MAHARASHTRA STATE BOARD OF VOCATIONAL EDUCATION EXAMINATION, MUMBAI - 51

1	**Name of Course**	**Diploma Course in CNC Programming and Machining**
2	**Course Code**	303411
3	**Max no. of Students**	25
4	**Duration**	2 Year
5	**Course Type**	Full Time
6	**No. of Days per week**	6 days
7	**No. of hours per day**	7 Hrs
8	**Space require**	Theory Class Room – 200 sqft Three Practical Lab – 500 sqft each
9	**Entry qualification**	SSC Pass
10	**Objective of syllabus**	Learn to work on CNC machine, their axes, machine co-ordinate system, different programming systems, job setting, tool selection &l setting, operation sequence, coolant selection, process selection of different types of jobs and different types of machine controls, machining processes, industrial safety and working procedure, selection of work process, metal cutting processes, gear/ thread manufacturing methods, finishing and super finishing processes, To Understanding m/c Drawing, To Prepare Drawing using CAD.
11	**Employment opportunities**	The student can get jobs in industries or with working experience will be in a position to start his own independent Business.
12	**Teachers Qualification**	1) For Vocational subject - B.E.Mech. 2) For Non Vocational Subject - Master Degree in Concern subject

13 **Teaching Scheme –**

Sr.	Subject	Subject Code	Clock Hours / Week		Total
			Theory	Practical	
1	**English (Communication Skill)**	90000001	2 Hrs	1 Hrs	3 Hrs
2	**Elective – I**		2 Hrs	1 Hrs	3 Hrs
3	**Elective – II**		2 Hrs	1 Hrs	3 Hrs
4	**Mechanical Technology and Material Science**	30340001	3 Hrs	8 Hrs	11 Hrs
5	**Machine Drawing and CAD**	30340004	3 Hrs	8 Hrs	11 Hrs
6	**Machining and CNC Programming**	30340020	3 Hrs	8 Hrs	11 Hrs
Total					**42 Hrs**

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14	**Internship**	Two Months Summer Internship from 1st May to 30th June is Compulsory.

15 **Examination Scheme – Final Examination will be based on syllabus of both years.**

Paper	Subject	Subject Code	Theory			Practical			Total	
			Duration	Max	Min	Duration	Max	Min	Max	Min
1	**English (Communication Skill)**	90000001	3 Hrs	**70**	**25**	3 Hrs	**30**	**15**	**100**	**40**
2	**Elective – I**		3 Hrs	**70**	**25**	3 Hrs	**30**	**15**	**100**	**40**
3	**Elective – II**		3 Hrs	**70**	**25**	3 Hrs	**30**	**15**	**100**	**40**
4	**Mechanical Technology and Material Science**	30340001	3 Hrs	**100**	**35**	3 Hrs	**100**	**50**	**200**	**85**
5	**Machine Drawing and CAD**	30340004	3 Hrs	**100**	**35**	3 Hrs	**100**	**50**	**200**	**85**
6	**Machining and CNC Programming**	30340020	3 Hrs	**100**	**35**	3 Hrs	**100**	**50**	**200**	**85**
									900	**375**

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16 **Teachers** – Three Teachers per batch for vocational component. For English, Elective-I & II guest faculty on clock hour basis.

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a) For Elective I – Student can choose any one subject

Code	Subject Name
90000011	**Applied Mathematics**
90000012	**Business Economics**
90000013	**Physical Biology (Botany & Zoology)**
90000014	**Entrepreneurship**
90000015	**Psychology**

b) For Elective II – Student can choose any one subject

Code	Subject Name
90000021	**Applied Sciences (Physics & Chemistry)**
90000022	**Computer Application**
90000023	**Business Mathematics**

Subject Name - Mechanical Technology and Material Science

Subject Code - 30340001

Theory – 1st year	Practical – 1st year
1] **Fundamental of material** □ Introduction of metals and non metals □ Structure of metal □ Formation of grain □ Imperfection in crystals □ Deformation in metal and change in properties □ Fracture □ Equilibrium diagram □ Iron, carbon equilibrium diagram □ Time temperature transformation diagrams	1. Take the tensile test of M.S. specimen & Draw stress strain diagram, yield pts.
2 **Ferrous metals and alloys** □ Pig iron and cast iron □ Effect of chemical elements on iron □ Classification of steel and its application □ Alloy steel and special alloy steel 3 **Non Ferrous metals and alloys** Introduction to non ferrous alloys □ Aluminum and its alloys □ Copper and its alloys □ Lead and its alloys □ Nickel and its alloys □ Alloys for high temperature service □ Metal for nuclear energy	2. Study the mechanical properties like Elasticity, ductility, malleability, Brittleness, toughness of Different materials – M.S., C.S. Bronze, Copper, Aluminum Study the Hardness test □ Brinnel Hardness test □ Rockwell hardness test

4 **Crystal Structures** □ Fundamental concept □ Unit Cells □ Metallic crystal structures □ FCC Structure □ BCC Structure □ HCP Structure □ Weld ability 5 **Properties of Metal** □ **Mechanical properties of Metal** Elasticity, ductility, malleability, brittleness, Toughness, Stress strain behavior, Elastic limit, hooks Law, UTS, poisons ratio, factor of safety, hardness and hardness tests shear strength, resistance. □ **Electrical properties of Metal** Electrical conductivity, resistivity, electrical Characteristic of commercial alloys	

Theory – 1st year	Practical – 1st year
Thermal properties of metal Heat capacity, thermal expansion, thermal Conductivity, thermal stress 6 **Magnetic Properties of metal** Basic concepts, diamagnetism and Para magnetism, ferromagnetism, influence of temperature on magnetic behavior, domain and hystersis, soft and hard magnetic material. 7 **Heat Treatment of material** Normalizing Hardening Quenching and tempering Annealing Stress Relieving Case carburizing and case hardening. Toughening Weld ability of Metal definition and concept Effect of alloying elements on weld ability Purpose and types of weld ability tests	3. Study the Electrical Properties of some conductors (conductivity, Resistively) Aluminum, Copper, Brass, Tungsten
8 **Cracking phenomena in steel** Cold crack due to hydrogen Hydrogen cracking Measurement and control of hydrogen in the deposited weld metal Cracking mechanism in the weld metal and HAZ Weld decay Lamellar tearing Hot cracking Reheat cracking	4. Study the effect on materials with heat treatment Normalizing, Hardening, Quenching & Tempering Anne ling, Stress Reliving, Case Hardening, Toughing For Different Material's M.S., C.S.,Nickel,Capper

Theory – 2nd year	Practical – 2nd year
1 Bench work and fitting Introduction- Vices – Hammers- Chisels- Chipping- Files- Filling- Scrapper-Scraping-Grinding and Polishing- Hacksaw sawing-Marking tools – Surface plate- Scriber – Punch- V block- Angle plate- Try square – Marking out – Drill- Drilling- Reamer- Reaming- Taps- Tap drill size-Tapping – Dies and stock- Dieing. **2 Sheet Metal Work** Introduction – Metal used in sheet metal work- Sheet metal hand tools- Sheet metal operation-Sheet metal joint- Hems and Sems – Sheet metal allowance- Sheet Metal working machine-Laying out a pattern **3 Plumbing, Threading, Fasteners & joints** Plumbing- Specifications of pipes- Material used for pipes-Pipe fitting & Joints-Taps & valves – Plumber tools – Threaded fasteners- screw threads and their uses- Indian standard threads-Cap screw and machine screw-Set screw- Methods of producing screw threads-Bolts- Studs- Forms of nuts- Riveting joints. **4 Smithy and Forging** Maintenance and application of smith health-Anvil- Swage block-Tongs-Hammer-Flatters-Measuring tools e.g.-Try square- Steel rules-Calipers-Operations e.g. up setting- drawing down- bending setting- forge welding. **5 Welding Technology** Welding Welding introduction to different welding processes, like gas Welding, ARC welding TIG, MIG, submerged arc welding,	**Fitting** 1. Filing Flat surfaces: Checking flatness and square ness using a try square – Types of filing – Cleaning files. 2. Chipping: Hints on chipping 3. Hack sawing: Selection of blades for different metal sections - Fix hack sawing the material for the job blades maintaining. Correct tension and direction – Hack sawing. Filing 'V groove and complex profile by file & check with profile gauge. 4. Filing radius –check with radius gauge 5. Check profile with profile gauges. 6. Drill plate, Drilling, counter sinking, counter boring. Operations on job 7. Drilling and Tapping: Internal threading of holes by using hand taps – determine the tap drill size, drilling, counter-sinking and tapping – precautions with tapping a blind hole. 8. External thread cutting using die.

spot Welding, electrodes etc. Brazing methods & application, Knowledge of welding skills. **6 Metal Turning (Lathe)** 6.1 Function of lathe, Types of lathe, the size of lathe, Descriptions & function of lathe parts, 6.2 Lathe accessories and attachments. 6.3 Operation on Lathe 6.4 Cutting Tools, Classification , Influence of tool angles. 6.5 Types of tools, cutting speed, Feed, Depth of cut, 6.6 Machining time. Cutting tool signature.	

Theory – 2nd year	Practical – 2nd year
7 DRILLING Introduction Types of drilling machine, Portable drilling machine, Sensitive drilling machine. Upright drilling machine, Radial Drilling Machine; Gang drilling machine, Multiple spindle drilling machine Automatic drilling machine, Deep hole drilling machine; The size of a drilling machine, Upright drilling machine parts. Radial drilling machine parts, Work holding devices, Tool holding devices, Drilling machine operation, Drilling machine tools. Twist drill nomenclature. Drill size Designation of drill material Reamer, reamer nomenclatures. Counter bore, Countersinks and spot face, Taps. Tap nomenclatures. Cutting speed Feed, Depth of cut, Machining time in drilling	**Basic Workshop Practice** 1. Step turning and Radius forming: Free hand form turning – by using form tool. 2. Drilling and Boring-Use of inside caliper and outside Micrometer for bore measurement. 3. Drilling and reaming: by hand-Method of checking the bore With a plug gauge. 4. Drilling and step Boring: Boring blind hole with a boring tool.
8 SHAPER Introduction. Types of shapers. Principal parts. Shaper size; Shaper mechanism; Work holding devices. Shaper operations. Shaper tools; Cutting speed, feed and depth of cut; Machining time. **9 SLOTTING** Introduction. Types of slotting machine; Slotter size; Slotting machine parts; Work holding devices; Slotter operation; Slotter tools; Cutting speed, feed and depth of cut.	5. Drilling, Boring and Recessing: Internal recessing to a size broader than the width tool – Form a recess. 6. Shaping blind & open keyways on shaping machine 7. Shaping irregular surfaces.(Concave / Convex)
Powder Metallurgy Introduction- Process Description- Manufacture of metal powder- Blending of powders- competing profiteering- Sintering- Secondary operation –ISO Static pressing – Product of powder metallurgy-Advantages of process – Disadvantages and limitation-Design considerations Introduction to CNC	8. Slotting internal grooves on slotting machine 9. Welding Practical-fusion run with/without filler rod on MS Sheet – squire butt joint on MS sheet LAP,T& Edge joint on M.S. Sheet

List of Books

1 M. N. Uppal A Text - book of ngineering Chemistry

2 V. P. Mehta A Text - book of polytechnic Chemistry

3 Banswal, Mahajan and Mehta A Text - book of,Applied Chemistry

4 Hazra Choudhary Elements,of workshop technology

5 S.K.Hajra Choudhary Elements of workshop technology Vol-I First 1964 Media promoters & Publisher pvt. Ltd.

6 Mahajan Mechanical Technology Third 1989 Vrinda publication

Sr. No. Name of the equipment/ machinery NOS.

1	TRAINEES TOOL KIT	5
2	Try Square 10 cm Blade	5
3	Calipers outside 15 cm spring	5
4	Caliper inside 15 cm spring	5
5	Dividers 15 cm Spring	5
6	Calipers 15 cm Hermaphrodite	5
7	Scriber 15 cm	5
8	Punch center 10 cm	5
9	Screw driver 15 cm	5
10	Chisel cold 20 cm	5
11	Trammel 30 cm	5
12	Hammer ball peen 0.5 kg with handle	5
13	Hammer Mallet	5
14	Hammer Plastic	5
15	Hammer ball peen 0.5 kg with handle	5
16	File flat 25 cm second cut	5
17	File flat 25 cm second cut	5
18	Hacksaw frame adjustable 20-30 cm	5
19	Dot slot punch	5

20	Steel rule 15 cm English and metric	5
21	Steel rule 30 cm English and metric	5
22	Try square 20 cm Blade	5
23	Steel tool box	5
24	Scriber	5
25	Lock and keys	5
26	Combination plier	5
27	Jenny calipers	5
28	Aluminum tray 15 cm X 10 cm	5
29	Fellow polish cloth standard size	5

	SHOP OUTFIT & MEASURING INSTRUMENTS	
30	Straight edge 45 cm X 45 cm	1
31	Marking table 90X90 cm	1
32	Surface plate 45 cm X 45 cm	1
33	Vee Block pair 7 cm and 15 cm with clamps	1
34	Angle plate 10 X 20cm	1
35	Number Punch 3 mm set	2
36	letter Punch 3 mm set	2
37	Round punch 3 mm X 4 mm set of 2	2
38	File flat 20 cm bastard	2
39	Oil Stone 15 X 5 cm X 2.5 cm	
40	Spanner adjustable 10 cm	1
41	Chisel cold 20 cm cross cut	2
42	Chisel 10 cm flat	2
43	Drill twist 1.5 mm to 15mm (various sizes) by 0.5	2
44	Files assorted sizes and type including safe edge	10
45	Micrometer inside 50-150 mm with screen	2
46	Bench Vice 12 cm jaw	5
47	Work Bench 240 X 120 60 mm with screen	3
48	Drill point angle gauge	1
49	Vernier Calipers 20 cm	2
50	Vernier height gauge 30 cm	1
51	Huntington and diamond dresser	1
52	Taps and dies complete set (metric)	2 set
53	Hacksaw frame	5
54	Fire buckets with stand	1
55	Thread pitch gauge metric, BSX, BSF, MC, MF & SAE	1 each
56	D.E. spanner ser of 12 metric 6 mm to 32 mm	1 set
57	Ring spanner set at 12 metric 6 mm to 32	1 set

58	Stud extractor set of 3	1 set
59	Universal puller for removing pulleys, bearings	1 set
60	Unserviceable engine/gear box rear axle	1
61	Stud remover with socket handle	1
62	Combination pliers 15 cm	5
63	Depth guage (inch and metric	1
64	Screw pinch gauge (inch and metric)	1 set
65	Feeler gauge 20 blades (inch and metric)	1
66	Aluminum tray 45 X 30 mm	5
67	Oil can 0.5 liter capacity	1
68	Surface gauge	1
69	Cylinder bore gauge (mercer)	1
70	Telescopic gauge	1
71	Steel measuring tape 10 meter in a case	2
72	Sets of Morse socket MT 0-1,1-2,and 2-3	1 set
73	Blow lamp	1
74	Torque wrenches 5-35 Nm,12-68 Nm&50-225 Nm.	1 each
75	Outside micrometer English 0-1,1-2,2-3,3-4,4-5,And 5-6 inches	1 each

76	Micrometer outside 1 to 25 mm,25mmto 50mm ,50 to75 mm,75 to100mm,100 to 125mm,125 to 150mm.	1
77	Surface gauge with dial test indicator plunger type i.e. 0.01 mm	1
78	Printed wall chart framed for display showing measuring instruments.	10
79	Inside micrometer English 2” to 6” with extension road	1
80	Vernier bevel protractor (metric and inch)	1
81	Vernier calipers (inch and metric) 6”x12”	1
82	Vernier micrometers(inch and metric)	1
83	Vernier height gauge 150 mm height (inch and metric)	1
84	Dial micrometer (inch and metric)	1
85	Small bore gauge (standard)	1
86	Dial test indicator to read (inch an metric)0.02mm	1
	GENERAL INSTALLATOIN /MACHINERIES	
87	Radial Drilling Machine 25mm capacity	1
88	Power Hacksaw	1
89	Rotary Cut off Machine	1
90	Shaping machine	1
91	Hydraulic Press 2 ton capacity	1
92	Surface plate (small)	1
93	Surface plate (big)	1
94	Standard Arc Welding machine	1
95	Horizontal milling machine	1
96	Bench Drilling machine 6-12mm cap Motorized with chuck and key	1
97	Grinding machine (general purpose)D.E. pedestal with 300mm dia wheels rough and smooth	1
98	Hydraulic Trainer with Power pack	1
99	Pneumatic Trainer	1
	Workshop furniture	
100	Suitable Work Tables with vices As required	1
101	Stools 25 Nos	25

102	Tool Cabinet 2 nos	2
103	Trainees locker 2 nos	2
104	Fire fighting equipment , first aid box etc As required	1
105	Book shelf (glass panel) 1 nos	1
106	Storage Rack As required	2
107	Storage shelf As required	2

Subject Name - Machine Drawing and CAD

Subject Code - 30340004

Theory – 1st year	Practical – 1st year
1 **INTRODUCTION OF DRAWING** Use of different drawing instruments, equipments & Drafting Techniques, Types of letters, conventions of line, Scales;plane scale and diagonal scales. 2 **CURVES & TANGENTIAL EXERCISES** To draw an ellipse by 1. Arcs of circle method 2. Concentric circle Method 3. Rectangle / oblong method; To draw a parabola by 1. Dircetrix focus method 2. Rectangle method; To draw hyperbola 1. Transverse axis and focus Method 2. Passing Through a given point; To draw an Involutes of 1. A polygon (up to Hexagon) 2. A circle. To draw a cycloid, epic cycloid & hypocycloid. 3 **ORTHOGRAPHIC PROJECTIONS** Introduction to orthographic projections, first and third angle Method of projection, conversion of simple pictorial view into Orthographic view Dimensioning technique 4 **SECTIONAL VIEWS**	**PRACTICAL** 1. Practice: Layout of drawing sheet Types of lines – Thickness, shade of lines and its General applications. Practice: Draw type of lines as per IS-70714-1983 Type of Angle, Triangles and their types. Dimensioning- Types of dimension, elements of dimensions, Methods of indicating Values, Arrangement and indication of dimensions. Place dimensions in the drawing by aligned system and unidirectional system, Give dimension to the given drawing by following dimensioning principles as per BIS Method of dimension common features Geometrical construction using drawing instruments-Lines, Angles, patterns, Circle, Arc, Tangents, Triangles, Quadrilaterals, Regular Polygons. Different type of Tapers, Related Exercise on this topic. 1. Practice: Construct square, rectangle, parallelogram, rhombus, trapezium and quadrilateral 2. Practice: Draw a regular pentagon by circum scribing & inscribing 3. Practice: Draw a regular hexagon by arc method 4. Practice: Draw a regular pentagon, octagon and various types of tapers 5. Free hand sketching of straight lines, rectangular, circles, squares, Polygons, ellipse. 6. Practice: Prepare proportionate free hand

Conversion of given pictorial view into sectional orthographic views. 5 **ORTHOGRAPHIC VIEWS** Isometric scale and views of simple objects; isometric views of Rectangular, cylindrical objects and Representations of slots on Sloping faces. 6 **PROJECTIONS OF LINES** Projections of solids- prism, prism, cone, cylinder, Tetrahedron; axis Inclined to one reference plane only. 7 **SECTION OF SOLIDS** Sections of the solids-prism, pyramid, cone, cylinder, Solids resting on their bases on the Ground Section plane is inclined to one Reference plane and perpendicular to other	sketches of plane figures 7. Practice: Sketch horizontal, vertical and inclined line by free hand, Draw circles by free hand using square and radial line method, Draw arcs and ellipse by free hand Orthographic projection I and III angle – Simple machine elements, Procedure for preparing a scale drawing. 8. Practice: Draw a plan, elevation and side view of prism and cylinder, cone and pyramids 9. Practice: Draw 1st angle and 3rd angle projection (i) Front View (ii) Top view and (iii) side view of object having stepped blocks with curved surfaces – simple machine elements. Drawing Isometric views out of orthographic views – Simple Machine Elements 10. Practice: Construct an isometric scales to a given length

8 **CONVENTIONAL REPRESENTATION** Introduction; Conventional Representation of Material; Conventional breaks, Machine components such as splinted shaft; bearings, slotted heads, raced & pinion, Internal & External Threading, Springs, Gears, Pipe fitting & pipe joint, Welded joint; Practice Drawing of all type of Conventions in the sketch book. 9 **LIMIT FITS & TOLERANCES** Process Tolerance, Machining symbol, Induction of machining Symbol, Indication of surface roughness characteristics, symbol for direction of lay; Induction of machine allowance, position of Specification of surface roughness, Indication of drawing, Introduction of dimensional; Tolerances Element of Interchangeable system, Tolerance; Fundamental tolerance, Calculation of limit size, Method of specifying dimensions of fit, limit & Tolerance, Geometrical Tolerance, form tolerance, Position Tolerance, Indication of Geometrical Tolerance; types of geometrical Tolerance.	11. Practice: Draw the isometric projection of cube, hexagonal prism, cylinder and cone 12. Practice: Draw the isometric view of the objects/blocks/solids with curved surfaces Missing lines and views. 13. Practice: Visualize the shape of the object from the given two views and add the third views – simple machine elements 14. Practice: Identify the lines missed in multi views and supply them. Identify at least five shapes satisfying a given view. One problem on each projection of lines and plane are to be drawn in A-3 size sketch book. 15. Identify the third view for the given two views of similar in shapes and size. Development of regular objects bounded by plane surfaces-cube, prisms, cylinder and cones. 16. Practice: Draw the development of surfaces of a cube and prism 17. Practice: Draw the development of surfaces of a cylinder and cones Explanations of full – sectional view, half-sectional view, aligned sections.
10 **PRODUCTION DRAWING** Introduction, need, scope; Production drawing procedure, Production drawing for, Nut & Bolt, Spur gear, Fly – cotter joint Wheel, V belt pulley.	18. Practice: Draw full and half sectional view of simple machine elements. Conventions and symbols used in drawing, Abbreviations used in engineering drawing, surface finish symbols, Welding symbols and Annotations. 19. Practice: Draw surface finish symbols, Welding symbols and Annotations. Machining symbol, Induction of machining Symbol, Indication of surface roughness characteristics, symbol for direction of lay; Induction of machine allowance, position of Specification of surface roughness, Indication of drawing,

	Blue print reading of various Engineering drawing and Machine drawing. 20. Practice: Blue print reading of Engineering Drawings and Machine drawing. Introduction to free hand sketching of machine parts. Tracing and printing of drawing. Introduction to Auto CAD, 3D modeling concept. 21. Practice: Draw the elevation, plan and the side view of Nut & Bolt, Spur gear, and Fly cotter joint Wheel, V belt pulley.

Machine Drawing and CAD – 2nd **Year**

Theory	Practical
A] Computer Fundamental	
1] Fundamentals Of Computer Introduction Components of PC The system Unit Front part of system Unit Back part of system Unit CPU Memory of computer Monitor Mouse, Keyboard Disk, Printer, Scanner, Modem, Video, Sound cards, Speakers	**List of Practical** 1. Working with Windows 2000 desktop ,start icon, taskbar, Recycle Bin, My Computer icon ,The Recycle Bin and deleted files Creating shortcuts on the desktop 2. The Windows 2000 accessories, WordPad – editing an existing document, Use of Paint – drawing tools The Calculator, Clock 3. The Windows Explorer window, concept of drives, folders and files? Folder selection techniques, Switching drives, Folder creation, Moving or copying files, Renaming, Deleting files ,and folders 4. Printing, Installing a printer driver, Setting up a printer, Default and installed printers, Controlling print queues, Viewing installed fonts, The clipboard and 'drag and drop', Basic clipboard concepts Linking vs. embedding,
2] Introduction To Windows 2000/Xp Working with window Desktop Components of window Menu bar option Starting window Getting familiar with desktop Moving from one window to another Reverting windows to its previous size Opening task bar buttons into a windows Creating shortcut of program Quitting windows	5. Moving through a Word document menu bar and drop down menus toolbars 6. Entering text into a Word 2000 document, selection techniques Deleting text 7. Font formatting keyboard shortcuts 8. Paragraph formatting Bullets and numbering 9. Page formatting What is page formatting? Page margins Page size and orientation Page breaks, Headers and footers 10. Introducing tables and columns
3] GUI Based Editing, Spreadsheets, Tables & Presentation Application Using MS Office 2000 & Open Office.Org Menus Opening, menus, Toolbars, standard toolbars, formatting toolbars & closing Quitting Document , Editing & designing your document Spreadsheets Working & Manipulating data with Excel Changing the layout Working with simple graphs Presentation Working With PowerPoint and	11. Printing within Word 2000 Print setup Printing options Print preview 12. Development of application using mail merge Mail merging addresses for envelopes Printing an addressed envelope and letter 13. Creating and using macros in a document 14. Creating and opening workbooks Entering data 15. Navigating in the worksheet Selecting items within Excel 2000 Inserting and deleting cells, rows

Presentation	and column Moving between worksheets, saving worksheet, workbook
4] Introduction To Internet What is Internet Equipment Required for Internet connection Sending &receiving Emails Browsing the WWW Creating own Email Account Internet chatting	16. Formatting and customizing data 17. Formulas, functions and named ranges 18. Creating, manipulating & changing the chart type 19. Printing, Page setup, Margins Sheet printing options, Printing a worksheet 20. ***** Preparing presentations with Microsoft Power Point. Slides and presentations, Opening an existing presentation , Saving a presentation
5] Usage of Computer System in various Domains Computer application in Offices, books publication data analysis ,accounting , investment, inventory control, graphics, database management, Instrumentation, Airline and railway ticket reservation, robotics, artificial intelligence, military, banks, design and research work, real-time, point of sale terminals, financial transaction terminals.	21. Using the AutoContent wizard ,Starting the AutoContent wizard, Selecting a presentation type within the AutoContent wizard Presentation type Presentation titles, footers and slide number 22. Creating a simple text slide, Selecting a slide layout Manipulating slide information within normal and outline view, Formatting and proofing text, Pictures and backgrounds, drawing toolbar, AutoShapes, Using clipart, Selecting objects, Grouping and un-grouping objects, The format painter

Theory	Practical
	23. Creating and running a slide show, Navigating through a slide show, Slide show transitions, Slide show timings. Animation effects 24. Microsoft Internet Explorer 5 & the Internet Connecting to the Internet The Internet Explorer program window, The on-line web tutorial Using hyper links, Responding to an email link on a web page 25.Searching the Internet, Searching the web via Microsoft Internet Explorer, Searching the Internet using Web Crawler, Searching the Internet using Yahoo, Commonly used search engines
6] Information technology for benefits of community Impact of computer on society Social responsibilities Applications of IT Impact of IT Ethics and information technology Future with information technology	26. Favorites, security & customizing Explorer Organizing Favorite web sites Customizing options – general, security, contents, connection, programs, advanced 27. ***** Using the Address Book Adding a new contact Creating a mailing group, Addressing a message, Finding an e-mail address 28. Using electronic mail, Starting Outlook Express Using the Outlook Express window, Changing the window layout, Reading file attachment, Taking action on message-deleting, forwarding, replying 29. Email & newsgroups, Creating and sending emails Attached files, Receiving emails, Locating and subscribing to newsgroups, Posting a message to a newsgroup 30. Chatting on internet, Understating Microsoft chat environment, Chat toolbar
Minimum system requirement for AutoCAD Starting AutoCAD – Use a Wizard, Use a Template, Start from Scratch, Open a Drawing, Quick Setup method, Advanced Setup method, Types of Units, AutoCAD Window Details – Menus, Toolbars, Command line area, Drawing area, WCS icon etc, Use of Function keys, Modes in AutoCAD – Snap, Grid, Ortho, Osnap, Polar, Otrack, Model Using various Toolbars, Creating new drawing, Saving a drawing, Closing a drawing, Opening a drawing, Use of	Practical related Creating New file, Closing Drawing, Saving Drawing, Startup Methods, Modes in AutoCAD, Use of Function Keys, Use of Keyboard and Mouse in AutoCAD Practice. CAD Command Practice on small objects

mouse in AutoCAD, Use of Keyboard, Coordinate system – Types of Coordinate, Absolute, relative, polar coordinate Draw commands – Line, Ray, Construction line, Spline, rectangle, Polygon, circle, ellipse, Arc, Donut, Polyline, Multiline, Multiline Style, Point, Point Style, Divide, measure Zoom commands – Real-time zoom, pan real-time, zoom window, zoom all, zoom in, zoom out, zoom center, zoom dynamic. Zoom scale, zoom previous.	

Machine Drawing and CAD – 2nd **Year**

Theory	Practical
Object Snapping – Dialog box, Toolbar, Tracking, snap p from, end point, mid point, center, intersection, apparent intersection, insertion, quadrant, tangent, perpendicular, node etc. Editing commands – Setting drawing limit, setting units, drawing area parameter, Copy, move, erases, opps, scale, rotate, stretch, lengthen, break, trim, extend, chamfer, fillet, mirror, offset, align, explode, array – rectangular & polar, editing using grips, edit Polly line, edit multiline, using property dialog box., Match property, using single line text, using multiline text, editing text, creating text style. Dimensioning technique – Linear, Aligned, Radius, Diameter, Angular, Baseline, Continuous, Leader, Center mark, creating dimensioning style. Block, Wblock, Attribute. Hatch, Boundary, Region. Object property toolbar – layer control, color control, Line type control, line weight control, working with layers, (freeze, thaw, lock, unlock, plot etc.) Printing and using scale in the drawing.	Practice on Small Drawing Objects using Commands in Draw Menu Practice of Editing command on above drawing objects, Dimensioning Drawing Creating Title block, Creating Part List, Material List using Text in AutoCAD, Drawing Plan, Elevation, Section, in AutoCAD for various mechanical objects, machine part etc.
Viewing Orthographic projections, Viewing Isometric projections, Plan View, Aerial View Window, Using Named Views, Using multiple Tiled View ports – New view ports, Polygonal View ports, object viewports, named view ports, joining viewports, Floating viewports in paper space, Region, Redraw, Regen all command. Shading the model – 2D wireframe, 3D wireframe, Flat shaded, Gauged shaded, hidden view Region, Redraw, Regen all command. Interacting Viewing in 3D – 3D orbit command, panning, zooming, adjusting the view, Adjusting the camera distance, swiveling the camera, Continuous orbit, using Visual aids – Compass, Grid, UCS icon etc Concept of Wire frame modeling, Surface modeling, Solid modeling, Concept of Thickness & Elevation	Suitable CAD Practical (Command Practice) based on the Theory. Creating Simple 3D Model of Machine assemblies required 3D view from all sides. Practice of using AutoCAD Mechanical Desktop package for creating various 3D Machine Elements.
Surface modeling – Ruled surface, Edge surface, Revolve surface, Tabulated surface, 2D solid, 3D face, Using Predefined 3D surface objects – Box, pyramid, Wedge, dome, sphere, cone, tours, dish, mesh. Solid modeling – Extruding solid, Revolving solid, Slicing & Interfering solid, using predefined 3D solid objects - Box, pyramid, Wedge, Cylinder, Cone, Torus Modifying 3D Solid object – 3D array, 3D mirror, 3D Rotate, Trim, Extend, Fillet, Chamfer etc. Boolean operation – Union, Subtract, intersect.	Creating, Rendering, and Viewing Various Machine parts and assemblies Elements like different types of Screws, bolt, nut, nail, rivet, keys, cotter, locking devices, stud, plates, angle, channel, sockets, cover, packings, gasket, belt, wheels, gear, grooved parts, casting, supports base plates, pipe joints, I section joints etc.

Machine Drawing and CAD – 2nd **Year**

Theory	Practical
Solid Editing – Extrude face, move face, offset face, delete face, rotate face, taper face, color face, copy face, color edge, copy edge, imprinting the object, Cleaning, separating objects, shelling the solid Checking validity of solid object. Rendering 3D solid – Rendering options / Rendering procedure – query, crop window, skip dialog box method, Rendering, using light effects in rendering – Distance light, point light, spot light, using Sun angle calculator for shaded model, modifying lights parameter, using lights in scene. Applying material effect to solid object. Using material library. Mapping background. Using background images Printing the 3D rendered view / drawing.	Creating, Rendering, Viewing, Generating JPEG images for Complete assembly model, Printing Photo with various View of machine assemblies, Creating Slide show presentation of such views of assembly model including All four side view, 3D view from four corner, Isometric View, Perspective View etc. Introduction to 3DS Max Software Package for animation Purpose. Introduction to Pro-Engineer, CATIA Software.

List of Books

Machine Drawing

1] N.D.Bhatt Elements of Engineering Drawing 49TH 2005 Charotar publishing house,opposite Amuldairy, court road Anand India

2] N.D.Bhatt Machine Drawing 40TH 2005 Charotar publishing house,opposite Amul dairy, court road Anand India

Computer Fundamental

1] Vikas Gupta Comdex Computer Course Kit First Dreamtech

2] Henry Lucas Information Technology for management 7Th Tata Mc-Graw Hills

3] B.Ram Computer Fundamentals Architecture and Organisation Revised 3rd New Age International Publisher

CAD Books

1] Reference Manual of AutoCAD AutoDesk

2] Reference Manual of Felix cad Felix CAD

3] Reference Manual of Intel CAD

4] Reference Manual of Auto Civil

5] Reference Manual of 3D-Max

List of Tools and Equipment

A] General Class room

Sr	Name of Item	No.
1	Steel lockers 8 compartments with individual lockers (1980 x 910 x 480 mm)	4
2	Chair with writing pad	25
3	Steel almari with self 6.5' x 3' (18 gauge)	2
4	Steel table 4' x 3'	2
5	Teacher chair	2

B] For Computer Fundamental and CAD Practical

Sr	Name of Item	No.
1	Computer System P4 with accessories Complete with license OS. Compatible for- to run AutoCAD 2010 and Windows 7 OS.	5+1
2	Plotter- HP Design Jet 500 latest model	1
3	Scanner	1
4	Computer table	5+2
5	Chair for computer	10+2
6	Laser Printer	1
7	AutoCAD 2010 or above Software	1
8	M. S. Office Software	1
9	Pro- Engineering –V-4 Student Version	1
10	CATIA R-17 – Evolution Student Version	1

Subject Name - Machining and CNC Programming (TH & PR)
Subject Code - 30340020

Syllabus for Theory & Practical (First Year)
General Introduction Manufacturing processes, Classification of manufacturing processes; Types of production system; Plant layout; Objective of plant layout; Types of layout; Product design; Process selection; Industrial safety; Factories act and accidents. **Foundry** Introduction; Advantages of casting; Process flow chart; Steps in casting Pattern, pattern materials, types, allowances; Molding sand, its characteristics, terminology, ingredients, composition preparation; Mould making its types, method, Molding hand tools; Core and Core making; foundry tools, Foundry blackings; Molding sand testing; Cleaning of castings; Heat treatment; Inspection of casting; Casting defects; Safety precaution; **Forming Processes** Introduction; Extrusion; Cold drawing; Hot rolling, Stamping, Spinning, Casting Forging. **Boring** Introduction; Types of boring machine; Horizontal boring machine Parts of a horizontal; boring machine; Size of a horizontal boring machine; Boring machine mechanism. Boring machine mechanism, Work-holding devices for horizontal boring. Horizontal boring machine operations. Boring tool mountings for horizontal boring. Boring tool. Vertical boring machine operations. Vertical boring machine tools. Precision boring machine. Jog boring machine; Methods of locating holes in jig boring. Jig boring operations **Shaper** Introduction. Types of shapers. Principal parts. Shaper size; Shaper mechanism; Work holding devices. Shaper operations. Shaper tools; Cutting speed, feed and depth of cut; Machining time. **Planing** Introduction; Types of planing machine. Size of a planer, Planing machine parts. Planer mechanism. Work holding devices. Planer operations. Planer tools. Cutting speed, feed and depth of cut Machining time. Shaper vs. planer. Safety on the planer.

Slotting

Introduction. Types of slotting machine; Slotter size; Slotting machine parts; Work holding devices; Slotter operation; Slotter tools; Cutting speed, feed and depth of cut

Grinding

Introduction; Kinds of grinding; Grinding machines floor-stand and bench grinders; Portable and flexible shaft grinders; Swing

frame grinders; Abrasive belt grinders; Cylindrical center-type grinders; Centre less grinders; Internal grinders; Surface grinder Tool and cutter grinders; Special grinding machines; Size and capacities of grinders; Work holding devices and attachment 6;

Principal grinding operations; Wet and dry grinding; Allowance and tolerance for grinding; The grinding wheel; Abrasives, Bonds and bonding processes; Grit, grade and structure of wheels; Wheel shapes and sizes; Mounted wheels; Standard marking system; Selection of grinding wheels; Mounting the grinding wheels; Glazing and loading in wheels; Dressing and truing grinding wheels; Balancing grinding wheels; Diamond wheels; Cutting speed and work speed; Feed; Depth of cut; Machining time in girding

Milling

Introduction; Types of milling machine; Principal parts; Milling machine mechanism; Work holding devices; Cutter holding devices, Milling machine attachments; Milling cutters; Standard milling cutter; Elements of a plain milling cutter; Elements of a side milling cutter; Elements of a face milling cutter, Influence of tooth angles on cutter performance; Sharpening milling cutters; Milling cutter materials; Fundamentals of the milling processes; Milling machine operations; Cutting speed, feed and depth of cut ; Number of cutter teeth; Calculation of machining time; Safety measures in milling

Jigs And Fixtures

Introduction; Principles of jigs and fixtures design; Component; The machine; Location; Methods of location; Loading and unloading; Clamping; Types of clamps; Power devices of clamping, Clearance in a jig fixture; Indexing arrangement; Tool guiding and cutter setting arrangement; Ful-proofing; Ejection; Swarf removal, Rigidity and vibration; Table fixing arrangement; Safety devices; Jig base, body or frame construction; Jig and fixture types.

Metal Cutting & Cutting Tools

Introduction; Types of cutting tools; Orthogonal & oblique cutting; Mechanics of cutting & chip formation; Chip thickness ratio; Velocity relationship; Cutting forces in orthogonal / oblique Cutting; Types of chip; Chip Breakers; Geometrical control of tool Systems; Cutting speeds & feed; Tool life & wear; Mach inability; Cutting tool material; Cutting fluids.

Gear Manufacturing Methods

Introduction; Materials; Methods of manufacture; Gear cutting by Milling; Gear cutting by single point formed tool on shaper/planer; Broaching; Shear speed process; Gear planning; Gear shapers; Gear Hobbling; Bevel; gear generating; miscellaneous gear manufacturing Methods; Gear finishing operations; Gear inspection; Design of gear Hob.

Thread Manufactuing

Introduction; Casting; Thread chasing; Thread rolling; Die-threading and tapping; Thread milling; Thread grinding; Thread measurement and inspection.

Kinematics Of Machine Tools

Introduction; Drives in machine tools; Mechanical drive; Selecting The maximum and minimum cutting speeds and feeds; Upper and Lower speed limits of a lathe; Stepped and step less drives; Characteristics of stepped mechanical drive; Designing layout for Mechanical stepped drives; Kinematics calculation of speed gear Boxes; Step less mechanical drive; Hydraulic Drive; Pneumatics Drive; Electrical drive.

Finishing And Super-Finishing

Lapping, Honing, Super Finishing; Burnishing, Polishing and Buffing.

Broaching

Broach; Cutting action of broach; broaching operation; Broaching Machines; Power consumption; Broach design and manufacture of a Broach.

Practical (Based on above syllabus)

1) Horizontal milling machine – Identifying different parts & importance of each part-

2) Use work holding devices- tool holding devices- hand tools on milling machine.

3) Mill a plain surface using plain milling cutter / slab milling cutter

4) Checking the flatness with tri-square.

Mill six faces of a cubical block to an accuracy of **+** 0.1mm Checking the square ness with trisquare

and the size with vernier caliper.

5) Step mill using side and face milling cutter Angular mill using angular milling cutter checking

with bevel protractor.

6) Slot mill using slot-milling cutter/slitting saw.

7) Vertical milling machine Face mill using face milling cutter Step mill using a slot drill Milling

angular surface by tilting the spindle head and universal vice

8) Mill a hexagon / square on a round rod using direct indexing.

9) Mill a tung and groove – match the same Cut Spur gear on horizontal milling machine by using

indexing head Check gear tooth using gear tooth vernier caliper

10) Mill a rack by linear indexing method checking the gear tooth using gear tooth vernier caliper

11) Cut RH helical gear on universal milling machine checking the gear tooth using flange

micrometer. Exercise using rotary table

12) Cutting LH helical gear and match with right hand helical gear. ; Bevel gear generating

13) Thread chasing; Thread rolling; Die-threading and tapping; Thread milling;

14) Thread grinding;

15) Thread measurement and inspection

16) Kinematics calculation of speed gear Boxes; Step less mechanical drive; Hydraulic Drive;

Pneumatics Drive; Electrical drive. Selecting The maximum and minimum cutting speeds

and feeds Broaching operation on Broaching Machines

Sr. No	Syllabus for Theory & Practical (Second Year)
	Machine Operating **Control key function** Machine starting & operating in Reference Point, JOG, and Incremental Modes Co-ordinate system points, assignments and simulations. Absolute and incremental programming assignments and simulations. Work and tool setting CNC M/C Part program preparation, Simulation & Automatic Mode Execution. **Control Switch function** Linear interpolation, assignments and simulations on soft ware. Circular interpolation, assignment and simulations on soft ware. Work off set measurement and entry in CNC Control. Tool off set measurement and entry in the control Part program preparation, Simulation & Automatic Mode Execution **Identification of machine over travel limits and emergency stops. Automatic Mode operation: Face Milling etc.** **Assignments and simulations** Linear interpolation,– Milling Circular interpolation, assignment and simulations – Milling Work off set measurement and entry in CNC Control. Tool off set measurement and entry in the control. **Tool off set** – Tool off set measurement and entry in the control Part program preparation, Simulation & Automatic Mode Execution CNC M/C. Turning with Radius / chamfer with TNRC Review Geometry and wear offset correction. Cycles stock removal cycle OD, Drilling / boring cycles Stock removal cycle ID etc Review, assignment / practice, Test **Preparations of part programs for thread cutting for CNC turning** **centers and simulation on computers. Machining of Part program** **exercises of** **CNC TURNING practical**

	Grooving and thread cutting OD Grooving and thread cutting ID Threading cycle OD Sub program with repetition Sub program with macro call. Eccentric turning **Part program preparation,** Polar co-ordinate points, assignments and simulations. Identification of machine over travel limits and emergency stop. Work and tool setting. Work and tool setting. CNC M/C Exercises. Part program preparation, Simulation & Automatic Mode Execution **: Simple turning & Facing, Step turning etc.** Linear interpolation, assignments and simulations. Circular interpolation, assignment and simulations. Work off set measurement and entry in CNC Control. Tool off set measurement and entry in the control Tool off set measurement using tool pre-setter. Simulation software Program entry and editing. Part program preparation, Simulation & Automatic Mode Execution Of CNC Geometry and wear offset correction. Part program preparation, Simulation & Automatic Mode Execution of CNC Machine **Operating** Study of CNC Machining centre, keyboard & specifications. Machine starting & operating in Reference Point, JOG, and Incremental Modes. Co-ordinate system points, assignments and simulations. Absolute and incremental programming assignments and simulations. Identification of machine over travel limits and emergency stops. Review, assignment / practice; Test **Linear** interpolation, and simulation. Assignment – Milling Circular interpolation, and simulation. Assignment – Milling Tool change in CNC milling & JOG, INC, MPG mode operation. Manual Data input mode operations & checking of zero offsets and tool offsets. Preparation of part programs for Exercises and computer simulations. Automatic mode execution **Cycles milling** CNC Machine drilling-G 81. Etc Geometry and wear offset correction. Part Program Preparation, entry and simulation on CNC Mill & on Computers. CNC Milling Machine Deep hole drilling G 83. Threading and tapping G 84. Boring Cycles G85 – G 89. Preparations of part programs for thread cutting / thread milling for CNC machining centers. Part Program Preparation entry and simulation on CNC Mill & on Computers for program/repetition and Circular and rectangular pockets machining. Drilling milling patterns. Thread milling etc**.** **Tool** Change in CNC milling & JOG, INC, MPG mode operation. MDI mode operations and checking of zero offsets and tool offsets. Preparation, simulations of part programs exercises in Automatic mode execution with Block Search and restart: End milling with polar co-ordinates.
	Practical :- Job Drawing Drawing reading CNC M/C – Co-ordinate system A) Absolute & Incremental **Operating** Study of CNC machine, keyboard & specifications. Machine starting & operating

	in Reference Point, JOG, and Incremental Modes **Programming** Absolute and incremental programming assignments and simulations. Identification of machine over travel limits and emergency stop. **Setting** Work and tool setting CNC M/C Part program preparation, Simulation **Turning** Simple turning & Facing (step turning) Linear interpolation, assignments and simulations on soft ware. Circular interpolation, assignment and simulations on soft ware. Work off set measurement and entry in CNC Control. Tool off set measurement and entry in the control Part program preparation. Simulation & Automatic Mode Execution CNC M/C. Turning with Radius / chamfer with TNRC Review, assignment / practice, Test Linear interpolation, and simulation. Assignment. Circular interpolation, and simulation. Chuck removal and mounting on CNC Lathe. Tool change in CNC turning & MPG mode operation. Manual Data Input (MDI) mode operations and checking of zero offsets and tool offsets. Part program preparation, Simulation & Automatic mode Execution Of CNC Machine Geometry and wear offset correction. Part program preparation, Simulation & Automatic Mode Execution Tool path of job Drawing – Diff examples of lathe, milling, Drilling Coding – G codes, M codes, Address Letter's Programmed format Programme script in different Control Programme editing Simulation of edited programme Tools Offsets on the m/c's 2 Dimension operation on lathe & milling m/c's **Milling** Coordinate system points, assignments and simulations. Absolute and incremental programming assignments and simulations. Identification of machine over travel limits and emergency stops. Work and tool setting Automatic Mode operation: Face Milling etc.

	Linear interpolation, assignments and simulations – Milling Circular interpolation, assignment and simulations – Milling Work off set measurement and entry in CNC Control. Tool off set measurement and entry in the control. Program entry & editing. Part program preparation, Simulation & Automatic Mode Execution Of CNC Machine Practical. Chamfering and end milling with CRC etc Review, assignment / practice, ▪ Study of CNC machines, keyboards & specifications. ▪ Machine starting & operating in Reference Point, JOG, Incremental Modes Co-ordinate system points, assignments and simulations. ▪ Absolute and incremental programming assignments and simulations, Job setting, Tool ▪ selection, etc. ▪ Diff. operation programming & Manufacturing On lathe m/c, ▪ Chuck removal and mounting on CNC Lathe. ▪ Tool change in CNC turning & MPG mode operation. Manual Data Input (MDI) mode operations and checking of zero offsets and tool offsets. ▪ Part program preparation, Simulation & Automatic mode Execution Of CNC Machine Practical In side , Out side step turning, Threading, ID/OD-, V threading, square threading ▪ CNC turning exercises: Multistart-threading Programming with variables. Project work: CAD / CAM programming & DNC operations. ect. ▪ Diff operation programming & Manufacturing on milling & drilling m/c like Face milling, drilling, Tapping, Reaming. ▪ Tool off set measurement and entry in the control Tool off set measurement using tool presetter. ▪ Simulation software Program entry and editing. Part program preparation, Simulation & Automatic Mode Execution Of CNC Turning ▪ Practical Exercise: Turning with Radius / chamfer with TNRC etc Review, assignment / practice, Test Linear interpolation, and simulation. Assignment Circular interpolation, and simulation. ▪ Assignment Chuck removal and mounting on CNC Lathe. Tool change in CNC turning/milling & MPG, MDI mode operation. ▪ Zero offsets and tool offsets measurement on tool pre-setter Preparation of simple turning and facing program. Automatic mode operation of CNC Machine ▪ Exercise: Radius programming contours with TNRC etc Canned cycles used in turning, milling, Drilling m/c'sWork and tool setting Automatic Mode operation: Face Milling etc. ▪ Linear interpolation, assignments and simulations – Milling Circular interpolation, assignment and simulations – Milling ▪ Work off set measurement and entry in CNC Control. ▪ Tool off set measurement and entry in the control. Program entry & editing. Part program preparation, Simulation & Automatic Mode Execution Of CNC Machine ▪ Practical EX.: Chamfering and end milling with CRC etc CNC Milling Machine ▪ Simple drilling – G 81. Chamfer and counter-sink drilling. ▪ Deep hole drilling G 83. ▪ Threading and tapping G 84. ▪ Boring Cycles G85 – G 89. - Preparations of part programs for thread cutting / thread milling for CNC machining centers. Part Program Preparation entry and simulation on CNC Mill & on Computers for program/repetition and Circular and rectangular pockets machining. Drilling milling patterns. Thread milling etc ▪ Offsetting of number of tools in one operation, & number of tools on Different operation. ▪ Block search /reset & start from intermediate step.

Reference books-

Sr. No.	Author	Title	Publisher and address
1	S.K.Hajra Choudhary	Elements of workshop technology Vol. I	Media promoters &Publisher pvt. Ltd.
2	Mahajan	Mechanical Technology	Vrinda publication
3	M.N. Uppal	Engineering Chemistry	
4	PROF.-R.B. Kelkar, Vinayak Mulay	CAD/ CAM & Automation	Nishant Prakashan
5	P.K.Roy,Y.V. Deshmukh	Production Engineering	Nirali Prakashan
6	S.K. Hajra Choudhari A.K. Hajra Choudhari	Element of work shop Technology Vol.-II	Media promoters &publishers pvt. Ltd.

List of Tools & Equipments

Sr. No	Name of Item	Quantity
1	Steel rule 30 cm graduated both in English & Metric units	5 nos.
2	Outside spring caliper 150 mm	3 nos.
3	Inside spring caliper 150 mm	3 nos.
4	Hermaphrodite caliper 150 mm	3 nos.
5	Divider spring 150 mm	3 nos.
6	Centre punch 100 mm	5 nos.
7	Hammer B.P.0.5 kg	2 nos.
8	Combination plier 150 mm	5 nos.
9	Safety glasses	5 pairs
10	File flat bastard 300 mm	5 nos.
11	File flat 2nd cut 250 mm	5 nos.
12	Engineers screw driver	5 nos.
13	File flat smooth 200 mm	5 nos.

14	Cold chisel flat 25 X 200 mm	5 nos.
	Tools, Instruments and General Shop Out fits	
15	Surface plate 400 mm X 400 mm grade 1	1 nos.
16	Table for surface plate 900 X 900 X 1200 mm	1 nos.
17	Marking off table 1200 X 1200 X 900 mm high	1 nos.
18	Scribing block universal 300 mm	2 nos.
19	Vee block 100/7-80-A	2 nos.
20	Try square 300 mm	2 nos.
21	Outside spring caliper 200 mm	2 nos.
22	Divider spring 200 mm	2 nos.
23	Inside spring caliper 200 mm	2 nos.
24	Straight edge steel 1 metre	1 nos.
25	Straight edge steel 500 mm	1 nos.
26	Steel tape 2 metre in case	1 nos.
27	Steel rule 60 cm graduated both in English and Metric units.	2 nos.
28	Spirit level 2V 250, 05 metre	1 Nos.
29	Hammer B.P.800gms. with handle 6	5 nos.
30	Screw driver , heavy duty 300 mm with handle	2 nos.
31	Hammer lead 1kg.	2 nos.
32	Combination set 300 mm	2 nos.
33	Spindle blade screw driver 100 mm	2 sets
34	Allen hexagonal keys 2.5 to 12	2 sets
35	Spanner D.E.G.P. series 2	3 sets
36	Adjustable spanner 300 mm	2 nos.
37	Reduction sleeve morse 1-1, 3-1, 4-1,4-2,5-1,5-2,6-1	2 nos.
38	Angle plate size 200 X 100 X 200 mm	2 nos.
39	Angle plate adujstable 250 X 150 X 175	2 nos.
40	solid parallels in pairs (Different sizes) in Metric	5 pairs
41	Oil cane pressure feed 500 mg.	3 nos.
42	Oil stone 150 X 50 X 25 mm	2 nos.

43	Number drills H.S.S (Parallel shank)	1 set
44	Drill (Parallel shank)	2 set
45	Twist drills 3 mm to 13 mm (Parallel Shank)	1 set
46	Drill chuck 0.20 with taper shank	1 no.
47	Centre drill A1 to 5	2 set
48	Grinding wheel dresser (diamond)	1 no.
49	Grinding wheel dresser Hunting time type	2 nos.
50	Clamps C100 mm	2 nos.
51	Clamps C 200 mm	2 nos.
52	Tap and die set in box metric pitch	1 set
53	Drill HSS taper shank	2 set
54	File flat 2nd cut 250 mm	2 nos.
55	File flat smooth 200 mm	2 nos.
56	File H/R 2nd cut 250 mm	2 nos.
57	File triangular smooth 200 mm	2 nos.
58	Needle file set	1 no.
59	File square 2nd cut 250 mm	2 nos.
60	Reamer 6 mm to 25 mm by 1 mm	1 set
61	Reamer adjustable 10 mm to 15 mm by 75 mm	1 set
62	Tools bits HSS 6 mm square	1 doz.
63	Tools bits HSS 10 mm square	1 doz.
64	Tools bit holder (Amstrong) L.H.	2 nos.
65	Tools bit holder (Amstrong) R.H.	2 nos.
66	Assorted tools for lathe, shaper, slotter & planner of different shapes and sizes	as reqd.
67	Hacksaw frame adjustable 250-300 mm with blades.	2 nos.
68	Table chuck 75 mm jaw swivel base	1 no.
69	Machine vice 200 mm swivel base	2 nos.
70	Machine vice 160 mm swivel base	2 nos.
71	Lathe machine tipped tools, threading tools, facing tools, grooving &boring tools.	2 nos.each
72	Radius truing attachment	1 no

73	Angle truing attachment	1 no.
74	Compound angle vice (standard sine)	1 no.
75	Universal vice	1 no.
76	Universal table angle plate	1 no.
77	Taper shank twist drill set 6.30 mm X 1.5 mm to suit radial drilling machine	1 set
78	Shaper tool holder turret type	2 nos.
79	Base chuck for slotter	1 no.
80	Shaper indexing centre	1 no.
81	Knurling tools (set of3) straight and diamond.	1 each
82	Plier cutting 200 mm	2 nos.
83	Magnifying glass 75 mm	2 nos.
84	Carbide tipped tools of different sizes and shapes (Throw away tips)	2 sets
85	Hand hammer 1 kg. with handle	2 nos.
	Milling Cutters	
1	Cylindrical cutter 63 X 90 bore dia.	3 nos.
2	Cylindrical cutter 80 X 90 bore dia.	3 nos.
3	Side and face cutter B 80 X 8	2 nos.
4	Side and face cutter B 160 X 10	3 nos.
5	Side and face cutter B 100 X 12	2 nos.
6	Side and face cutter B 160 X 16	2 nos.
7	Side and face cutter A 200 X 20	3 nos.
8	T slot milling cutter	2 nos.
9	Equal angle cutter 45/100	2 nos.
10	Equal angle cutter 60/100	2 nos.
11	Equal angle cutter 90/100	2 nos.
12	Double angle unequal cutter 50 x12 x 55	2 nos.
13	Double angle unequal cutter 63 x 18 x 60	2 nos.
14	Double angle unequal cutter 80 x 32 x 70	2 nos.
15	Double angle unequal cutter 100 x 36 x 75	1 no.
16	Single angle cutter 63 x 18 x 45 RH	1 no.

17	Single angle cutter 63 x 18 x 45 LH	1 no.
18	Single angle cutter 63 x 18 x 60 RH	1 no.
19	Single angle cutter 63 x 18 x 60 LH	2 nos.
	Measuring Instruments	
1	Micrometer outside 0-25 mm	2 nos.
2	Micrometer outside 25-50 mm	2 nos.
3	Micrometer outside 50-75 mm	1 no.
4	Micrometer depth gauge 0-200mm	1 no.
5	Direct reading vernier caliper B 300 (Direct reading with dial)	1 no.
6	Vernier height gauge 250 mm	1 no.
7	Vernier gear tooth caloper	1 no.
8	Vernier bevel protractor with 150 mm blade	1 no.
9	Bevel gauge 200 mm	1 no.
10	Telescopic gauge 13 mm to 300 mm	1 set
11	Sine bar 200 mm	1 no.
12	Compound dial gauge with stand (Metric)	1 no.
13	Dial test indicator with magnetic gauge type 1 grade A with magnetic base.	1 no.
14	Centre gauge 60	1 no.
15	slip gauge set (Normal set) metric (For the whole intstitute)	1 set
16	Screw pitch gauge for metric pitches (25-6 mm)	2 set
17	Radius gauge metric set (1-6 mm)	1 set
18	Limit plug gauges 5mm to 25mm by 2.5 mm	1 set
19	Ring gauges 5 mm to 25 mm by 2.5 mm (Go & No Go)	1 set
20	Taper gauge M.T.No. 1,2,3,4,&5	1 no.
21	Feeler gauge	1 no.
22	Planner gause standard size	1 no.
23	Steel lockers for 12 trainees	1 no.
24	Steel chair for Instructor	1 no.
25	Steel table for Instructor	1 no.

26	Workbench for Fitters with two vices of 100 mm jaw	1 no.
27	Steel cup board 120 x 90 x 45 cm	1 no.
28	Steel cup board 120 x 60 x 45 cm	1 no.
29	Black board with easel	1 no.
30	First aid box	1 no.
	General Installation	
1	Shapping machine 450 mm stroke (Motorised) with all attachments.	1 no.
2	Shapping machine 315 mm stroke (Hydraulic) with all attachments.	1 no.
3	Double column planer 1500 x 1000 x1000 (Motorised) with all attachments.	1 no.
4	Slotter 180 mm stroke (Motorised) with all attachments.	1 no.
5	Lathe general purposes all gearedheight of centres 150 mm to below between centres 150 mm supplied with 3 jaw & 4 jaw chuck, face plate, taper turning attachment steadies etc. and set of lathe tool.	1 nos
6	Tool & cutter grinder 250 mm to admit 450 mm between centre-fully motorised work head supplied with tool rest of different types table clamps and other attachments.	1 no.
7	Drilling machine pillar 20 mm capacity	1 no.
8	Radial drill 1200 mm area motorised with tapping attachment.	1 no.
9	Silicon carbide grinder for carbide tipped tools	1 no.
10	Milling machine universal horizontal (Motorised) no. 1 with all attachments such as- (a) Universal head (b) Vertical head (c) Slotting attachment (d) Rack cutting attachment (e) Rotary table (f) Dividing head (g) Adaptors, arbors and collets etc. for straight shank and mile from 3 mm to 30 mm	1 no.
11	Milling machine universal horizontal no. zero with all attachments.	1 no.
12	Milling machine plain type horizontal (Motorised) No.2 with all attachments.	1 no.

13	Milling machine vertical No. 1 (Motorised) with all attachments.	1 no.
14	Surface grinding machine wheel dia 180 mm (or near) reciprocating table, longitudinal table traverse 200 mm (or near) fitted with adjustable traverse stop. Full motorised supplied with magnetic chuck 250 mm x 120 mm diamond tool holder set of spanner, grease gun etc.	1 no.
15	Cylindrical grinder	1 no.
16	Lapping ,honing , burnishing ,buffing machine	1 no each
17	Broaching machine with tools	1 no
18	Thread rolling and thread grinding machine	1 no each
	CNC Programming & Machining Setup	
1.	Latest CNC Lathe Fanuc control with cutting tools & all accessories.	01
2.	Latest CNC Lathe Siemens control with cutting tools & all accessories	01
3.	Latest CNC Milling fanuc control with ATC ,Magazine ,pallet changer with cutting tools & all accessories (VMC)	01
4.	Latest CNC Milling Siemens control with ATC ,Magazine ,pallet changer with cutting tools & all accessories (HMC)	01
5.	Turn mill center fanuc/ Simens control with cutting tools & all accessories	01
6.	L.C.D. projector	01
7.	White board with magnetic base	01
8.	Teachers table	01
9.	Teachers chair	01
10.	Teachers cupboard	01
11.	Display board	01
12	Laptops of latest version	02

Raw material	stud	Total Qty
1) M/s Rod F 80 X 150	1	25
2) M/s Rod F 80 X 150	1	25
3) Casting 80 X 80 X 150	1	25
4) M/s plate F 150 X 150	1	25
5) M/s plate F 60 X 50	1	25
1) m/s or Aluminums Rod F 80 X 150	4	100
2) Casting 80 X 80 X 150	2	50
1) m/s or Aluminums Rod F 80 X 150	4	100
2) Casting 80 X 80X 150	2	50
3) m/s flat 100 X 100 X 30	2	50
4) m/s Rod F 70 X 150	2	50

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