Model Curriculum

CNC Programmer

CNC Programmer

SECTOR:	**CGSC**
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:	**Design**
REFERENCE ID:	**CSC/Q 0401**
NSQF LEVEL:	**4**

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CNC Programmer

CURRICULUM / SYLLABUS

This program is aimed at training candidates for the job of a "CNC Programmer", in the "Capital Goods" Sector/Industry and aims at building the following key competencies amongst the learner

Program Name	CNC Programmer		
Qualification Pack Name & Reference ID.	CSC/Q 0401		
Version No.	1.0	Version Update Date	26 – 12 – 2015
Pre-requisites to Training	Minimum qualification – Diploma in Mechanical Engineering		
Training Outcomes	**After completing this programme, participants will be able to:** • **Carry out Preparations for Programming CNC machine for production:** read and establish job requirements of raw material / component, dimensions, limits and tolerances, surface finish, shapes etc accurately; report and rectify inconsistence information, conduct prelim check on machine, extract and use information from engineering drawings, identify tools and suitable work holding devices and ensure correct and latest part-programme is uploaded in CNC system. • **Carry out programming for CNC Machine:** ensure that the programme is efficient with commands for tool motions, spindle motions etc in syntax corresponding to the machine and control system of the CNC machine. Transmit and check the errors; handle the typical problems with the programming, loading and editing activities effectively. • **Test and prove the program on the CNC Machine:** ensure that appropriate equipment and tools are calibrated and free from damage; mount tools correct positions, enter work offset and tool data on machine, cut a trail part and edit programme as per requirement. • **Work safely following health and safety standards:** read and understand the safety signs and instructions on the CNC machine, use of PPE, identify job –site hazards and apply good housekeeping practices etc		

This course encompasses 3 out of 3 National Occupational Standards (NOS) of "CSC /Q 0401" Qualification Pack issued by "Capital Goods Skill Council".

Sr. No.	Module	Theory Duration (hh:mm)	Practical Duration (hh:mm)	Key Learning Outcomes	Corresponding NOS Code	Equipment Required
1	Programming Computer Numerically	70:00	130:00	• Understand the main features and working parts of CNC machines	CSC/N 0401	(2-axis CNC machine, 3-axis machining

| Controlled (CNC) machines | | | | and accessories (2 axis machines to 5 axis machines including machining centres)

• Understanding and minimizing the hazards associated with machining operations on CNC machines.

• Understand the common terminologies used in CNC Programming like program number; part number and name; tool names; operation names; motion commands; tool change positions and commands; tool numbers and offset numbers; subprograms and canned cycles; tool nose radius compensation commands; spindle, feed rate and coolant commands etc

• Read and establish the importance of extracting information from engineering drawings and related specifications, tool selection based on material, finish and tolerance; factors which determine selection and use of tungsten carbide and tips; importance and effect of the depth of cut, RPM and feed; reading and interpreting first and third angle from drawings; | | centers (VMC, HMC), > 3 axes machining centers(3.5/4/5 axes) , measuring tools , Hand Tools , Power tools , PPE , Drawing Tools , GD&T , Etc. |

				• Setting the machine controller in program and editing mode and enter and download the program. Understand the importance of proving the program, and how to do it by selecting the correct proving tools; • Understanding the importance of writing programs that are editable and correctable by next person. • Identify and obtain job specifications from valid sources like job instruction sheet /job card; work drawings and instructions; planning documentation; quality control documents; operation sheets; process specifications (detailed component drawings; approved sketches/illustrations; national, international and organizational standards; reference tables and charts; fabrication/casting drawings; operational diagrams; contractual specifications) And raw material or components required (type, quality, quantity); dimensions; limits and tolerances; surface finish requirements; operations required (list, sequence and procedures where		

applicable); shape or profiles to be generated; instruments and tools to be used; form tolerances (flatness, concentricity, etc.); cycle time, production rate; projections orthographic (first angle, third angle), isometric (including exploded, oblique); reference points, lines, edges and surfaces; dimensions (baseline, continuous)the job / Operation specific measuring tools, tapping sizes and threads; cutting parameters – feeds, speed, depth of cut; machining symbols and tolerances.

- Understand and effectively use the methods of checking quality of shaped components against required standards; impact of depth of cut on chatter, surface finish; range of materials used in common engineering applications and identify materials by their physical properties. work out production costs, machine hour rate, raw material cost, tool cost, coolant cost;

- Design efficient CNC program with

commands for tool motions, spindle motions, misc functions and tool change in syntax corresponding to the machine and control systems on which the components will be machined using various methods to make the CNC program like writing on paper or in computer's text editor or using CAM software or controllers on the machine.

- Transfer the program to the CNC machine, deal with error messages and handle typical problems that can occur with the programming, loading and editing activities effectively.

- Test and prove the program on CNC Machine by obtaining appropriate equipment or tools, ensure calibration of measuring equipment, mount tools in correct position, measure tool and work offset data-x and z offsets, work offsets, length offsets and tool radius for machining centre and cut trail part. Edit program and adjust tool and wear offsets to correct dimensional errors if any. Cut trial part after every change of worn out tools.

| 2 | Use basic health and safety practices at the workplace | 30 | 70 | • Understand importance of complying health safety and environmental regulation at work place.

• Understand hazards associated with use of CNC operations, revolving and moving parts, hot metal particles, sharp cutting tools, lifting and holding work holding devises, burrs and sharp edges on the component.

• Be able to identify job site hazards like sharp edged heavy tools, gas cylinders, welding radiations, chemicals, fumes, obstructions in corridors, naked wires / cables etc

• Understand: Different types of fire; use of appropriate fire extinguishers risk and accidents; safe working practices and methods of accident prevention at work place

• Importance of using protective clothing like leather or asbestos gloves, flame proof aprons, flame proof overalls buttoned to neck, cuffless (without folds), trousers, reinforced footwear, helmets/hard hats, cap and shoulder covers, ear defenders/plugs, | CSC/ N 1335 | Sample Helmet, gloves, earplugs, goggles, Shoes, node mask, Apron Etc. |

				safety boots, knee pads, particle masks, glasses/goggles/visors ,hand shields, machine guards, residual current devices, shields, dust sheets, respirator etc.		
3	Work effectively with others	40	60	• Able to receive and pass information from and to authorised persons and seeking clarification from authorized persons where required. • Able to communicate by avoiding use of abusive language; display respect to others. • Respect others time by completing given task in time, avoiding gossip and avoid conflict. • Understand and practices active listening, teamwork, effective communication; understands the barriers to effective communication and common reasons for interpersonal conflict.	CSC/N 1336	

Total Duration: 450	Theory 140	Practical 310	Unique Equipment Required: (2-axis CNC machine, 3-axis machining centers (VMC, HMC), > 3 axes machining centers (3.5/4/5 axes) , measuring tools , Hand Tools , Power tools , PPE , Drawing Tools , GD&T , Etc. Helmet, gloves, earplugs, goggles, Shoes, node mask, Apron Etc.

Grand Total Course Duration: **450 Hours 00 Minutes**

(This syllabus/ curriculum has been approved by Capital Goods Skill Council)
Annexure1: Assessment Criteria

Assessment Criteria for CNC Programmer	
Job Role	**CNC Programmer**
Qualification Pack	**CSC/Q 0401**
Sector Skill Council	**Capital Goods Skill Council (CGSC)**

Sr. No.	Guidelines for Assessment
1	Criteria for assessment for Qualification Pack has been created based on the NOSs and performance criteria by CGSC. Each Performance Criteria (PC) has been assigned marks proportional to its importance within NOS and weightages have also been given among the NOSs accordingly. CGSC has laid down the proportion of marks for Skills (Practical), Theory/Knowledge and Behaviour for each PC.
2	The assessment of the theory/knowledge will be based on written test/viva-voce or both while skill test shall be hands on practical.
3	The assessment shall be done as per the assessment guides devised by CGSC in coordination with the assessment agencies. Assessment guides consists of a unique question papers for theory/knowledge and the method of assessments and evidence collection and detailed marking.
4	To pass the Qualification Pack, every trainee should score a minimum of 70% in Skill, 60% in Knowledge OR as per guidelines applicable from time to time.
5	.....
6	.....

Sr. No.	NOS No.	NOS Name	Total Marks	Marks Allocation: Skills	Marks Allocation: Knowledge	Marks Allocation: Behaviour
1	CSC/ N 0401	Program Computer Numerically Controlled (CNC) machines	100	75	25	..
2	CSC/N 1335	Use basic health and safety practices at the workplace	100	64	36	..
3	CSC/N 1336	Work effectively with others	100		30	70
	Total:		**300**	**139**	**91**	**70**
	Percentage Weightage:			**70%**	**20%**	**10%**
	Minimum Pass% to qualify:			**70%**	**60%**	**60%**

Annexure2: **Trainer Prerequisites for Job role: "CNC Programmer " mapped to Qualification Pack: "CSC /Q 0401"**

Sr. No.	Area	Details
1	**Job Description**	To deliver accredited training service, mapping to the curriculum detailed above, in accordance with the Qualification Pack "CSC/Q 0401".
2	**Personal Attributes**	Aptitude for conducting training, and pre/ post work to ensure competent, employable candidates at the end of the training. Strong communication skills, interpersonal skills, ability to work as part of a team; a passion for quality and for developing others; well-organised and focused, eager to learn and keep oneself updated with the latest in the mentioned field.
3	**Minimum Educational Qualifications**	Preferably Diploma/Degree in Mechanical Engineering
4a	**Domain Certification**	Certified for Job Role: "CNC Operator Turning" mapped to QP: "CSC /Q 0401" with Minimum acceptance score of 85 %.
4b	**Platform Certification**	Recommended that the Trainer is certified for the Job Role: "Trainer", mapped to the Qualification Pack: "SSC/1402" with Minimum accepted score of 85%. Alternatively, must have successfully undergone a CGSC organized TOT workshop on "How to Trainer".
5	**Experience**	Minimum 3 to 4 years of industry experience in relevant job role and a Minimum of 3 to 4 years and Training experience in relevant job role.