GUJARAT TECHNOLOGICAL UNIVERSITY

Syllabus for Bachelor of Vocation (B.Voc), 4th Semester
Branch: Production Technology
Subject Name: CNC Setter Cum Operator-VMC (Level-5)
Subject Code: 21140308

Type of course: OJT Elective

Prerequisite: None.

Rationale: This program is aimed at training candidates for the job of a "CNC Setter cum Operator-Vertical Machining Centre", in the "Capital Goods" Sector/Industry and aims at building the following key competencies amongst the learner

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks
L	T	P	C	Theory Marks		Practical Marks		
				ESE (E)	PA (M)	ESE (V)	PA (I)	
0	0	15	15	0	0	100	100	200

L- Lectures; T- Tutorial/Teacher Guided Student Activity; P- Practical; C- Credit; ESE- End Semester Examination; PA- Progressive Assessment

Sr. No.	Topic	No. of hours	% Weightage
01	**Introduction** • State the various opportunities available in fabrication industry. • Describe the role and responsibilities for a computer numerical control (CNC) AND VMC setter cum operator. • Importance of using CNC & VMC machines over conventional machines	10	5
02	**Units, measurement and engineering drawing** • Identify various systems of measurements. • Read and interpret 'First angle' and 'Third angle' projections. • Identify dimensioning methods. • Read manufacturing notes as per the standards specified. • Define 'Limits', 'Fits' and 'Tolerances'. • Use precision measuring instruments correctly. Measuring equipments: steel rules, micrometer (external, internal, depth), vernier (digital, dial; length, depth; protractors), gauges (slip, bore/hole, thread, plug, radius/profile), dial test indicators (DTI), surface finish equipment (such as comparison plates), height master. • Perform numerical calculations	20	10
03	**Introduction to CNC** • Explain terminologies used in CNC turning. • Identify the parts of a CNC & VMC machine. • Describe various turning operations that can be performed on a CNC. Turning operations: turning (OD and ID), facing, contour turning with roughing, finish turning using stock removal cycles (OD and ID), grooving (face, OD and ID), thread cutting (OD and ID), drilling, boring, rigid tapping and tapping with attachment. • Identify various types of cutting tool materials and describe their properties. • Identify various types of tools based on the operations. Cutting	30	15

	tools: turning tool (OD and ID), grooving tool (OD and ID), parting tool, threading tool, form tools, centre drills, twist/insert drills, reamers. • Hand tools: hammer (ball peen, mallet), magnifying glass, allen keys, spanner, wrenches, deburring tools. • Identify various types of work holding devices. Work-holding devices: chucks with hard jaws, chucks with soft jaws, fixtures, drive centres, collet chucks, faceplates, magnetic/pneumatic devices, other work-holding devices. • Identify tool posts, magazines and carousels. • Describe the method to position and identify tools in relationship to the operating program.		
04	**Preparing CNC & VMC machine for operation** • Establish job requirements from the document accurately. Job requirements: raw materials or components required (type, quality, quantity); dimensions; limits and tolerances; operations required (list, sequence and procedures where applicable); work-holding devices; instruments and tools to be used; interdependencies; form tolerances; cycle time. • Perform primary checks on the CNC machine. Preliminary check ensuring readiness: e.g. machine is clean, lubrication is functioning, coolant level is correct, sub-systems are working correctly, confirmation received from the machine setter that the machine is ready for production, received necessary instruction/training on specific operation of the machine, etc. CNC machines: 2-axis CNC lathe machine. • Identify suitable work holding or fixture as per the work requirement. • Check tools, fixtures for any damage, breakage and calibration. • Ensure that the correct program is being used and the tool is set properly. • Pre-set the tooling appropriately using setting jigs / fixtures.	60	30
05	**Tool setting for CNC & VMC operations** • Use appropriate method to mount tool in the correct tool post, turret, magazines, or carousel. • Identify tool number in relation to the operating program. • Produce components of various features. • Feed the relevant tool data to the program. Tool data: e.g. tool types, tool lengths, tool offsets, radius compensation, etc. Part-program commands: axes convention, co-ordinates, (absolute, incremental); basic motion commands G00, G01, G02/03; tool radius compensation; F, S, T commands; program transfer to CNC machine. • Set tool datum, position, length, offset and radius compensation. • Position the work holding device in relationship to the machine datum and reference points. • Adjust machine tool operating parameters. Mode of machine control: machine / Operator Control Panel. CNC - MDI Panel. • Perform trial run using single block run, dry run and feed and speed overdrive controls • Verify critical parameters of the job. Critical parameters: linear dimensions (such as lengths, depths), slots (position, width, depth),	80	40

	flatness, squareness, parallelism, hole size/fit, angles, recesses, thread fit (suit to gauges / masters), runout, concentricity, contour/profile. • Perform necessary checks before proceeding for the full mode operation. Checks: after proving the program, measure the dimensions of the component on the machine and correct tool offsets accordingly; unload the component after all the dimensions are as per specifications; inspect the component for all dimensions and record findings in specified formats; make a note of the corrections to be made in the tool wear offsets and correct accordingly; run the next component; ensure that all dimensions are within specifications; correct if required; repeat this till parts come within specifications without any correction requirement.		
	Total	**200**	**100**

Course Outcome:

Sr. No.	CO statement	Marks % weightage
CO 1	To understand basic preparation required for computer numerically controlled vertical machining center to perform range of operations on metal components	50
CO 2	To perform range of operations on metal components using computer numerical control vertical machining centre	30
CO 3	To understand basic tool setting operation on CNC and VMC machine	10
CO 4	To learn basic health and safety practices at the workplace	10

Reference:

1) CNC Setter cum Operator-Vertical Machining Centre (NSQF Level: 5), Capital Goods Skill Council