

1	Name of Course	Diploma Course in Mechanical Engineering																																																																																																									
2	Course Code	303426																																																																																																									
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, Lab Sub.– 1500 sqft, Lab Elective - 400 sqft Total = 2100 Sq.Ft.																																																																																																									
9	Entry qualification	S.S.C. Pass																																																																																																									
10	Objective of syllabus	To enable the students to 1. develop skills in fitting and bench work. 2. develop skills in job inspection with the help of precision measuring instrument gauges. 3. develop the skill in fabrication by providing adequate knowledge of welding. 4. provide a sound working and operational knowledge of different machine tools like lathe, milling machine, shaping machine, power hacksaw, grinding machine, CNC lathe, planning machine. 5. develop adequate knowledge of engineering drawing. 6. provide adequate knowledge of Maintenance of machine tools. 7. provide adequate knowledge of modern and sophisticated machining operations. 8. provide adequate knowledge of jigs and fixtures. 9. knowledge of entrepreneurship activities. 10. develop proper knowledge of Carpentry tools and joints.																																																																																																									
11	Employment opportunities	The trainee will either to be able to take up jobs with agencies. Work as 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 – <table><tr><th rowspan="2">Sr.</th><th rowspan="2">Subject</th><th rowspan="2">Subject Code</th><th colspan="2">Clock Hours / Week</th><th rowspan="2">Total</th></tr><tr><th>Theory</th><th>Practical</th></tr><tr><td>1</td><td>English (Communication Skill)</td><td>90000001</td><td>2 Hrs</td><td>1 Hrs</td><td>3 Hrs</td></tr><tr><td>2</td><td>Elective – I</td><td></td><td>2 Hrs</td><td>1 Hrs</td><td>3 Hrs</td></tr><tr><td>3</td><td>Elective – II</td><td></td><td>2 Hrs</td><td>1 Hrs</td><td>3 Hrs</td></tr><tr><td>4</td><td>MECH. TECHN. MATERIAL SCIENCE</td><td>30340001</td><td>3 Hrs</td><td>8 Hrs</td><td>11 Hrs</td></tr><tr><td>5</td><td>Machine drawing with cad</td><td>30340004</td><td>3 Hrs</td><td>8 Hrs</td><td>11 Hrs</td></tr><tr><td>6</td><td>Machine operation</td><td>30340036</td><td>3 Hrs</td><td>8 Hrs</td><td>11 Hrs</td></tr><tr><td colspan="5">Total</td><td>42 Hrs</td></tr></table>											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	MECH. TECHN. MATERIAL SCIENCE	30340001	3 Hrs	8 Hrs	11 Hrs	5	Machine drawing with cad	30340004	3 Hrs	8 Hrs	11 Hrs	6	Machine operation	30340036	3 Hrs	8 Hrs	11 Hrs	Total					42 Hrs																																														
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14	Internship	Two Month Summer Internship from 1 st May to 30 th June is Compulsory.																																																																																																									
15	Examination Scheme – Final Examination will be based on syllabus of both years. <table><tr><th rowspan="2">Paper</th><th rowspan="2">Subject</th><th rowspan="2">Subject Code</th><th colspan="3">Theory</th><th colspan="3">Practical</th><th colspan="2">Total</th></tr><tr><th>Duration</th><th>Max</th><th>Min</th><th>Duration</th><th>Max</th><th>Min</th><th>Max</th><th>Min</th></tr><tr><td>1</td><td>English (Communication Skill)</td><td>90000001</td><td>3 Hrs</td><td>70</td><td>25</td><td>3 Hrs</td><td>30</td><td>15</td><td>100</td><td>40</td></tr><tr><td>2</td><td>Elective – I</td><td></td><td>3 Hrs</td><td>70</td><td>25</td><td>3 Hrs</td><td>30</td><td>15</td><td>100</td><td>40</td></tr><tr><td>3</td><td>Elective – II</td><td></td><td>3 Hrs</td><td>70</td><td>25</td><td>3 Hrs</td><td>30</td><td>15</td><td>100</td><td>40</td></tr><tr><td>4</td><td>MECH. TECHN. MATERIAL SCIENCE</td><td>30340001</td><td>3 Hrs</td><td>100</td><td>35</td><td>3 Hrs</td><td>100</td><td>50</td><td>200</td><td>85</td></tr><tr><td>5</td><td>Machine drawing with cad</td><td>30340004</td><td>3 Hrs</td><td>100</td><td>35</td><td>3 Hrs</td><td>100</td><td>50</td><td>200</td><td>85</td></tr><tr><td>6</td><td>Machine operation</td><td>30340036</td><td>3 Hrs</td><td>100</td><td>35</td><td>3 Hrs</td><td>100</td><td>50</td><td>200</td><td>85</td></tr><tr><td colspan="9">Total</td><td>900</td><td>375</td></tr></table>											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	MECH. TECHN. MATERIAL SCIENCE	30340001	3 Hrs	100	35	3 Hrs	100	50	200	85	5	Machine drawing with cad	30340004	3 Hrs	100	35	3 Hrs	100	50	200	85	6	Machine operation	30340036	3 Hrs	100	35	3 Hrs	100	50	200	85	Total									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.																																																																																																										
	a) For Elective I – Student can choose any one subject <table><tr><td>Code</td><td>Subject Name</td></tr><tr><td>90000011</td><td>Applied Mathematics</td></tr><tr><td>90000012</td><td>Business Economics</td></tr><tr><td>90000013</td><td>Physical Biology (Botany & Zoology)</td></tr><tr><td>90000014</td><td>Entrepreneurship</td></tr><tr><td>90000015</td><td>Psychology</td></tr></table>					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 <table><tr><td>Code</td><td>Subject Name</td></tr><tr><td>90000021</td><td>Applied Sciences (Physics & Chemistry)</td></tr><tr><td>90000022</td><td>Computer Application</td></tr><tr><td>90000023</td><td>Business Mathematics</td></tr></table>						Code	Subject Name	90000021	Applied Sciences (Physics & Chemistry)	90000022	Computer Application	90000023	Business Mathematics																																																																												
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Subject Name - **Mechanical Technology and Material Science**

Subject Code - **30340001**

Theory – 1 st year	Practical – 1 st year
<p>1] Fundamental of material</p> <ul style="list-style-type: none"> <input type="checkbox"/> Introduction of metals and non metals <input type="checkbox"/> Structure of metal <input type="checkbox"/> Formation of grain <input type="checkbox"/> Imperfection in crystals <input type="checkbox"/> Deformation in metal and change in properties <input type="checkbox"/> Fracture <input type="checkbox"/> Equilibrium diagram <input type="checkbox"/> Iron, carbon equilibrium diagram <input type="checkbox"/> Time temperature transformation diagrams 	<p>1. Take the tensile test of M.S. specimen & Draw stress strain diagram, yield pts.</p>
<p>2 Ferrous metals and alloys</p> <ul style="list-style-type: none"> <input type="checkbox"/> Pig iron and cast iron <input type="checkbox"/> Effect of chemical elements on iron <input type="checkbox"/> Classification of steel and its application <input type="checkbox"/> Alloy steel and special alloy steel <p>3 Non Ferrous metals and alloys</p> <p>Introduction to non ferrous alloys</p> <ul style="list-style-type: none"> <input type="checkbox"/> Aluminum and its alloys <input type="checkbox"/> Copper and its alloys <input type="checkbox"/> Lead and its alloys <input type="checkbox"/> Nickel and its alloys <input type="checkbox"/> Alloys for high temperature service <input type="checkbox"/> Metal for nuclear energy <p>4 Crystal Structures</p> <ul style="list-style-type: none"> <input type="checkbox"/> Fundamental concept <input type="checkbox"/> Unit Cells <input type="checkbox"/> Metallic crystal structures <input type="checkbox"/> FCC Structure <input type="checkbox"/> BCC Structure <input type="checkbox"/> HCP Structure <input type="checkbox"/> Weld ability <p>5 Properties of Metal</p> <ul style="list-style-type: none"> <input type="checkbox"/> Mechanical properties of Metal <p>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.</p> <ul style="list-style-type: none"> <input type="checkbox"/> Electrical properties of Metal <p>Electrical conductivity, resistivity, electrical Characteristic of commercial alloys</p>	<p>2. Study the mechanical properties like Elasticity, ductility, malleability, Brittleness, toughness of Different materials – M.S., C.S. Bronze, Copper, Aluminum</p> <p>Study the Hardness test</p> <ul style="list-style-type: none"> <input type="checkbox"/> Brinell Hardness test <input type="checkbox"/> Rockwell hardness test

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

Theory – 2 nd year	Practical – 2 nd year
<p>1 Bench work and fitting Introduction- Vices – Hammers- Chisels- Chipping- Files- Filing- Scraper-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.</p> <p>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</p> <p>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.</p> <p>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.</p> <p>5 Welding Technology Welding Welding introduction to different welding processes, like gas Welding, ARC welding TIG, MIG, submerged arc welding, spot Welding, electrodes etc. Brazing methods & application, Knowledge of welding skills.</p> <p>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.</p>	<p>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.</p> <p>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.</p>

Theory – 2 nd year	Practical – 2 nd year
<p>7 DRILLING</p> <p>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.</p> <p>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</p>	<p>Basic Workshop Practice</p> <ol style="list-style-type: none"> 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.
<p>8 SHAPER</p> <p>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.</p> <p>9 SLOTTING</p> <p>Introduction. Types of slotting machine; Slotter size; Slotting machine parts; Work holding devices; Slotter operation; Slotter tools; Cutting speed, feed and depth of cut.</p>	<ol style="list-style-type: none"> 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)
<p>Powder Metallurgy</p> <p>Introduction- Process Description- Manufacture of metal powder- Blending of powders- competing profiteering- Sintering- Secondary operation –ISO Static pressing – Product of</p> <p>powder metallurgy-Advantages of process – Disadvantages and limitation-Design considerations Introduction to CNC</p>	<ol style="list-style-type: none"> 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 – 1 st year	Practical – 1 st year
<p>1 INTRODUCTION OF DRAWING</p> <p>Use of different drawing instruments, equipments & Drafting Techniques, Types of letters, conventions of line, Scales; plane scale and diagonal scales.</p> <p>2 CURVES & TANGENTIAL EXERCISES</p> <p>To draw an ellipse by</p> <ol style="list-style-type: none">1. Arcs of circle method2. Concentric circle Method3. Rectangle / oblong method; <p>To draw a parabola by</p> <ol style="list-style-type: none">1. Director focus method2. Rectangle method; <p>To draw hyperbola</p> <ol style="list-style-type: none">1. Transverse axis and focus Method2. Passing Through a given point; <p>To draw an Involute of</p> <ol style="list-style-type: none">1. A polygon (up to Hexagon)2. A circle. To draw a cycloid, epicycloid & hypocycloid. <p>3 ORTHOGRAPHIC PROJECTIONS</p> <p>Introduction to orthographic projections, first and third angle Method of projection, conversion of simple pictorial view into Orthographic view Dimensioning technique</p> <p>4 SECTIONAL VIEWS</p> <p>Conversion of given pictorial view into sectional orthographic views.</p>	<p>PRACTICAL</p> <p>1. Practice: Layout of drawing sheet</p> <p>Types of lines – Thickness, shade of lines and its General applications. Practice: Draw type of lines as per IS-70714-1983</p> <p>Type of Angle, Triangles and their types.</p> <p>Dimensioning- Types of dimension, elements of dimensions, Methods of indicating</p> <p>Values, Arrangement and indication of dimensions.</p> <p>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</p> <p>Geometrical construction using drawing instruments-Lines, Angles, patterns, Circle, Arc, Tangents, Triangles, Quadrilaterals, Regular Polygons. Different type of Tapers, Related Exercise on this topic.</p> <p>1. Practice: Construct square, rectangle, parallelogram, rhombus, trapezium and quadrilateral</p> <p>2. Practice: Draw a regular pentagon by circumscribing & inscribing</p> <p>3. Practice: Draw a regular hexagon by arc method</p> <p>4. Practice: Draw a regular pentagon, octagon and various types of tapers</p> <p>5. Free hand sketching of straight lines, rectangular, circles, squares, Polygons, ellipse.</p> <p>6. Practice: Prepare proportionate free hand sketches of plane figures</p> <p>7. Practice: Sketch horizontal, vertical and inclined line by free hand, Draw circles by free</p>

<p>5 ORTHOGRAPHIC VIEWS</p> <p>Isometric scale and views of simple objects; isometric views of Rectangular, cylindrical objects and Representations of slots on Sloping faces.</p> <p>6 PROJECTIONS OF LINES</p> <p>Projections of solids- prism, prism, cone, cylinder, Tetrahedron; axis Inclined to one reference plane only.</p> <p>7 SECTION OF SOLIDS</p> <p>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</p>	<p>hand using square and radial line method, Draw arcs and ellipse by free hand</p> <p>Orthographic projection I and III angle – Simple machine elements, Procedure for preparing a scale drawing.</p> <p>8. Practice: Draw a plan, elevation and side view of prism and cylinder, cone and pyramids</p> <p>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</p> <p>10. Practice: Construct an isometric scales to a given length</p>
<p>8 CONVENTIONAL REPRESENTATION</p> <p>Introduction; Conventional Representation of Material; Conventional breaks, Machine components such as splinted shaft; bearings, slotted heads, rased & pinion, Internal & External Threading, Springs, Gears, Pipe fitting & pipe joint, Welded joint; Practice Drawing of all type of Conventions in the sketch book.</p>	<p>11. Practice: Draw the isometric projection of cube, hexagonal prism, cylinder and cone</p> <p>12. Practice: Draw the isometric view of the objects/blocks/solids with curved surfaces</p> <p>Missing lines and views.</p> <p>13. Practice: Visualize the shape of the object from the given two views and add the third</p> <p>views – simple machine elements</p> <p>14. Practice: Identify the lines missed in multi views and supply them. Identify at least five shapes satisfying a given view.</p> <p>One problem on each projection of lines and plane are to be drawn in A-3 size sketch book.</p> <p>15. Identify the third view for the given two views of similar in shapes and size.</p> <p>Development of regular objects bounded by plane surfaces-cube, prisms, cylinder and cones.</p> <p>16. Practice: Draw the development of surfaces of a cube and prism</p> <p>17. Practice: Draw the development of surfaces of a cylinder and cones</p>

<p>9 LIMIT FITS & TOLERANCES</p> <p>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.</p>	<p>Explanations of full – sectional view, half-sectional view, aligned sections.</p>
<p>10</p> <p>PRODUCTION DRAWING</p> <p>Introduction, need, scope; Production drawing procedure,</p> <p>Production drawing for, Nut & Bolt, Spur gear, Fly – cotter joint Wheel, V belt pulley.</p>	<p>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.</p> <p>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.</p> <p>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.</p> <p>21. Practice: Draw the elevation, plan and the side view of Nut & Bolt, Spur gear, and Fly cotter joint Wheel, V belt pulley.</p>

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

<p>3] GUI Based Editing, Spreadsheets, Tables & Presentation</p> <p>Application Using MS Office 2000 & Open Office.Org Menus Opening, menus, Toolbars, standard toolbars, formatting toolbars & closing Quitting Document , Editing & designing your document Spreadsheets</p> <p>Working & Manipulating data with Excel</p> <p>Changing the layout Working with simple graphs</p> <p>Presentation Working With PowerPoint and Presentation</p>	<p>11. Printing within Word 2000 Print setup Printing options Print preview</p> <p>12. Development of application using mail merge</p> <p>Mail merging addresses for envelopes Printing an addressed envelope and letter</p> <p>13. Creating and using macros in a document</p> <p>14. Creating and opening workbooks Entering data</p> <p>15. Navigating in the worksheet Selecting items within Excel 2000 Inserting and deleting cells, rows and column Moving between worksheets, saving worksheet, workbook</p>
<p>4] Introduction To Internet</p> <p>What is Internet</p> <p>Equipment Required for Internet connection</p> <p>Sending &receiving Emails</p> <p>Browsing the WWW</p> <p>Creating own Email Account</p> <p>Internet chatting</p>	<p>16. Formatting and customizing data</p> <p>17. Formulas, functions and named ranges</p> <p>18. Creating, manipulating & changing the chart type</p> <p>19. Printing, Page setup, Margins</p> <p>Sheet printing options, Printing a worksheet</p> <p>20. * Preparing presentations with Microsoft Power Point. Slides and presentations, Opening an existing presentation , Saving a presentation</p>
<p>5] Usage of Computer System in various Domains</p> <p>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.</p>	<p>21. Using the AutoContent wizard ,Starting the AutoContent wizard, Selecting a presentation type within the AutoContent wizard Presentation type</p> <p>Presentation titles, footers and slide number</p> <p>22. Creating a simple text slide, Selecting a slide layout</p> <p>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</p>

Theory	Practical
	<p>23. Creating and running a slide show, Navigating through a slide show, Slide show transitions, Slide show timings. Animation effects</p> <p>24. Microsoft Internet Explorer 5 & the Internet</p> <p>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</p> <p>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</p>
<p>6] Information technology for benefits of community</p> <p>Impact of computer on society</p> <p>Social responsibilities</p> <p>Applications of IT</p> <p>Impact of IT</p> <p>Ethics and information technology</p> <p>Future with information technology</p>	<p>26. Favorites, security & customizing Explorer Organizing Favorite web sites Customizing options – general, security, contents, connection, programs, advanced</p> <p>27. * Using the Address Book Adding a new contact</p> <p>Creating a mailing group, Addressing a message, Finding an e-mail address</p> <p>28. Using electronic mail, Starting Outlook Express</p> <p>Using the Outlook Express window, Changing the window layout, Reading file attachment, Taking action on message-deleting, forwarding, replying</p> <p>29. Email & newsgroups, Creating and sending emails</p> <p>Attached files, Receiving emails, Locating and subscribing to newsgroups, Posting a message to a newsgroup</p> <p>30. Chatting on internet, Understating Microsoft chat environment, Chat toolbar</p>
<p>Minimum system requirement for AutoCAD</p> <p>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,</p> <p>Modes in AutoCAD – Snap, Grid, Ortho, Osnap, Polar, Otrack, Model</p>	<p>Practical related Creating New file, Closing Drawing, Saving Drawing, Startup Methods, Modes in AutoCAD,</p> <p>Use of Function Keys, Use of Keyboard and Mouse in AutoCAD Practice.</p> <p>CAD Command Practice on small objects</p>

Using various Toolbars, Creating new drawing, Saving a drawing, Closing a drawing, Opening a drawing, Use of 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
<p>Object Snapping – Dialog box, Toolbar, Tracking, snap p from, end point, mid point, center, intersection, apparent intersection, insertion, quadrant, tangent, perpendicular, node etc.</p> <p>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.</p> <p>Dimensioning technique – Linear, Aligned, Radius, Diameter, Angular, Baseline, Continuous, Leader, Center mark, creating dimensioning style.</p> <p>Block, Wblock, Attribute.</p> <p>Hatch, Boundary, Region.</p> <p>Object property toolbar – layer control, color control, Line type control, line weight control, working with layers, (freeze, thaw, lock, unlock, plot etc.)</p> <p>Printing and using scale in the drawing.</p>	<p>Practice on Small Drawing Objects using Commands in</p> <p>Draw Menu Practice of Editing command on above drawing objects, Dimensioning Drawing</p> <p>Creating Title block, Creating Part List, Material List using Text in AutoCAD,</p> <p>Drawing Plan, Elevation, Section, in AutoCAD for various mechanical objects, machine part etc.</p>
<p>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.</p> <p>Shading the model – 2D wireframe, 3D wireframe, Flat shaded, Gauged shaded, hidden view Region, Redraw, Regen all command.</p> <p>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</p>	<p>Suitable CAD Practical (Command Practice) based on the Theory.</p> <p>Creating Simple 3D Model of Machine assemblies required 3D view from all sides.</p> <p>Practice of using AutoCAD Mechanical Desktop package for creating various 3D Machine Elements.</p>
<p>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.</p> <p>Solid modeling – Extruding solid, Revolving solid, Slicing & Interfering solid, using predefined 3D solid objects - Box, pyramid, Wedge, Cylinder, Cone, Torus</p> <p>Modifying 3D Solid object – 3D array, 3D mirror, 3D Rotate, Trim, Extend, Fillet, Chamfer etc.</p> <p>Boolean operation – Union, Subtract, intersect.</p>	<p>Creating, Rendering, and Viewing Various Machine parts and assemblies Elements like different types of</p> <p>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.</p>

Machine Drawing and CAD – 2nd Year

Theory	Practical
<p>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.</p> <p>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.</p> <p>Applying material effect to solid object. Using material library. Mapping background. Using background images Printing the 3D rendered view / drawing.</p>	<p>Creating, Rendering, Viewing, Generating JPEG images for Complete assembly model, Printing Photo with various View of machine assemblies,</p> <p>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.</p> <p>Introduction to 3DS Max Software Package for animation Purpose.</p> <p>Introduction to Pro-Engineer, CATIA Software.</p>

List of Books

Machine Drawing

- 1] N.D.Bhatt Elements of Engineering Drawing 49TH 2005 Charotar publishing house,opposite Amul dairy, 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 MACHINE OPERATOR

Sub Code 30340036

**THEORY I
Machine Operation**

1. Centre Lathe

1.1 Lathe machine special operations

a) Drilling

b) Boring

c) Internal thread cutting

d) Taper turning using offset method

1.2 Standard tapers

1.3 Coolants and Lubricants

2. Capstan and Turret Lathe

2.1 Turret and capstan lathe

2.2 Specification

2.3 Machine Main parts

2.4 Turret head

2.5 Work holding devices

2.6 Tool holding devices

2.7 Capstan and turret lathe tools

2.8 Turret tooling layout

2.9 Turret and capstan operations

3. Shaping machine

3.1 Shaping machine working principle

3.2 Essential features

3.3 Shaper mechanism

3.4 Work holding device

3.5 Shaping tools

3.6 Capability and work range

4. Slotting machine

4.1 Working principle

4.2 Essential features

4.3 Work holding devices

4.4 Slotter tools

4.5 Slotter operations

4.6 Specification

5. Planer

5.1 Working principle

5.2 Essential features

5.3 Planer mechanism

5.4 Work holding devices

5.5 Planer tools

5.6 Planer operations

6. Alignment Tests

6.1 Location and foundation

6.2 Function, designing, loads on foundation

6.3 Vibration

6.4 Test charts

6.5 Care and maintenance of above machines

7. Safety rules

7.1 Safety rules in the workshop

8. Super finishing operation

8.1 Super finishing operation like lapping, honing, scraping, electroplating, anodizing

9. Heat Treatment

9.1 Necessicity

10. CNC Lathe

10.1 CNC Lathe

11. COMPUTER FUNDAMENTALS

Familiarizes with computer as CNC work station, communication between CNC and computer i.e. series, parallel.

12. CNC MACHINES-OPERATION

Familiarization with co-ordinate system, use of CNC codes and programming practice. Manufacturing of simple job on CNC trainer after programming-like straight, grooving, concave, convex, taper and threading. Practice on block number, M, G, T, S code, tool offset zero offset, axis movement, interpolation. Maintenance- error messages, meaning, fault identification from messages, loose connection, earthing, electromagnetic interference etc. hands on experience on CNC operation, referencing (zeroing), programming, and precautions while executing commands.

PRACTICAL

Exercises based on :

1. Facing - one job
2. Centering - one job
3. Plane Turning - one job
4. Step Turning - two jobs
5. Form Turning - six jobs
6. Taper Turning - two jobs
7. Parting off - one job
8. Drilling and Boring - one job
9. Blind boring - one job
10. Turning on odd surfaces - one on M.S. and three jobs on cast iron
11. Threading - internal and external - three jobs
12. Study of different types of rolling, contract bearing their mounting, assembling and dismantling
13. Local Industrial visits.

1. Milling Machine

- 1.1 Types
- 1.2 Construction
- 1.3 Specification
- 1.4 Work holding devices
- 1.5 Cutter holding devices
- 1.6 Milling cutters
- 1.7 Milling operations
- 1.8 Indexing head
- 1.9 Care and maintenance

2. Grinding Machine

- 2.1 Type
- 2.2 Cylindrical grinders
- 2.3 Surface grinders
- 2.4 Grinding machine accessories
- 2.5 Grinding wheel
- 2.6 Selection of grinding wheel,
- 2.7 Composition of grinding wheel
- 2.8 Grinding wheel balancing, dressing and mounting.
- 2.9 Capability and work range

3. Boring machine

- 3.1 Types
- 3.2 Specification and operations

4. Modern Methods of machining

- 4.1 Basic knowledge of Electro discharge machining (EDM)
- 4.2 Electro chemical machining (ECM)
- 4.3 Ultrasonic machining
- 4.4 Laser Beam machining

5. Study of pneumatic system

- 5.1 Study of pneumatic
- 5.2 Compressor.

PRACTICAL

A) Milling

- 1. Preparation of different shapes from M.S. round bar such as, square, hexagonal, Octagonal etc. - two jobs minimum.
- 2. Cutting spline on shaft
- 3. Cutting keyways on shaft - two jobs minimum.
- 4. Cutting spur gear
- 5. Cutting spiral grooves on shaft
- 6. Preparation of slots with steps:
 - i) Dovetail
 - ii) Rectangle
 - iii) Square
 - iv) Vee slot

B) Inspection

- 7. Inspection and overhauling of machines (parts of milling)
- 8. Preparation of preventive maintenance programmed for workshop machinery
- 9. Industrial visit to small scale and large scale industries. Local and outside.

REFERENCE BOOK

1. Nandkumar K. Hukeri (Electro tech Publication) Industrial Engineering & Production & Operations Management
2. HMT - Production Technology.
3. Mahajan – Mechanical Technology
4. P.K.Roy, Y.V. Deshmukh - Production Engineering
5. O. P. khanna – Mechanical estimating & costing

LIST OF TOOLS AND EQUIPMENT

SR.NO	ITEM	I.S.CODE	Qty.
1.	Steel rule 30cm graduated both in English and metric units	IS:1481-1970	5 Nos.
2.	Outside spring caliper 150mm	IS:4052-1967	2 Nos.
3.	Inside spring caliper 150mm	IS:4052-1967	2 Nos.
4.	Hermaphrodite caliper 150mm	IS:	2 Nos.
5.	Divider spring 150mm	IS:4083-1967	2 Nos.
6.	Center punch 100mm	IS:7177-1974	5Nos.
7.	Hammer B.P.0.5kg	IS:841-1968 and 620-1985	2 Nos.
8.	Combination pliers 150mm	IS:3650-1973	5 Nos.
9.	Safety glasses	IS:1179-1967	5 pairs
10.	File flat bastard 300mm	IS:1931-1962	5 Nos.
11.	File flat 2 nd cut 250mm	IS:1931-1962	5 Nos.
12.	Engineers screw driver	IS:844-1962	5 Nos.
13.	File flat smooth 200mm	IS:1931-1962	5 Nos.
14.	Cold chisel flat 25x200mm	IS:402-1964	5 Nos.
TOOLS, INSTRUMENTS AND GENERAL SHOP OUT FITS:-			
15.	Surface plate 400mmx400mm grade1	IS:2285-1963	1No
16.	Table for surface plate 900x900x1200mm	IS	1NO
17.	Marking off table 1200x1200x900mm high		1No
18.	Scribing block universal 300mm		2Nos.
19.	Vee block 100/7-80-A	IS:2949-1964	2Nos.
20.	Try square 300mm	IS:2103-1962	2Nos.

21	Outside spring caliper 200mm	IS:4052-1967	2Nos
22	Divider spring 200mm	Is:4083-1967	2Nos
23	Inside spring caliper 200mm	IS:4052-1967	2Nos.
24	Straight edge steel 1 meter	IS:	1No.
25	Straight edge steel 500mm		1No
26.	Steel tape 2 meter in case	IS:1270	1No
27	Steel rule 60cm graduated both in English and metric units	IS:1481-1970	2Nos.
28	Spirit level 2V 250, 05 meter	IS:5706	1No
29	Hammer B.P.800 gms with handle	IS:841-1963	5Nos.
30	Screw driver, heavy duty 300mm with handle	IS:844-1962	2Nos.
31	Hammer lead 1 kg		2Nos
32	Combination set 300mm		1No
33	Spindle blade screw driver 100mm	IS:844-1962	2Nos
34	Allen hexagonal keys 2.5to 12	IS:	2sets
35	Spanner D.E.G.P. series 2	IS:2028-1968	2sets of 7 pieces each
36	Adjustable spanner 300mm	IS:6149	2Nos.
37	Reduction sleeve Morse 1-1, 3-1, 4-1, 4-2, 5-1, 5-2, 6-1	IS:2608-1961	2Nos.
38	Angle plate size 200x100x200mm	IS:2554-1963	2Nos.
39	Angle plate adjustable 250x150x175		2Nos.
40	Solid parallels in pairs(different sizes) in metric	IS:4241-1967	5pairs
41	Oil cane pressure feed 500mg		2Nos.
42	Oil stone 150x50x25mm		2Nos.
43	Number drills H.S.S.(parallel shank)		1set
44	Drill (parallel shank)	IS:5101-1969 to 5106-1969	2sets
45	Twist drills 3mm to 13mm (parallel shank)	-do-	1set
46	Drill chuck 0.20 with taper shank	IS:2243-1971	1No
47	Center drill A1 to 5	IS:664-1963	2sets
48	Grinding wheel dresser (diamond)		1No

49	Grinding wheel dresser hunting time type		2Nos
50	Clamps C 100mm		2Nos
51	Clamps C 200mm		2Nos
52	Tap and die set in box metric pitch	IS:1988-1962	1set
53	Drill HSS taper shank	IS:5103-1963	2sets
54	File flat 2 nd cut 250mm	IS:1931-1972	2Nos
55	File flat smooth 200mm	IS:1931-1972	2Nos
56	File H/R 2 nd cut 250mm	-do-	2Nos.
57	File triangular smooth 200mm	-do-	2Nos
58	Needle file set	-do-	1No
59	File square 2 nd cut 250 mm	IS:1931-1972	2Nos
60	Reamer 6mm to 25mm by 1mm	IS:1836-1961	1set
61	Reamer adjustable 10mm to 15mm by 75mm		1set
62	Tools bits HSS 6mm square		1dozen
63	Tools bits HSS 10mm square		1dozen
64	Tools bit holder (Armstrong) L.H		2Nos.
65	Tools bit holder (Armstrong) R.H		2Nos as required
66	Assorted tools for lathe, shaper, slotter and planner of different shapes and sizes		
67	Hacksaw frame adjustable 250-300 mm with blades	IS:5168-1969	2Nos
68	Table chuck 75mm jaw swivel base		1No
69	Machine vice 200mm swivel base	IS:4502-1968	2Nos
70	Machine vice 160mm swivel base		2Nos
71	Hand vice 50mm jaw		2Nos
72	Radius truing attachment		1No
73	Angle truing attachment		1No
74	Compound angle vice(standard sine)		1No
75	Universal vice		1No
76	Universal table angle plate		1No

77	Taper shank twist drill set 6.30mmx1.5mm to suit radial drilling machine		1set
78	Shaper tool holder turret type		2Nos
79	Base chuck for slotter		1No
80	Shaper indexing center		1No
81	Knurling tools(set of 3) straight and diamond	IS:6335-1971	1each
82	Pliers cutting 200mm	IS:4378-1973	2Nos
83	Magnifying glass 75mm	IS:5148-1965	2Nos.
84	Carbide tipped tools of different sizes and shapes (throw away tips)	IS:2163-1963	2sets
85	Hand hammer 1kg with handle	IS:841-1968 and 620-1965	2Nos
<u>MILLING CUTTERS:</u>			
1	Cylindrical cutter 63x90 bore dia	IS:1831-1961	2Nos
2	Cylindrical cutter 80x90 bore dia	IS:1831-1961	2Nos
3	Side and face cutter B 80x8	IS:6308-1971	2Nos
4	Side and face cutter B 160x10	IS:6308-1971	2Nos
5	Side and face cutter B 100x12	IS:6308-1971	2nos
6	Side and face cutter B 160x16	IS:6308-1971	2Nos
7	Side and face cutter A 200x20	IS:6308-1971	2Nos
8	Side and face cutter A 100x10	IS:6308-1971	2Nos
9.	Equal angle cutter 45 degree/100	IS:6326-1971	2Nos
10.	Equal angle cutter 60 degree/100	IS:6326-1971	2Nos
11.	Equal angle cutter 90 degree/100	IS:6326-1971	2Nos
12.	Double angle unequal cutter 50x12x55 degree	IS:6325-1971	2Nos
13.	Double angle unequal cutter 63x18x60 degrees	IS:6325-1971	2Nos
14.	Double angle unequal 80x32x70 degree	IS:6325-1971	2Nos
15.	Double angle unequal cutter 100x36x75 degrees	-do-	1No
16.	Single angle cutter 63x18x45 degree RH	IS:6324-1971	1No
17.	Single angle cutter 63x18x45 degree LH	-do-	1No
18.	Single angle cutter 63x18x60 degree RH	-do-	1No

19.	Single angle cutter 63x18x60 degree LH	IS:6324-1971	2Nos
MEASURING INSTRUMENTS			
1	Micrometer outside 0-25 mm	IS:2967- 1964	2nos.
2.	Micrometer outside 25-50 mm	IS:2967-1964	2nos
3.	Micrometer outside 50-75mm	IS:2967-1964	1no.
4.	Micrometer depth gauge 0-200mm		1no.
5.	Direct reading vernier caliper B 300 (direct reading with dial)	IS:3651-1964	1no.
6.	Vernier height gauge 250 mm	IS:2921-1960	1no.
7.	Vernier gear tooth caliper		1no.
8.	Vernier bevel protector with 150mm blade	IS:4239-1970	1no.
9.	Bevel gauge 200 mm		1no.
10.	Telescopic gauge 13mm to 300mm		1set
11.	Sine bar 200mm	IS:5359-1969	1no.
12.	Compound dial gauge with stand (metric)		1no.
13.	Dial test indicator with magnetic gauge type 1 grade a with magnetic base	IS:2092-1969	1no.
14.	Center gauge 60 degree		1no.
15	Slip gauge set (normal set) metric (for the whole institute)	IS:2984-1966	1set
16	Screw pitch gauge for metric pitches (25-6mm)	IS:4211-1967	2sets
17	Radius gauge metric set (1-6mm)	IS:5273-1969	1set
18.	Limit plug gauges 5mm to 25mm by 2.5mm	IS:2251-1965	1set
19	Ring gauges 5mm to 25mm by 2.5mm(go and no go)	IS:2251-1965	1set
20	Taper gauge M.T.No.1,2,3,4&,5		1set
21	Feeler gauge	IS:3179-1965	1no.
22	Planner gauge standard size		1no.
23	Steel lockers for 12 trainees	IS:3314-1965	1no.
24	Steel chair for instructor		1no.
25	Steel table for instructor		1no.
26	Work bench for fitters with 2 vices of 100mm jaw		1no.
27	Steel cupboard 180x90x45mm	IS:1883-1966	1no.

28	Steel cupboard 120x60x45cm	-do-	1no.
29	Blackboard with easel		1no
30	First aid box		1no
GENERAL INSTALLATION:-			
1	Shaping machine 450mm stroke(motorised)with all attachments	IS:5990-1971	1no
2	Shaping machine 315mm stroke (hydraulic) with all attachments	IS:5990-1971	1no
3	Double column planner 1500x1000x10000mm(motorised) with all attachments	IS:4872-1968	1no
4	Slotter 180mm stroke (motorised) with all attachments		1no
5	Lathe general purpose all geared-height of centers 150mm to below between centers 150mm supplied with 3 jaw and 4 jaw chuck, face plate, taper turning attachment steadies etc. and set of lathe tool	IS:2392-1963	1no
6	Tool and cutter grinder 250mm to admit 450 mm between center-fully motorised work head supplied with tool rest of different types table clamps and other attachments		1no
7	Drilling machine pillar 20mm capacity		1no
8	Radial drill 1200mm area motorised with tapping attachment	IS:6893-1973 (part-III)	1no
9	Silicon carbide grinder for carbide tipped tools		1no
10	Milling machine universal horizontal(motorized) 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 mill from 3mm to 30mm		1no
11	Milling machine universal horizontal no. zero with all attachments	IS:6893-1973	1no

12	Milling machine plain type horizontal (motorized) No.2 with all attachments	-do-	1no
13	Milling machine vertical no.1 (motorized)with all attachments	-do-	1no
14	Surface grinding machine wheel dia 180mm (or near) reciprocating table, longitudinal table traverse 200mm (or near) fitted with adjustable traverse stop. Full motorized supplied with magnetic chuck 250mmx120mm diamond tool holder set of spanner, grease gun etc.		1no
15	Cylindrical grinder		1no
16	CNC Milling trainer		1no
17	CNC Cutting tool		1no
18	Voltage stabilizer		1no
19	VCP		1no
20	Color +1' monitor		1no
21	Cassette tape recorder		1no
