style-type: none"> ○ Material ○ Low medium steel ○ High-carbon steel ○ Low alloy steel ○ Stainless steel ○ Cast iron ○ Aluminium and aluminium alloys ○ Bronze ○ Silicone etc. ○ Features ○ Faces(Square, flat, parallel, angular) ○ Threads ○ Forms (Concave, convex, square, square, rectangular) ○ Holes(tapered, on pitch circles, rows, angles) ○ Engraving 	

Sr. No.	Module	Key Learning Outcomes	Equipment Required
		<ul style="list-style-type: none"> ○ Internal and external profile forms ○ Cavities ○ Radii/arcs ○ Parallel/ tapered steps/slots/shoulders ○ Special features ● Check the accuracy of the finished component using suitable measuring device <ul style="list-style-type: none"> ○ Free from false starts and sharp edges ○ Dimensional tolerances 20 to 30 microns ○ Surface texture 0.8 micro meter ○ Machined holes with H6 ○ Angles within +/- 0.5 degree ○ Flatness and squareness 0.025 mm ○ G and M codes ● Fill up appropriate technical forms, process charts, activity logs etc. ● Convey and share technical information ● Undertake basic numerical computations and calculations ● Identify various basic, compound and solid shapes ● Demonstrate problem solving abilities ● Plan, prioritize and sequence work operations as per job requirements <p>Work in a team to achieve better results</p>	
2	<p>Health and safety</p> <p>Theory Duration (hh:mm) 10:00</p> <p>Practical Duration (hh:mm) 08:00</p> <p>Corresponding NOS Code CSC/N1335</p>	<ul style="list-style-type: none"> ● 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 	<p>Training kit (Trainer guide, PowerPoint)</p> <p>Leather gloves, leather apron, welding screen – helmet types, hand screen welding and safety shoes</p>
3	<p>Fire Safety</p> <p>Theory Duration (hh:mm) 05:00</p>	<ul style="list-style-type: none"> ● 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 	<p>Training kit (Trainer guide, PowerPoint)</p> <p>Class A, B, C, D and K fire extinguishers</p>

Sr. No.	Module	Key Learning Outcomes	Equipment Required
	Practical Duration (hh:mm) 30:00 Corresponding NOS Code CSC/N1335	evacuation method in case of a fire <ul style="list-style-type: none"> Identify the location of assembly point, fire exit, fire alarm Follow reporting procedure in case of a fire 	
4	Emergencies, rescue and first aid procedure Theory Duration (hh:mm) 09:00 Practical Duration (hh:mm) 18:00 Corresponding NOS Code CSC/N1335	<ul style="list-style-type: none"> 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
5	Work effectively with others Theory Duration (hh:mm) 20:00 Practical Duration (hh:mm) 60:00 Corresponding NOS Code CSC/N1336	<ul style="list-style-type: none"> 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 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 	Training kit (Trainer guide, PowerPoint)
	Total Duration Theory Duration 84:00 Practical Duration 216:00	Unique Equipment Required: CNC EDM with all accessories, Steel rules, Internal micrometer, External micrometer, Depth micrometer, Vernier calliper, Protractors, Slip gauge, Bore gauge, Thread gauge, Plug gauge, Radius/profile gauge, Dial test indicator, Clamps Machine vice, Angle plate, Vee block. Fixtures, Ancillary indexing device, Personal Protective Equipment , Class A, B, C, D and K fire extinguishers, PPE, First aid kit with all contents	

Grand Total Course Duration: **300 Hours, 0 Minutes**

(This syllabus/ curriculum has been approved by [Capital Goods Skill Council](#))

Trainer Prerequisites for Job role: “Operator-Computer Numerically Controlled EDM (Spark erosion)” mapped to Qualification Pack: “CSC/Q0118 v1.0”

Sr. No.	Area	Details
1	Description	Machining of a range of component shapes using Computer Numerical Control (CNC) electro-discharge machines (EDM), (spark erosion), 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: “ <u>Operator-Computer Numerically Controlled Electro-discharge machine (Spark erosion)</u> ” mapped to QP: “ <u>CSC/Q0118, v1.0</u> ”. 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	<ul style="list-style-type: none"> 3-4 years of industry experience in the relevant field 3-4 years of teaching experience

Annexure: Assessment Criteria

Assessment Criteria	
Job Role	Operator – Computer Numerically Controlled Electro Discharge Machine (Spark Erosion)
Qualification Pack	CSC/Q0118, 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 center (as per assessment criteria below) .
4	Individual assessment agencies will create unique evaluations for skill practical for every student at each examination/training center 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 (300)	Out Of	Marks Allocation	
				Theory	Skills Practical
1.CSC/N0118 Operate Computer Numerically Controlled Electro discharge Machine (Spark Erosion)	PC1.work safely at all times, complying with health and safety and other relevant regulations and guidelines.	100	4	1	3
	PC2.adhere to procedures or systems in place for health and safety, personal protective equipment (PPE) and other relevant safety regulations		5	1	4
	PC3.ensure machine guards are in place and correctly adjusted		3	0	3
	PC4.read and establish job requirements from the job specification document		3	0	3
	PC5.carry out preliminary check and confirm the machine readiness for the machining activities to be carried out		4	0	4
	PC6.obtain and use the appropriate job specification documentation and specifications from valid source		3	0	3
	PC7.use and extract information from reference charts, tables, graphs and standards		3	0	3
	PC8.seek any necessary instructions/support/information on the operation of the machine, where appropriate		3	0	3
	PC9.hold components securely without distortion		3	0	3
	PC10.check that the correct electrode is in place and is in usable condition		4	0	4
	PC11.ensure that the dielectric fluid is at an appropriate level		3	0	3
	PC12.check that the operating program is at the correct start point		3	0	3
	PC13.ensure that the workpiece is clear of the tooling before starting the machine		3	0	3
	PC14.follow the defined procedures for starting and running the operating system		4	1	3
	PC15.ensure that machine settings are adjusted as and when required to maintain the required accuracy		3	0	3
	PC16.produce component shapes on a range of materials		5	0	5
	PC17.produce machined components with the required features		5	0	5
	PC18.produce components with dimensional accuracy, form and surface texture as per specifications and required standards		6	2	4
	PC19.deal promptly and effectively with error messages or equipment faults that are within their control and report those that cannot be solved		4	0	4
	PC20.monitor the computer process and ensure		4	1	3

Assessable Outcome	Assessment Criteria	Total Mark (300)	Out Of	Marks Allocation	
				Theory	Skills Practical
	that the production output is to the required specification				
	PC21.shut down the equipment to a safe condition on conclusion of the activities		3	0	3
	PC22.check that the components produced meet the required specification for quality and accuracy		5	2	3
	PC23.use appropriate gauges or instruments to carry out the necessary checks, during production, for testing accuracy parameters		5	2	3
	PC24.identify unsatisfactory output and defects		3	0	3
	PC25.deal with defects and output shortcomings per procedures and appropriate rectification/further processing techniques		6	2	4
	PC26.deal promptly and effectively with problems within span of responsibility and control and report those that cannot be solved		3	0	3
	Total		100	12	88
2.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

Assessable Outcome	Assessment Criteria	Total Mark (300)	Out Of	Marks Allocation	
				Theory	Skills Practical
	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 heart attack or cardiac arrest due to electric shock, before the arrival of emergency services in real or simulated cases		3	1	2
	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
	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

Assessable Outcome	Assessment Criteria	Total Mark (300)	Out Of	Marks Allocation	
				Theory	Skills Practical
3.CSC/N1336 Work effectively with others	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			300	78	222
Percentage Weightage:				26	74
Minimum Pass% to qualify (aggregate):				70	