**GUJARAT TECHNOLOGICAL UNIVERSITY**

**Syllabus for Bachelor of Vocation (B.Voc), 3rd Semester**
**Branch: Production Technology**
**OJT Elective Name: CNC Programmer (CSC/Q0401)**
**Subject Code: 1130307**

**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 performindependentlyas perinstructionsgiven, taking personal responsibility for one's ownactions and for the quality and accuracyof 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 |
|---|---|---|---|
| **01** | **Set Computer Numerically Controlled Vertical Machining Centre to perform a Range of Operations on Metal Components**<br>• Understand the main features and working parts of CNC machines and accessories (2 axis machines to 5 axis machines including machining centres)<br>• Understanding and minimizing the hazards associated with machining operations on CNC machines. | 10 | 5 |
| **02** | **Terminologies related to CNC m/c**<br>• 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. | 20 | 10 |
| **03** | **Interpretation of manufacturing drawing and tool selection**<br>• 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 firstand third angle from drawings.<br>• 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. | 20 | 20 |

| | | | |
|---|---|---|---|
| **04** | **Cnc programing**<br>• Understanding the importance of writing programs that are editable and correctable by next person.<br>• 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; operationaldiagrams; 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.<br>• 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.<br>• CNC programming for lathe & milling machine using ISO codes into the CNC simulator.<br>• CNC programming for lathe and milling machines using different machining cycles into the CNC simulator.<br>• Procedures Associated with part programming, Cutting process parameter selection, Process planning issues and path planning, G & M Codes, Interpolations, Canned Cycles and Subprograms, Tool compensations.<br>• Exposure for programming and simulator of FANUC, SINUMERIC, DMG TURNPLUS & Controls through post processors.<br>• 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. | 100 | 65 |

| | | | |
|---|---|---|---|
| | • 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.<br>• 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. | | |
| **05** | **Making programs for different industry required jobs** | 50 | |

**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 (CNC) machines for turning operations on metal components
2. Create and check CNC programs for manufacturing of different geometries on CNC machines.
3. Perform operations on metal components using Computer Numerically Controlled (CNC) machines.
4. Adopt basic health and safety practices at the workplace

**List of Open Source Software/learning website:**

1. www.nptel.ac.in/