GUJARAT TECHNOLOGICAL UNIVERSITY

Syllabus for Bachelor of Vocation (B.Voc), 3rd Semester
Branch: Production Technology
OJT Elective Name: CNC Setter Cum Operator - VMC (CSC/Q0123)
Subject Code: 1130311

With effective from academic year 2018-19

Type of course: Under Graduate

Prerequisite: None**.**

Rationale: This unit covers setting of computer numerically controlled (CNC) lathe machines, in order to perform turning operations on metal and plastic components, as per specifications provided. The candidate will be expected to perform independently as per instructions given, taking personal responsibility for one's own actions and for the quality and accuracy of the work produced.

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

Sr. No.	Topic	No. Of hours	% Weightage
1.	**Units, measurement and Engineering drawing** • Explain various systems of measurement. • Interpret First Angle and Third Angle component drawing correctly.	2	5
2.	**Introduction to CNC Vertical Machining Centre, its operation and safety** • State safety practices to be followed while operating CNC Vertical Machining Centre. • Explain various CNC machining operations and methods. • Describe CNC machining procedure. • Identify hazards associated while setting CNC Vertical Machining Centre. • Explain various terms used in VMC. • Interpret job specifications correctly. • State the importance of following correct machining sequence. • Describe the procedure to set work holding devices correctly.	8	5
3.	**Selection of tools and calibrations** • State the properties of cutting tool material. • Describe the application of various cutting tools. • Describe factors that determine the selection and use of indexable tips. • Interpret reference charts, graphs and tables. • Identify various forms of raw material. • Define 'Feed' and 'Speed'. • Explain the factors affecting feed and speed based on the	20	10

	material type. • List various types of cutting fluids. • Describe characteristics of cutting fluids. • Interpret various error messages to evaluate actions to be taken. • Explain quality and accuracy standards. • Prepare the work area for the VMC setting operations. • Perform preliminary checks on the machine before the operation. • Obtain required tools and equipment. • Verify that all the measuring tools are calibrated and approved for use.		
4.	**Setting up cnc vertical milling centre** • Upload latest part program onto the CNC machine. • Setup the machine as per the component to be produced. • Verify specific tool number as per the part program. • Enter all tool data to the operating program • Mount work holding devices correctly and check for any backlash. • Set the machine operating parameters. • Put the machine into correct operating mode. • Conduct trial run and perform the suggested checks. • Handover the machine to the operator with all necessary documentation.	50	40
5.	**Perform a Range of Operations on Metal Components Using Computer Numerical Controlled Vertical Machining Center** • Explain safety practices to be followed while operating Vertical Machining Center (VMC). • Identify required Personal Protective Equipment (PPE) required for machining operation. • Locate safety mechanisms on the machine. • Identify hazards associated with VMC to avoid accidents. • Identify various types of materials. • Identify different form of materials. • Identify casted, forged and machined components. • Explain mechanical properties of ferrous and non-ferrous materials. • Interpret first angle and third angle engineering drawings. • Interpret work instructions correctly. • Explain common terms used in VMC machining. • Describe various systems of measurement. • Convert units from one system of measurement to another. • Identify measuring equipments required for machining. • Identify right kind of tool for a specific operation.	80	40

	• List work holding devices required machining operation. • Explain important characteristics of tungsten carbide, ceramic and diamond indexable tips. • Explain effects of critical factors on the machining like feed and speed. • Explain absolute and incremental systems of tool positioning and off setting • Explain various CNC machining operations that can be performed • Identify cutting tool based on the application. • Interpret error messages displayed on the control panel. • Identify commonly used hand tools • Conduct preliminary check on the machine to check for readiness • Perform simple troubleshooting activities during the machining operation • Perform basic maintenance activities • Set work piece as per the instruction. • Load and unload components using predetermined fixtures or work holding devices • Carry out trial run by taking back the tool offsets by a minimum amount keeping margin error rectification • Measure the critical parameters of the machined component on the machine after the trial run • Perform offset and radius compensation • Produce machined components that combine different operations and have a range of applicable features • Interpret in-built alarms and error codes of equipment and respond to the same as per operating manual/organizational guidelines • Inspect tool for wear and change tool as and when necessary • Fill up appropriate technical forms, activity logs as per the requirement • Follow proper communication protocol. • Communicate with people in respectful manner in line with organizational policy • Perform numerical operations, geometry and calculations. • Maintain current knowledge of application standards, legislation etc • Address any problems arising during the machining operation • Plan, organize and sequence work operations as per the job requirement • Work in a team to achieve better results.		

Suggested Specification table with Marks (Practical):

Distribution of Practical Marks					
R Level	**U Level**	**A Level**	**N Level**	**E Level**	**C Level**
10	**15**	**10**	**10**	**5**	**5**

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

Reference Books:

1. P.Radhakrishnan, " Computer Numerical Control ", New CentralBook Agency, 1992
2. Computer integrated manufacturing -S. Kant Vajpayee –Prentice Hall of India
3. Computer Aided Manufacturing-Rao, Tewari, Kundra, McGraw Hill, 1993
4. CAD/CAM, Principles and Applications –P N Rao, McGraw Hill, 2010

Course Outcome:

After learning the course the students should be able to:

1. Set computer numerically controlled (VMC) machines for operations on metal components
2. Students will prepare CNC programs for manufacturing of different geometries on milling and lathe machines.
3. Perform different operations on metal components using Computer Numerically Controlled (CNC) machines.
4. Use basic health and safety practices at the workplace

List of Open Source Software/learning website:

1. www.nptel.ac.in/