

Model Curriculum

5. Operator- Conventional Milling

SECTOR: CAPITAL GOODS

SUB-SECTOR: MACHINE TOOLS, DIES, MOULDS AND PRESS TOOLS, PLASTICS MANUFACTURING MACHINERY, TEXTILE MANUFACTURING MACHINERY, PROCESS PLANT MACHINERY, ELECTRICAL AND POWER MACHINERY, LIGHT ENGINEERING GOODS

OCCUPATION: MACHINING

REF ID: CSC/Q0108, V1.0

NSQF LEVEL: 2



Certificate

CURRICULUM COMPLIANCE TO QUALIFICATION PACK – NATIONAL OCCUPATIONAL STANDARDS

is hereby issued by the

CAPITAL GOODS SKILL COUNCIL

for the

MODEL CURRICULAM

Complying to National Occupational Standards of

Job Role/ Qualification Pack: 'Operator - Conventional Milling' OP No. 'CSC/ Qo1o8 NSQF Level 2'

Date of Issuance: July 12th, 2016

Valid up to : Aug 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
(Capital Goods Skills Council)

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Operator-Conventional Milling

CURRICULUM / SYLLABUS

This program is aimed at training candidates for the job of a “Operator-Conventional Milling”, in the “Capital Goods” Sector/Industry and aims at building the following key competencies amongst the learner

Program Name	Operator-Conventional Milling		
Qualification Pack Name & Reference ID. ID	CSC/Q0108, v1.0		
Version No.	1.0	Version Update Date	
Pre-requisites to Training	10th Standard passed, preferably		
Training Outcomes	<p>After completing this programme, participants will be able to:</p> <ul style="list-style-type: none"> • Work safely: State the importance of safe working practices at the workplace, and comply with health and safety legislation, regulations and other guidelines. • Prepare for operating conventional milling machine: Identification of parts of a milling machine, select the correct cutting tool, prepare the surface for milling operation, secure the work piece in the work holding device, set the work piece in the correct position and identify the type of milling operation. • Carry out the cutting operation, and test for accuracy: Gather milling requirement from instruction sheets, carryout milling as per the instruction on various materials and forms and check for accuracy of the work using standard measuring devices. • Handling of unresolved problems: Seek guidance from the concerned authority within the department or outside the department and resolve the problems arising out of milling operation. • 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-Conventional Milling” Qualification Pack issued by “Capital Goods Skill Council”.

Sr. No.	Module	Key Learning Outcomes	Equipment Required
1	<p>Introduction to Milling</p> <p>Theory Duration (hh:mm) 26:00</p> <p>Practical Duration (hh:mm) 03:00</p> <p>Corresponding NOS Code CSC/N0108</p>	<ul style="list-style-type: none"> State the various opportunities available in fabrication industry Describe the role and responsibilities for a milling machine operator Identify system of measurement and convert units from system of measurement to another Explain First angle and third angle projection Read Engineering drawings Use precision measuring instruments – Vernier calliper, micrometer screw gauge, depth gauge etc., Define Limits, Fits and Tolerances Explain various types of cutting process used in the fabrication industry Classify materials and state their properties and composition Explain the purpose of milling Identify types and parts of a milling machine – Knee type milling machine, universal horizontal milling machine, Ram type milling machine, Universal ram type milling machine, universal Classify milling machines – Horizontal milling machine and vertical milling machine Identify accessories of milling machine – saddle, compound slide, tailstock, profile attachments, fixed and live stays Explain various milling operations – milling of flat surfaces, gang and straddle milling, milling of sunk and recessed surfaces, face milling, side milling, angular milling, slotting, slitting, key way cutting, face slot cutting, woodruff cutting, dovetail cutting etc., List the process of milling- up milling, down milling, face milling, end milling 	<p>Training Kit (Trainer Guide, PowerPoint), sample drawing of First angle and third angle, Vernier Calliper, micrometer screw gauge, depth gauge, Go- No Gauge</p>
2	<p>Work safely</p> <p>Theory Duration (hh:mm) 05:00</p> <p>Practical Duration (hh:mm) 04:00</p> <p>Corresponding NOS</p>	<ul style="list-style-type: none"> Explain importance of safe working practices at the work place Apply electrical safety practices at the work place Explain and comply with health and safety legislation, regulations and other guidelines Follow general safety practices at the workplace Identify hazards at the workplace and take 	<p>Training Kit (Trainer Guide, PowerPoint) Plane glasses, ear plug, leather gloves, Safety shoes, leather apron</p>

Sr. No.	Module	Key Learning Outcomes	Equipment Required
	<p>Code CSC/N0108</p>	<p>corrective actions to avoid such hazards</p> <ul style="list-style-type: none"> Follow the stated procedure for material handling List the personal protective equipment (PPE) required for gas cutting operation Wear suggested personal protective equipment correctly Follow the safety recommendations while handling milling machine 	
3	<p>Prepare for operating conventional milling machine</p> <p>Theory Duration (hh:mm) 20:00</p> <p>Practical Duration (hh:mm) 60:00</p> <p>Corresponding NOS Code CSC/N0108</p>	<ul style="list-style-type: none"> State the purpose of calibration Explain the method of calibration Read instructions from operational drawings, approved sketches and illustrations Explain the cutting tool nomenclature, tool material, cutting parameters, chip breaker geometry Identify different types of cutters used in horizontal and vertical milling machine Select proper coolant to dissipate heat generated during cutting operation List work holding devices like – chuck, work holding devices- clamp, vice- block, angle plate etc., State the method to clamp the work piece in the chuck to avoid distortion during the cutting operation Establish relationship between metal cutting results, tool nose radius, speed and feed rate Examine that machine guards are in place. Unguarded machines are unsafe to use Seek guidance from the machine setter regarding readiness of the machine for operation Check the components for false tool cuts, burrs, and sharp edges 	<p>Training Kit (Trainer Guide, PowerPoint), Cutting tool, Vertical Milling machine with accessories, horizontal milling machine with accessories, work holding devices like – vice, clamps, Chucks, V- Block, sample instruction sheets</p>
4	<p>Carryout operations on conventional milling machine</p> <p>Theory Duration (hh:mm) 20:00</p> <p>Practical Duration (hh:mm) 100:00</p> <p>Corresponding NOS Code</p>	<ul style="list-style-type: none"> Operate the machine controls in both hand and power modes Identify the location of emergency switch to stop the machine in case of emergency Select right kind of fluid based on the material to be milled Clamp the work piece securely in a chuck/work holding devices such as vice, V- Block, clamp, angle plate etc., Perform milling on flat surfaces, gang and saddle milling, milling of sunk and recessed surfaces, face milling, side milling, angular milling, slotting, key way cutting, face slot cutting, woodruff cutting dovetail cutting etc., to an accuracy of 	<p>Training Kit (Trainer Guide, PowerPoint), Cutting tool, Vertical Milling machine with accessories, horizontal milling machine with accessories, work holding devices like – vice, clamps, Chucks, V- Block, try square, vernier calliper, micrometer screw gauge, depth</p>

Sr. No.	Module	Key Learning Outcomes	Equipment Required
	CSC/N0108	<p>0.020 to 0.030 mm in flatness and squareness within 0.125 mm, surface finish of 63 micro inch and angle within +/- 1 degree</p> <ul style="list-style-type: none"> Perform milling on various materials like steel/ stainless steel, aluminium/aluminium alloys, copper/copper alloys, cast iron and plastic Follow the work schedule to meet production targets Apply correct safe disposal method Clean the machine using the brush after the work is complete Check critical parameters using tri square, bevel protractor, vernier calliper, micrometers, height gauge, go-no-go gauge, spring calliper etc., Use quality control methods while using milling machine Understand relevant legislation standards policies and procedures Own job role and responsibilities Identify proper source to get information Know various departments and their function Identify key people in the organization and their job responsibilities Follow reporting structure and escalation matrix Carryout documentation and understand the importance of documentation Read and interpret information Fill appropriate formats Follow communication protocol Perform numerical calculations Critically think and apply problem solving skills Improve decision making abilities Plan and organize day to day work State the importance of delivering products to meet customer requirement Explain the importance of team work 	gauges, go- no go gauges, marking tools, measuring tools
5	<p>Handling of unresolved problems</p> <p>Theory Duration (hh:mm) 02:00</p> <p>Practical Duration (hh:mm) 00:00</p>	<ul style="list-style-type: none"> Refer the unresolved problems to the competent authority Seek help from the external specialists if the problem is outside his domain 	Training Kit (Trainer Guide, PowerPoint)

Sr. No.	Module	Key Learning Outcomes	Equipment Required
	<p>Corresponding NOS Code CSC/N0108</p>		
6	<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>
7	<p>Fire Safety</p> <p>Theory Duration (hh:mm) 05:00</p> <p>Practical Duration (hh:mm) 30:00</p> <p>Corresponding NOS Code CSC/N1335</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 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 	<p>Training kit (Trainer guide, PowerPoint)</p> <p>Class A, B, C, D and K fire extinguishers</p>
8	<p>Emergencies, rescue and first aid procedure</p> <p>Theory Duration (hh:mm) 09:00</p> <p>Practical Duration (hh:mm) 18:00</p> <p>Corresponding NOS Code CSC/N1335</p>	<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 	<p>Training kit (Trainer guide, PowerPoint)</p> <p>First aid kit with all contents</p>
9	<p>Work effectively with others</p> <p>Theory Duration (hh:mm) 20:00</p>	<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 	<p>Training kit (Trainer guide, PowerPoint)</p>

Sr. No.	Module	Key Learning Outcomes	Equipment Required
	<p>Practical Duration (hh:mm) 60:00</p> <p>Corresponding NOS Code CSC/N1336</p>	<ul style="list-style-type: none"> 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 	
10	<p>Final Assessment</p> <p>Theory Duration (hh:mm) 04:00</p> <p>Practical Duration (hh:mm) 06:00</p> <p>Corresponding NOS Code</p>	<ul style="list-style-type: none"> To test skills and knowledge 	
	<p>Total Duration</p> <p>Theory Duration 121:00</p> <p>Practical Duration 289:00</p>	<p>Unique Equipment Required: Leather gloves; leather apron, white glasses, safety shoes; fire extinguishers - dry powder fire extinguisher; fire bucket with sand, first aid kit; gas cutting equipment with all accessories; surface plate - standard size; scribe - 15 cm; dividers 20 cm; calliper outside 15 cm; prick punch; chisel cold flat - 19 mm; centre punch - 9 mm x 127 mm; rule 60 cm; two fold; brass topped to read inches and mm; hammer scaling 0.25 kg with handle; steel rule - 30 cm to read inch and millimetre; Vernier calliper (digital) - 0-150 mm; ball peen hammer with handle - 0.25 kg; cross peen hammer with handle - 0.25 kg; holding tongs - 30 cm; wire brush - 15 cm x 3.7 cm and double ended spanner. Vertical milling machine, horizontal milling machine, micrometer, vernier height gauge, depth gauge, try square, no- no- gauge</p>	

Grand Total Course Duration: **410 Hours, 0 Minutes**

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

Trainer Prerequisites for Job role: “Operator-Conventional Milling” mapped to Qualification Pack: “CSC/Q0108 v1.0”

Sr. No.	Area	Details
1	Description	Produce a range of components that combine a number of different features (eg. flat faces, parallel faces, faces that are flat and square to each other, angular faces, steps, slots and special forms) and continuously monitor the machining operations and make minor adjustments to settings if required.
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-Conventional Milling</u> ” mapped to QP: “ <u>CSC/Q0108, 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: “SSC/Q1402”. Minimum accepted 70 % as per respective SSC guidelines is 70%.
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-Conventional Milling
Qualification Pack	CSC/Q0108, 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 center based on this criteria
5	To pass the Qualification Pack, every trainee should score a minimum of 60% in aggregate and 40% in each NOS
6	The marks are allocated PC wise; however, every NOS will carry a weight age in the total marks allocated to the specific QP

Assessable Outcome	Assessment Criteria	Total Mark (300)	Out Of	Marks Allocation	
				Theory	Skills Practical
1.CSC/N0108 Operate conventional milling machines	PC1. comply with health and safety, environmental and other relevant regulations and guidelines at work		3	1	2
	PC2. adhere to procedures and guidelines for personal protective equipment (PPE) and other relevant safety regulations while performing machining operations		3	1	2
	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. check that all measuring equipment is within calibration date		2	0	2
	PC7. ensure that the components used are free from foreign objects, dirt or other contamination		2	0	2
	PC8. ensure availability of job specification from a valid source		2	0	2
	PC9. read and establish job requirements from the job specification document (to include symbols and conventions to appropriate ISO standards in relation to work undertaken)		3	1	2
	PC10. prepare and maintain the work area as per procedure or operation specification		3	1	2
	PC11. confirm with the machine setter that the machine is ready for production		2	0	2
	PC12. seek any necessary instruction/training on the operation of the various milling machines, where appropriate		3	0	3
	PC13. ensure that machine guards are in place and are correctly adjusted		3	1	2
	PC14. identify different types of cutters used in horizontal and vertical milling machines		3	0	3
	PC15. identify different parts of the vertical and horizontal milling machine		3	0	3
	PC16. hold components securely, without distortion		2	0	2
	PC17. ensure that machine settings are adjusted as and when required to maintain the required accuracy and quality standards		3	1	2
	PC18. operate the machine controls in both hand and power modes		3	0	3
	PC19. stop the machine in both normal and emergency situations, and use correct procedure for restarting after an emergency		3	1	2
	PC20. use British and metric systems of measurement		3	1	2

Assessable Outcome	Assessment Criteria	Total Mark (300)	Out Of	Marks Allocation	
				Theory	Skills Practical
	PC21. perform various milling operations to produce various features on metal and non-metal components		5	1	4
	PC22. produce components as per given quality standards		5	1	4
	PC23. plan and work accordingly to achieve given production targets		5	1	4
	PC24. overcome the effects of backlash in machine slides and screws		3	1	2
	PC25. apply roughing and finishing cuts considering the effect on tool life, surface finish and dimensional accuracy		3	0	3
	PC26. apply cutting fluids with regard to a range of different materials		3	0	3
	PC27. clamp the work piece securely and without distortion in a chuck/work holding device such as vice, V-block, clamp, angle plate, etc.		3	0	3
	PC28. report any difficulties or problems that may arise with the milling activities, and carry out any agreed actions		3	1	2
	PC29. shut down the equipment to a safe condition on completion of the milling activities		2	0	2
	PC30. use range of equipment to check critical parameters		3	0	3
	PC31. perform the checks to be carried out on the components before removing them from the machine, and on the equipment needed for this activity		4	1	3
	PC32. ensure that the quality control procedures are used while operating the equipment		2	0	2
	PC33. refer the problem to a competent internal specialist if it cannot be resolved		3	1	2
	PC34. obtain help or advice from specialist if the problem is outside his/her area of competence or experience		3	1	2
	Total		100	17	83
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		4	2	2

Assessable Outcome	Assessment Criteria	Total Mark (300)	Out Of	Marks Allocation	
				Theory	Skills Practical
	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				
	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 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		4	1	3

Assessable Outcome	Assessment Criteria	Total Mark (300)	Out Of	Marks Allocation	
				Theory	Skills Practical
	people and others during an emergency				
	Total		100	36	64
3.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	300	300	117	183
	Percentage Weightage:			39	61
	Minimum Pass% to qualify (aggregate):			60	