

Model Curriculum

Operator- Conventional Milling

SECTOR:	CAPITAL GOODS
SUB-SECTOR:	1. Machine Tools 2. Dies, Moulds and Press Tools 3. Plastics Manufacturing Machinery 4. Textile Manufacturing Machinery 5. Process Plant Machinery 6. Electrical and Power Machinery 7. 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 CURRICULUM

Complying to National Occupational Standards of
Job Role/ Qualification Pack: 'Operator- Conventional Milling' QP No. 'CSC/Qo1o8 NSQF Level 2'

Date of Issuance: November 24th, 2017

Valid up to*: November 24th, 2021

*Valid up to the next review date of the Qualification Pack



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	19/09/2018
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"> • Prepare for operating conventional milling machine. • Perform cutting operations. • Follow basic healthy and work safety at the workplace. • Work effectively with colleagues and supervisors. 		

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) 10:00</p> <p>Practical Duration (hh:mm) 15:00</p> <p>Corresponding NOS Code CSC/N0108</p>	<ul style="list-style-type: none"> Identify various systems of measurement. Explain ‘First angle’ and ‘Third angle’ projection method. Interpret Engineering drawings accurately. Use precision measuring instruments. Define ‘Limit’, ‘Fit’ and ‘Tolerance’. Explain various types of cutting processes 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. Classify milling machines based on the rotation of milling cutter. Identify accessories of a milling machine. Explain different types of milling operations used in the industry. Describe the processes of ‘Up milling’, ‘Down milling’, ‘Face milling’ and ‘End milling’. 	<p>Training Kit (Trainer Guide, Presentation), sample drawing of first angle and third angle, vernier caliper, micrometer screw gauge, depth gauge, Go-No gauge</p>
2	<p>Working safely</p> <p>Theory Duration (hh:mm) 06:00</p> <p>Practical Duration (hh:mm) 04:00</p> <p>Corresponding NOS Code CSC/N0108</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. Comply with health and safety legislation, regulations and other guidelines. Follow general safety practices at the workplace. Identify hazards at the workplace to avoid accidents. Follow the stated procedure for material handling. Follow the safety recommendations while handling milling machine. 	<p>Training Kit (Trainer Guide, Presentation), plane glasses, ear plug, leather gloves, safety shoes, leather apron</p>
3	<p>Preparing for operating conventional milling machine</p> <p>Theory Duration (hh:mm) 20:00</p> <p>Practical Duration (hh:mm)</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 	<p>Training Kit (Trainer Guide, Presentation), 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>

Sr. No.	Module	Key Learning Outcomes	Equipment Required
	70:00 Corresponding NOS Code CSC/N0108	<p>machine.</p> <ul style="list-style-type: none"> • Select proper coolant to dissipate heat generated during cutting operation. • Identify various work holding devices used in the milling operation. • 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 to ensure that machine guards are in place. • Seek guidance from the machine setter regarding readiness of the machine for operation. • Check the components for false tool cuts, burrs, and sharp edges. 	
4	<p>Operating conventional milling machine</p> <p>Theory Duration (hh:mm) 10:00</p> <p>Practical Duration (hh:mm) 100:00</p> <p>Corresponding NOS Code CSC/N0108</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 various milling operations as per the work instruction sheet on a range of materials. • Follow the work schedule to meet production targets. • Clean the machine using the brush after the work is complete. • Check critical parameters using suggested instruments. • Use quality control methods while using milling machine. • Identify proper source to get information. • Follow reporting structure and escalation matrix. • Perform required documentation as per company policy. • Read and interpret information from various sources. • Fill appropriate formats as per the policy. • Follow proper communication protocol while providing and seeking information. • Undertake numerical calculations for 	<p>Training Kit (Trainer Guide, Presentation), cutting tool, vertical milling machine with accessories, horizontal milling machine with accessories, work holding devices like – vice, clamps, chucks, V-Block, tri square, vernier caliper, micrometer screw gauge, depth gauges, go-no-go gauges, marking tools, measuring tools.</p>

Sr. No.	Module	Key Learning Outcomes	Equipment Required
		<p>setting the machine for operation.</p> <ul style="list-style-type: none"> • Improve decision making abilities. • Plan and organize day to day work to meet expected outcomes. • State the importance of delivering products to meet customer requirement. • Explain the importance of team work. 	
5	<p>Handling of unresolved problems</p> <p>Theory Duration (hh:mm) 05:00</p> <p>Practical Duration (hh:mm) 00:00</p> <p>Corresponding NOS Code CSC/N0108</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, Presentation).
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). • Identify appropriate PPE for the various tasks performed. • Identify job site risks and hazards to avoid accidents at the work place. Hazards: sharp edged and heavy tools; heated metals; gas cylinders; welding radiation; hazardous surfaces (sharp, slippery, uneven, chipped, broken, etc.); hazardous substances (chemicals, gas, fumes, dust, etc.); physical hazards (working at heights, large and heavy objects and machines, sharp and piercing objects, tools and machines, intense light, load noise, obstructions in corridors, by doors, blind turns, noise, over stacked shelves and packages, etc.) electrical hazards (power supply and points, loose and naked cables and wires, electrical machines and appliances, etc.) Possible causes of risk and accident: physical actions; reading; listening to and giving instructions; inattention; sickness and incapacity (such as drunkenness); health hazards (such as untreated injuries and contagious illness) • Identify the names and locations of people responsible for health and safety in the workplace. 	Training kit (Trainer guide, Presentation), leather gloves, leather apron, welding screen – helmet types, hand screen welding and safety shoes

Sr. No.	Module	Key Learning Outcomes	Equipment Required
		<ul style="list-style-type: none"> • Identify documents that refer to health and safety in the workplace and where they are located. • Carry out safe working practices while dealing with hazards to ensure the safety of self and others. Safe working practices: using protective clothing and equipment; putting up and reading safety signs; handle tools in the correct manner and store and maintain them properly; keep work area clear of clutter, spillage and unsafe object lying casually; while working with electricity take all electrical precautions like insulated clothing, adequate equipment insulation, use of control equipment, dry work area, switch off the power supply when not required, etc.; safe lifting and carrying practices; use equipment that is working properly and is well maintained; take due measures for safety while working in confined places, trenches or at heights, etc. including safety harness, fall arrestors, etc. • Inspect steps and ladders for faults, set them and use them safely. Ladder faults: corrosion of metal components, deterioration, splits and cracks timber components, imbalance, loose rungs, missing/unfixed nuts or bolts, etc. Ladders set up: firm/level base, clip/lash down, leaning at the correct angle, etc. • Work safely in and around trenches, elevated places and confined areas. • Lift heavy objects safely using correct procedures. • Apply good housekeeping practices at all times. Good housekeeping practices: clean/tidy work areas, removal/disposal of waste products, protect surfaces • Identify common hazard signs displayed in various areas. Various areas: on chemical containers; equipment; packages; inside buildings; in open areas and public spaces, etc. 	
7	Fire Safety	<ul style="list-style-type: none"> • Identify causes of fire accidents. • Recognise required fire extinguisher 	Training kit (Trainer guide, Presentation),

Sr. No.	Module	Key Learning Outcomes	Equipment Required
	<p>Theory Duration (hh:mm) 05:00</p> <p>Practical Duration (hh:mm) 30:00</p> <p>Corresponding NOS Code CSC/N1335</p>	<p>based on the type of fire. Types of fires: Class A: e.g. ordinary solid combustibles, such as wood, paper, cloth, plastic, charcoal, etc.; Class B: flammable liquids and gases, such as gasoline, propane, diesel fuel, tar, cooking oil, and similar substances; Class C: e.g. electrical equipment such as appliances, wiring, breaker panels, etc. (These categories of fires become Class A, B, and D fires when the electrical equipment that initiated the fire is no longer receiving electricity); Class D: combustible metals such as magnesium, titanium, and sodium (These fires burn at extremely high temperatures and require special suppression agents)</p> <ul style="list-style-type: none"> • Use the various appropriate fire extinguishers on different types of fires correctly. • Interpret fire safety signs. • Inspect evacuation plan in case of fire. • Identify the location of assembly point, fire exit and fire alarm. • Follow reporting procedure in case of a fire. • Participate in fire safety drills at the workplace. • Demonstrate good housekeeping in order to prevent fire hazards. 	Class A,B,C and D fire extinguishers.
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. • Administer first aid in case of minor injuries, bleeding, burns, choking, electrical shock, poisoning, etc. • Demonstrate the artificial respiration and CPR process. • Follow correct method to move injured people and others during an emergency. • Explain stages of crisis and crisis management. • Participate in emergency procedures as per role. <p>Emergency procedures: raising alarm, safe/efficient evacuation, correct means of escape, correct assembly</p>	Training kit (Trainer guide, Presentation), First aid kit with all contents.

Sr. No.	Module	Key Learning Outcomes	Equipment Required
		<p>point, roll call, correct return to work.</p> <ul style="list-style-type: none"> Write an accident/incident report or dictate a report to another person and send report to person responsible. Incident Report includes details of: name, date/time of incident, date/time of report, location, environment conditions, persons involved, sequence of events, injuries sustained, damage sustained, actions taken, witnesses, supervisor/manager notified. 	
9	<p>Working effectively with others</p> <p>Theory Duration (hh:mm) 20:00</p> <p>Practical Duration (hh:mm) 60:00</p> <p>Corresponding NOS Code CSC/N1336</p>	<ul style="list-style-type: none"> State various categories of people that one is required to communicate and co-ordinate within the organization. Explain the importance of effective communication in the workplace. Explain the importance of teamwork in organizational and individual success. Describe various components of effective communication and active listening. Describe the barriers to effective communication. Provide and receive information to and from authorized persons accurately and within agreed timescale. Give information to others clearly, at a pace and in a manner that helps them to understand. Assist others in performing tasks in a positive and helpful manner, where required and possible. Take measures to maximize effectiveness and efficiency in carrying out tasks by consulting with and assisting others. Follow appropriate communication etiquette while working. Communication etiquette: do not use abusive language; use appropriate titles and terms of respect; do not eat or chew while talking (vice versa), use appropriate tone, pitch and language to convey politeness, assertiveness, care and professionalism, etc. Apply active listening skills while interacting with others at work. Explain the importance of ethics and discipline for professional success. 	Training kit (Trainer guide, Presentation)

Sr. No.	Module	Key Learning Outcomes	Equipment Required
		<ul style="list-style-type: none"> Describe common reasons for interpersonal conflict and ways of managing interpersonal conflict effectively. Explain the importance of developing effective working relationships for professional success. Display responsible and disciplined behaviors at the workplace. Disciplined behaviors: e.g. punctuality; completing tasks as per given time and standards; not gossiping and idling time; eliminating waste, honesty, etc. Escalate grievances and problems to appropriate authority as per procedure to resolve them and avoid conflict. 	
	<p>Total Duration</p> <p>Theory Duration 85:00</p> <p>Practical Duration 315:00</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; caliper 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 caliper (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, tri-square, go- no- go gauge</p>	

Grand Total Course Duration: **400 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: “ <u>MEP/Q0102</u> ”. 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

Criteria For Assessment Of Trainees

Job Role: Operator-Conventional Milling

Qualification Pack: CSC/Q0108

Sector Skill Council: Capital Goods Skills Council

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. Assessment will be conducted for all compulsory NOS, and where applicable, on the selected elective/option NOS/set of NOS.
4. Individual assessment agencies will create unique question papers for theory part for each candidate at each examination/training centre (as per assessment criteria below).
5. Individual assessment agencies will create unique evaluations for skill practical for every student at each examination/training centre based on this criterion.
6. To pass the Qualification Pack, every trainee should score a minimum of 70% of aggregate marks to successfully clear the assessment.
7. In case of *unsuccessful completion*, the trainee may seek reassessment on the Qualification Pack.

Compulsory NOS				Marks Allocation	
Total Marks: 300					
Assessment outcomes	Assessment Criteria for outcomes	Total Marks	Out of	Theory	Skills Practical
CSC/N0108 Operate conventional milling machines	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 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
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
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		4	2	2
	PC6.state methods of accident prevention in the work environment of the job role		3	2	1
	PC7.state location of general health and safety equipment in the workplace		5	2	3
	PC8.inspect for faults, set up and safely use steps and ladders in general use		5	2	3
	PC9.work safely in and around trenches, elevated places and confined areas		5	2	3
	PC10.lift heavy objects safely using correct procedures		4	2	2

	PC11.apply good housekeeping practices at all times		5	2	3
	PC12.identify common hazard signs displayed in various areas		3	1	2
	PC13.retrieve and/or point out documents that refer to health and safety in the workplace		4	1	3
	PC14.use the various appropriate fire extinguishers on different types of fires correctly		4	1	3
	PC15.demonstrate rescue techniques applied during fire hazard		3	1	2
	PC16.demonstrate good housekeeping in order to prevent fire hazards		4	1	3
	PC17.demonstrate the correct use of a fire extinguisher		4	1	3
	PC18.demonstrate how to free a person from electrocution		4	1	3
	PC19.administer appropriate first aid to victims where required eg. in case of bleeding, burns, choking, electric shock, poisoning etc.		3	1	2
	PC20.demonstrate basic techniques of bandaging		4	1	3
	PC21.respond promptly and appropriately to an accident situation or medical emergency in real or simulated environments		3	1	2
	PC22.perform and organize loss minimization or rescue activity during an accident in real or simulated environments		3	1	2
	PC23.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
	PC24.demonstrate the artificial respiration and the CPR Process		3	2	1
	PC25.participate in emergency procedures		2	1	1
	PC26.complete a written accident/incident report or dictate a report to another person, and send report to person responsible		3	1	2
	PC27.demonstrate correct method to move injured people and others during an emergency		3	1	2
		Total	100	37	63
CSC/N1336 Work effectively	PC1.accurately receive information and instructions from the supervisor and fellow workers, getting clarification where required	100	10	3	7

with others	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