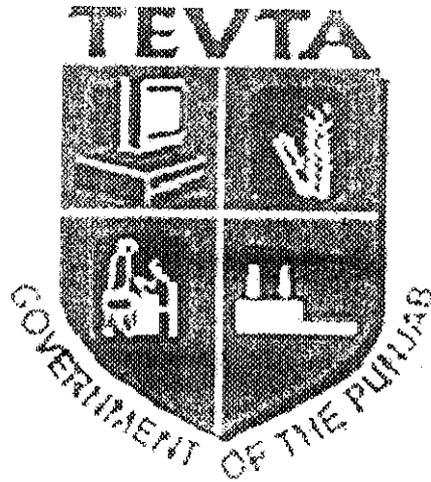


GOVERNMENT OF THE PUNJAB

TECHNICAL EDUCATION & VOCATIONAL TRAINING AUTHORITY



CURRICULUM FOR
CNC PROGRAMMER
(06 – Months Course)

Evaluated, July 2016

CURRICULUM SECTION
ACADEMICS DEPARTMENT

96-H, GULBERG-II, LAHORE

Ph # 042-99263055-9, 99263064

gm.acad@tevta.gop.pk, manager.cur@tevta.gop.pk

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TRAINING OBJECTIVES:

Computer aided design process (CAD/CAM/CNC) has revolutionized the process of product design. Modern techniques have integrated the design cycle from concept inception to CNC production operations.

This course will focus on CNC (Manual, Software Programming) by using CAD & CAM simulation/ Integration/ operations/ applications like Boxford/ Edge-CAM/ Del CAM/ Power Mill/ Hyper Mill/ Pro E/ CATIA (as per available conditions) etc. for better, efficient and fast product design & development.

CURRICULUM SALIENTS:

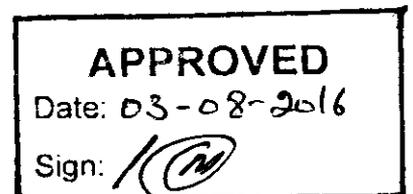
Name of the Course	:	CNC Programmer
Entry level	:	Matric and above
Duration of course	:	6-Months
Total training hours	:	800 Contact Hours
Training Methodology	:	Practical 80 % Theory 20 %
Medium of Instruction	:	English / Urdu



SKILL COMPETENCY DETAILS:

The trainee of this course will be able to:

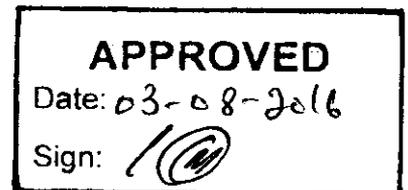
1. Apply the formulas of functional mathematics.
2. Demonstrate basic machine shop operations.
3. Design/compose manual CNC program.
4. Manipulate CNC software programming.
5. Convert CAD to CAM and simulate /integrate sequence of operations.
6. Run and operate CNC machine (lathe or milling).
7. Design products by using manual/auto programming tools.



KNOWLEDGE PROFICIENCY DETAILS:

The trainee of this course will be able to:

1. Understand the fundamentals of CAD/CAM/CNC.
2. Recognize and describe designing, layouts and drafting by using CAD applications.
3. Describe CAM software for modeling, simulation and integration.
4. Know to run and operate CNC lathe/milling.



SCHEME OF STUDIES**CNC Programmer
(6 – Months Course)**

Sr. No	Main Topics	Theory Hours	Practical Hours	Total Hours
1.	Fundamentals of CAD / CAM / CAE	20	80	100
2.	Basic Mathematics	5	35	40
3.	Basic Machine Shop Operations	15	80	95
4.	Manual Programming	42	163	205
5.	CNC Software Programming	40	200	240
6.	IT Fundamentals	30	50	80
7.	Functional English	08	32	40
Total		160	640	800

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DETAIL OF COURSE CONTENTS**CNC Programmer
(6– Months Course)**

Sr. No	Detail of Topics	Theory Hours	Practical Hours
1.	Fundamentals of CAD/CAM/CAE 1.1. File: New, Open, Save, Save As, Printer Set, Printer Preview and Print 1.2. Edit: Undo, Redo, Cut and Copy 1.3. View: Zoom Pan, Aerial View, Model Space, Paper Space, Hide Shade and Render 1.4. Format: Layer Color, Text Style Unit, Thickness, Drawing and Limits 1.5. Draw: Line Ray, Construction Line, Multi Line, Poly Line Polygon, Rectangle, Arc, Circle, Ellipse, Block, Hatch, Region, Text Surface and Solids. 1.6. Tool: UCS, Inquiry, Object Snap Setting and Drawing Aids 1.7. Dimension: Line, Aligned, Ordinate, Radius, Diameter, Angular, Baseline, Continue, Oblique, Aligned Text and Style. 1.8. Insert: Block 1.9. Modify: Erase, Copy, Mirror, Offset, Array, Move Rotate, Scale, Stretch, Trim Extent, Brake, Chamfer, Fillet and Explode	20	80
2.	Basic Mathematics 2.1 Addition of Fractions / Decimals 2.1.1. Subtraction of Fractions 2.1.2. Subtraction of Decimals 2.1.3. Multiplication of Fraction 2.1.4. Multiplication of Decimals 2.1.5. Division of Fraction/Decimals 2.1.6. Tolerances of Fractions/Decimals 2.1.7. Trigonometric Ratios 2.1.8. Exercise of mathematical ratios 2.1.9. Exercise addition of fraction /Decimals 2.1.10. Exercise subtraction of fraction /Decimals 2.1.11. Exercise multiplication of fraction /Decimals	05	35

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	2.1.12. Exercise division of fraction /Decimals 2.1.13. Exercise tolerances 2.1.14. Exercise trigonometric ratios.		
3.	Machines and their Operations 3.1. Basic Machine Shop Operations 3.1.1. Introduction to Lathe 3.1.2. Introduction to Lathe Tools 3.1.3. Straighten a job with chuck & key 3.1.4. Facing & simple turning 3.1.5. Counter sinking & step turning 3.1.6. Knurling & taper turning 3.1.7. Treading 3.1.8. Drilling, boring, tapping 3.1.9. Lathe parts and their working 3.1.10. Type of lathe tools and application 3.1.11. Straightening a job with chuck & key tools 3.1.12. Straightening a job with tool 3.1.13. Simple Turing exercise 3.1.14. Step Turing exercise 3.1.15. Step Turing exercise 3.1.16. To make center punch 3.1.17. To cut Trades 3.2. Introduction to Milling Machines 3.2.1. Types of Milling Machines 3.2.2. Types of Milling Cutters 3.2.3. Operations of Milling Machines i.e. Plain Milling, Face, Side, Angular, Gang, Form, End, Profile, Saw, Flute, T-slot, keyway, Gear, Helical Thread Milling Etc. 3.2.4. Accessories of Milling Machine 3.2.5. Usage & Safety Precautions 3.3. Introduction to Drilling Machines 3.3.1. Types of Drilling Machines 3.3.2. Types of Drills 3.3.3. Types of Drilling Operation 3.3.4. Accessories of Drilling Machine 3.3.5. Usage & Safety Precautions 3.3.6. Exercises	15	80

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4.	Manual Programming 4.1. Introduction to CNC Lathe & Control Panel 4.1.1. Introduction to CNC Lathe tools 4.1.2. Coordinate calculation techniques 4.1.3. Linear interpolation 4.1.4. Incremental coordinate programming 4.1.5. Turning & facing 4.1.6. Circular interpolation & rough cuts 4.1.7. Canned cycle facing & roughing 4.1.8. Canned cycle grooving 4.1.9. Canned cycle for threads 4.1.10. Canned cycle for peak drilling 4.1.11. Circular interpolation partial axis 4.1.12. Tool off setting techniques 4.1.13. Basic of machine maintenance 4.2. Introduction to CNC Milling/Machine Centre & Control Panel 4.2.1. Types of CNC Milling/Machining Centres 4.2.2. CNC Machining Cutters 4.2.3. Offsetting techniques 4.2.4. Coding (G&M Specially) 4.2.5. Canned cycles for Milling 4.2.6. Accessories of CNC Machining 4.2.7. Usage & Safety Precautions	42	163
5.	CNC Software Programming 5.1. Boxford/Edge CAM/Dell CAM/Power Mill/CATIA/Pro E etc. (subject to available conditions) 5.2. Introduction to software 5.3. Interfaces of software 5.4. Tool bars 5.5. Conversion of CAD to CAM 5.6. Simulation & Integration Operations etc.	40	200
6.	IT Fundamentals	30	50
7.	Functional English	08	32
Total		160	640

LIST OF PRACTICALS

1. To practice/study commands.
2. To draw /practice simple mechanical parts.
3. To practice drawing conventional machines.
4. To make/draw simple pulley, hand wheel, etc.
5. To make/draw nut, bolts etc.
6. To make/draw fuel injector etc.
7. To practice manual CNC coding, specifically with G&M code.
8. To practice CAM software with simulation of different parts.



LIST OF LABS REQUIRED FOR THE COURSE**(For class of 25 students)**

Sr. No	Name of Labs./Workshops
1.	CNC Lab.
2.	Conventional Machine Shop/Workshop
3.	CAD Lab.

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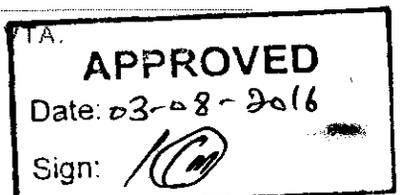
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LIST OF TOOLS/EQUIPMENT/MACHINERY ETC.**(For class of 25 students)**

Sr. No.	Tools / Equipment / Machinery	Quantity
1.	CNC Lathe Machine	01
2.	CNC Milling Machine	01
3.	CAD Software	--
4.	Conventional Machines i.e. Milling, Lathe, Drilling etc.	03 each
5.	Desktop Workstations (Specifications as per notification issued by MIS Section, TEVTA)	26 (01 for each student & 01 for the teacher)
6.	Printer	02
7.	Philips Screw Driver Set	02
8.	Screw Pitch Gauge	10
9.	Radius Gauge	05
10.	Combination Set	02
11.	Allen Key Set	02
12.	File Brush Set	02
13.	Letter Punch Set	02
14.	Needle File Set	02
15.	File Brush	05
16.	Centre Drill	05
17.	Oil Can	02
18.	Centre Gauge	02

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19.	Centre Punch	05
20.	Vernier Calipers	10
21.	Adjustable Wrench 12"	05
22.	File Set	05
23.	Micro Meter (mm)	05
24.	Micro Meter (inch)	05
25.	Adjustable Wrench 6"	05
26.	Safety Goggles	05
27.	Combination Pliers	05
28.	Tool Box	05

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LIST OF TOOLS/EQUIPMENT/MACHINERY ETC.**(For class of 25 students)**

Sr. No.	Tools / Equipment / Machinery	Quantity
1.	Mild Steel/Teflon 2 inch Diameter & 4ft Length	20 Nos.
2.	M.S Square 4×4 inch	40 Kg
3.	M.S 1 inch Diameter	10 Kg
4.	M.S Φ ¾ inch	35 Kg
5.	White Board Markers (Black, Blue, Red)	01 Pack

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MINIMUM QUALIFICATION OF INSTRUCTOR

Minimum qualification criteria of instructor is as follows:

1. B.Tech / BS Tech /B.Sc. Mechanical Engineering with 01 Year experience.
2. DAE Mechanical Technology with 04 Years hands on experience.

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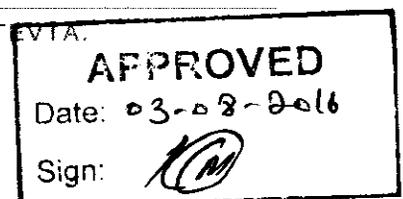
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EMPLOYABILITY OF PASS-OUTS

The pass outs of this course may find job / employment opportunities in the following areas / sectors / organizations:

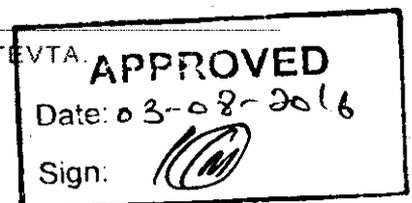
- Self-employment
- POF (Wah Cantt.)
- NDC
- HMC
- HIT
- PAC (Kamra)
- PMO
- AWC
- Shipyard
- Atomic Energy
- KRL
- International Arena
- Automobile Industry.
- Surgical Industry
- Cutlery Industry
- Engineering Sector
- Chemical Sector etc.



REFERENCE BOOKS

1. 'Technology of Machine Tools' by S.F Karar A.F Check, 5th Edition McGraw Hill (Mechanical Engineering Series) Unit 75, 76, 77, Page 585 to 642.
2. 'Mastering CAD/CAM' by Ibrahim Zeid, ISBN 978-0-07-286845-6, and McGraw-Hill.
3. 'Solid Works 2011 for Designers' by Prof. Sham Tickoo, ISBN: 978-1-932709-89-6, CAD Technologies, USA.
4. 'Exercise Workbook for Beginning AutoCAD' by Professor Cheryl R. Shrock Drafting Technology, Orange Coast College, Costa Mesa, Canada. etc.
5. 'CATIA Workbook V5' by Richard Cozzens, Southern Utah University.
6. 'CATIA V5 Tutorials' by Nader G. Zamani, University of Windsor

By S.F Karar A.F Check 5th Edition McGraw Hill (Mechanical Engineering Series)
Unit 75, 76, 77 Page 585 to 642



CURRICULUM EVALUATION COMMITTEE

Mr. Tariq Mehmood
Sr. Instructor (Mechanical)
GCT, Railway Road, Lahore.
0333-4376815

Convener

Mr. Akram Sarfraz
Instructor (Mechanical),
GCT Railway Road, Lahore.
0300-5604323

Member

Mr. Khalid Fareed
Instructor (Mechanical),
GCT Railway Road, Lahore.
0321-4861662

Member

