# Mechanical Technology (IA, IB, IC)

## List of Reference Books
### Std. XI & XII

| Sr. No. | Title of Book | Author | Publisher |
|---|---|---|---|
| 1 | Elements of Workshop Technology Vol. I & II | S. K. Hajra Chaudhary | Media Promoters & Publishers Mumbai |
| 2 | Elements of Mechanical Engg. | S. K. Hajra Chaudhary | Media Promoters & Publishers Mumbai |
| 3 | Engineering Drawing | N. D. Bhatt | Charatar Book Stall, Anand |
| 4 | Geometrical & Machine Drawing | N. D. Bhatt | Charatar Book Stall, Anand |
| 5 | Workshop Technology | B. S. Raghuwanshi | Dhanpal Rai & Sons Delhi |
| 6 | Engineering Drawing I.S. Code -696-1972 | - | - |
| 7 | Engineering Drawing | Wagholkar & Mandke | Nirali Prakashan Pune – 2 |
| 8 | Elements of Mechanical Technology | Prof. P. V. Mandke | Nirali Prakashan Pune – 2 |
| 9 | Hydraulics | Jagdishlal | - |
| 10 | Heat Engines Vol. I & II | Patel & Karamchandani | Acharya Book Depot |
| 11 | Basic Plumbing | Philbin | Prentice Hall |
| 12 | Teach Yourself Plumbing | Inness J. H. | The English Universal Press Trust |
| 13 | A Text Book Applied Mechanics | R. S. Khurmi | - |
| 14 | Applied Mechanics | Dhande / Jamdar | Anmol |
| 15 | Workshop Technology Vol. I & II | W. A. J. Chapman | Arnold |
| 16 | Blue Print Reading for Mechanical Trade | B. R. Sachdeva | McGraw Hill, Delhi |
| 17 | Shop Tools care & repair | De Witt Hunt | East West Pvt, Ltd., New Delhi |
| 18 | Theory of Machines | P. L. Ballaney | Khanna Publishers Delhi – 6 |
| 19 | Automobile Engg. Vol. I & II | Kripal Singh | Lomas Offset Press, Delhi |
| 20 | Basic Electric Engineering Part 4 | Prof. Prakash Shah | Arn Vidyutshala, Publication, Pune |
| 21 | Elementary Engineering Drawing | Bhatt & Panchal | Charatar Publishing House, Anand |
| 22 | Working in Microsoft Office | Ron Mansfield | Tata McGraw Hill Co. Ltd., New Delhi |
| 23 | Manual of CNC | - | - |

| Sr. No. | Title of Book | Author | Publisher |
|---|---|---|---|
| 24 | CNC Technology Programming & | Mahesh Dhotre | Sai Technology |
| | Operation (Marathi Medium) | | |
| 25 | CNC VMC Programming & | Avinash Ladagye | Padmavati Prakashan ,Kolhapur |
| | Operation (Marathi Medium) | | |
| 26 | Computers Today | - | Galgotia Publication Pvt. |
| | | | Ltd., 5 Ansari Road, New |
| | | | Delhi |
| 27 | Auto CAD Manual | - | - |
| 28 | CAD CAM Manual | - | - |
| 29 | Auto CAD 2015 for engineers and | Prof. Shyam Tikoo | Dream Tech. |
| 30 | Inside Auto CAD 2005 | David J. Harrington | Tech. Media |
| 31 | Auto CAD 2013 for Dummies | Mark Middle Brork | Wiley Publishing Inc. |
| | | P. N. Rao | Wiley Dream Tech, India Pvt. Ltd. |
| 32 | CAD/CAM Principles & Application | - | Tata McGraw Hill Publication |
| 33 | CAD/CAM Computer aided design & manufacturing | Mikell P. Grover Emory W. | PHI Publication |
| | | Zimmer C.J.R | (Educational Economical |
| | | | Edition) |
| 34 | Mastery CAD/CAM | Ibrahim Zeid | Tata McGraw Hill Publication |
| 35 | Mastering Auto CAD 2015 & Auto CAD LT 2015 | George Omura | |
| | | Brian Benton | |
| 36 | Workshop Calculation | Shri A.A.Baseshankar | Vijayshree Publication , Nagpur |
| 37 | Workshop Science | Shri A.A.Baseshankar | Vijayshree Publication , Nagpur |
| 38 | Hydraulics, Fluid | S. Chand | |
| | Mechanics and Hydraulics | (R. S. Khurmi) | |
| | Mechanics | | |
| 39 | Material Science and Metallurgy | O. P. Khanna | Dhanpat Rai and Sons |
| 40 | Welding Technology | M. B. Dnadgavhal | Anmol |
| 41 | Engineering Science | V. P. Boery | |
| 42 | Refrigeration and air Conditioner | Dhanpat Rai and sons | |
| 43 | Industrial Engineering and | O. P. Khanna | Dhanpat Rai and Sons |
| | Management | | |
| 44 | Industrial Organisation and Engineering Economics | T. R. Banga | Khanna Publishers |
| | | S. C. Sharma | |
| 45 | Auto Engineering | R. B. Gupta | Surya Prakashan |
| 46 | Electrical Engineering | B. L. Thereja | |
| 47 | Basic Plumbing | Philbin | Prentice Hall |
| 48 | Turner machinist | Dandgaval | Nikita Publication |
| 49 | Teach Yourself plumbing | Inness J. H. | The English University Press Ltd. |
| 50 | CNC Programming & Operating | Jagtap D D | Nikita Prakashan, Pune |

# Mechanical Technology (IA, IB, IC)

## Introduction

Keeping in mind the need of Society which will be highly productive in present and future scenario the syllabus of mechanical technology enhance the self-employability vertical mobility in the course field, mechanical capability and even skilled based approach among the students who will get through the successful utilization of knowledge in future.

The new framing format of syllabus will facilitated the adequate scope for improvement in their skills regarding machine operation and maintenance. After the successful completion of syllabus, the student can develop the first hand experience of work which will be beneficial for the formation of the innovative technological world of this new advanced era. In introduction with computer based learning, this syllabus will change the perspective of mechanical technology and its implementation in various fields wherever the students enter with knowledge of it.

## Job Opportunity

**A) Self employment in the following field.**

1. Fabrication.
2. Fitting & Welding
3. Plumbing.
4. Turning.
5. Machining.
6. CNC Lathe
7. Spare Parts.
8. Different Types of job work,such as supervision,maintenance etc

**B) Employment as a work shop Charge men in:**

1. Machine Shop.
2. Fitting/Assembly Shop.
3. Welding Shop.
4. Manufacturing Unit.
5. Machine Maintenance.
6. Job Inspection.
7. Sales Assistant.

8. Plumbing.

Employment in Government, Semi-Government or Private Sector up to lower management

**C) Employment as skilled labour in:**

1. Turning.
2. Fitting.
3. Welding.
4. Machining.
5. CNC Turning

**D) Further Education:**

If students desires, he can take admission in second year of diploma course of engineering ,

**E) Teaching Scheme:**

Theory: 120 periods (40 min) per paper (80 hrs).

Practical: 240 periods per paper (160 hrs)

On the job Training: 20 days x 04 hrs – 80 hrs minimum (on the job training should be conducte

Industrial Visits: Total 12 visits (During XI and XII Std.)

## Objectives

**To enable the student to:**

1. Develop skill in fitting & bench work
2. Develop skill in job inspection with the help of precision measuring instruments & gauges.
3. Develop the skill in fabrication by providing the knowledge of welding.
4. Provide a sound working & operational knowledge of different machine tools like, Lathe
5. Develop adequate knowledge of engineering drawing and Graphics.
6. Provide adequate knowledge of maintenance machine.
7. Knowledge of entrepreneurship activities.
8. Learn advanced machining operation and other related studies in the industries around by
9. Developed proper knowledge of Carpentry tools and joints.
10. Develop skills in workmanship.
11. Develop adequate knowledge planning and scheduling various machine operations.
12. Provide basic knowledge about electricity and internal combustion engine.
13. Develop skill as a plumber.
14. Develop confidence and entrepreneurship skill by arranging industrial visits.

# Mechanical Technology (IA, IB, IC)
# List of Tools, Equipments, Machinery and Furnitures
## (for the batch of Twenty Students)

| Sr. No. | Name of the tools & Equipments | Qty. Req. For Instructor | Qty. Req. For Trainees | Remark |
|---|---|---|---|---|
| 1 | Steel Rule – 30 cm graduated both in metric and English | 1 | 10 | |
| 2 | Outside Spring Caliper – 150 mm | 1 | 10 | |
| 3 | Inside Spring Caliper – 150 mm | 1 | 10 | |
| 4 | Hermaphrodite Caliper – 150 mm | 1 | 10 | |
| 5 | Divider Spring – 150 mm | 1 | 10 | |
| 6 | Centre Punch – 100 mm | 1 | 10 | |
| 7 | Hammer Ball Pein – 0.5 kg | 1 | 5 | |
| 8 | Cross Pein Hammer 0.5 kg | 1 | 5 | |
| 9 | Combination Plier – 200 mm | 1 | 10 | |
| 10 | File Flat bastard – 300 mm | 1 | 10 | |
| 11 | File Flat 2nd cut – 250 mm | 1 | 20 | |
| 12 | Engineers Screw Driver | 1 | 20 | |
| 13 | File Flat smooth – 300 mm | 1 | 20 | |
| 14 | File Triangular 2nd cut – 250 mm | 1 | 20 | |
| 15 | File Round 2nd cut – 200 mm | 1 | 10 | |
| 16 | File Half Round 2nd cut – 200 mm | 1 | 10 | |
| 17 | File Triangular smooth – 200 mm | 1 | 10 | |
| 18 | File square 2nd cut – 200 mm | 1 | 10 | |
| 19 | File warding smooth – 150 mm | 1 | 10 | |
| 20 | File knife edge smooth – 150 mm | 1 | 10 | |
| 21 | Needle file set | 1 | 2 | |
| 22 | Cold Chisel – Flat 25 x 200 mm | 1 | 5 | |
| 23 | Cold Chisel cross cut | 1 | 5 | |
| 24 | Cold Chisel round nose | 1 | 5 | |
| 25 | Surface plate 500 x 500 Grade – 01 | 1 | 1 | |
| 26 | Metal Stand table for Surface plate | 1 | 1 | |
| 27 | Screw driver set (Multi Head) | 1 | 1 | |
| 28 | Scribing block – Universal 300 mm | 1 | 1 | |
| 29 | Vee Block – Universal | 1 | 2 | |
| 30 | Try Square – 150 mm | 1 | 10 | |
| 31 | Straight Edge Steel – 500 mm | 1 | 1 | |
| 32 | Steel Tape – 05 meter | 1 | 1 | |
| 33 | Spirit Level | 1 | 1 | |
| 34 | Hammer Ball Pein – 800 gms with handle | 1 | 1 | |
| 35 | Screw Driver Heavy Duty – 300 mm with handle | 1 | 5 | |

| Sr. No. | Name of the tools & Equipments | Qty. Req. For Instructor | Qty. Req. For Trainees | Remark |
|---|---|---|---|---|
| 36 | Hammer Lead 01 kg | - | 1 | |
| 37 | Allen key set inches | 1 | 2 | |
| 38 | Allen key set metric | 1 | 2 | |
| 39 | Spanner Set D.E.C.P Series | 1 | 2 | |
| 40 | Apollo Box Spanner Set / Ring spanner set | 1 | 2 | |
| 41 | Reduction Sleeve MT as required | - | 1 | |
| 42 | Angle Plate 150 x 100 x 150 | 1 | 1 | |
| 43 | Solid Parallels in Pairs (Different sizes) | 1 | 2 | |
| 44 | Oil can pressure feed 500 mg | 1 | 5 | |
| 45 | Oil stone – 150 x 50 x 25 | 1 | 2 | |
| 46 | Twist Drills – 03 mm to 13 mm (Parallel shank) | 1 | 2 | |
| 47 | Drill chuck – 0 – 20 with Taper shank | 1 | 1 | |
| 48 | Centre Drill – A – 01 to 05 | - | 02 Set | |
| 49 | Grinding Wheel Dresser (Star Type/Diamond type) | - | 1 | |
| 50 | C – clamps – 100 mm | - | 2 | |
| 51 | C – clamps – 200 mm | - | 2 | |
| 52 | Tap and Die Set in Box metric pitch | 1 | 2 | |
| 53 | Tap and Die Set in Box British pitch | 1 | 2 | |
| 54 | Die Set for pipe threads (up to 2") with die stock | 1 | 1 | |
| 55 | Drill – HSS Taper shank (upto 20 mm) | 1 | 1 | |
| 56 | Reamer – 06 mm to 13 mm straight shank | 1 | 1 | |
| 57 | Hack saw – Adjustable – 250 to 300 mm with | 1 | 10 | |
| 58 | Letter Punch – 3 mm Set | 1 | 1 | |
| 59 | Number Punch – 3 mm Set | 1 | 1 | |
| 60 | Magnifying Glass – 75 mm | 1 | 2 | |
| 61 | Hand Vice – 50 mm jaw | 1 | 2 | |
| 62 | Bench Vice – 150 mm | - | 20 | |
| 63 | Work bench of bench vice for fitting work | - | 5 | |
| 64 | Micrometer – outside – 0-25 mm | 1 | 4 | |
| 65 | Micrometer – outside – 25-50 mm | 1 | 4 | |
| 66 | Micrometer Depth Gauge – 0-150 mm | 1 | 4 | |
| 67 | Vernier Caliper 150 mm | 1 | 4 | |
| 68 | Digital Vernier Caliper – 0-150 mm | 1 | 4 | |
| 69 | Vernier Height Gauge 300 mm | 1 | 4 | |
| 70 | Vernier Bevel Protractor with L.C of 0.5 | 1 | - | |
| 71 | Dial Gauge with Stand | 1 | 4 | |
| 72 | Screw Pitch gauge for metric and British pitch | 1 | 1 | |
| 73 | Radius Gauge – Metric Set (01 to 06 mm) | 1 | 1 | |
| 74 | Feeder Gauge (Metric) Set | 1 | 1 | |
| 75 | Plug gauges 5 to 25 mm | 01 Set | - | |
| 76 | Ring gauges 5 to 25 mm | 01 Set | - | |

| Sr. No. | Name of the tools & Equipments | Qty. Req. For Instructor | Qty. Req. For Trainees | Remark |
|---|---|---|---|---|
| 77 | Pipe wrench 50 cm | 1 | 2 | |
| 78 | Pipe Bending Machine Manually Operated | - | 1 | |
| 79 | Pipe Vice | - | 1 | |
| 80 | Leg Vice | - | 1 | |
| 81 | Chain wrench | 1 | - | |
| 82 | Hand Gloves Pair and Aprons for students | - | 4 | |
| 83 | Welding Screen – Helmet type with plain and | 1 | 5 | |
| 84 | Welding Screen – Hand type with plain and dark | 1 | 10 | |
| 85 | Welding Goggles Pair | 1 | 10 | |
| 86 | Welding Scaling Hammer with handle | 1 | 5 | |
| 87 | Holding tongs – 30 cm | 1 | 4 | |
| 88 | Wire Brush – S. Steel | - | 10 | |
| 89 | Wire Brush – M. Steel | - | 10 | |
| 90 | Spark Lighter | - | 4 | |
| 91 | Chipping Screen – Hand | - | 6 | |
| 92 | Safety Boots for welders | - | 10 | |
| 93 | Weld Measuring Gauge Fillet and Butt | 1 | 1 | |
| 94 | Welding torch with 5 to 10 nozzles High Pressure and Low Pressure | 1 | 2 | |
| 95 | Welding torch tips (All assorted tips must fit into | 1 | 6 | |
| 96 | Cutting torch oxy-acetylene | 1 | 2 | |
| 97 | Electrode holder | 1 | 1 | |
| 98 | Welding rubber hose for oxygen and acetylene | As per re requirement | | |
| 99 | Cylinder Valve key | As per re requirement | | |
| 100 | Rubber Hose clips | As per re requirement | | |
| 101 | Pressure regulator – Oxygen for brazing | 1 | 2 | |
| 102 | Pressure regulator – Acetylene for brazing | 1 | 2 | |
| 103 | Pressure regulator – Oxygen for cutting | 1 | 1 | |
| 104 | Pressure regulator – Acetylene for cutting | 1 | 1 | |
| 105 | Tip Cleaner | 1 | 1 | |
| 106 | Welding Cable (To carry 350 amps) | As per re requirement | | |
| 107 | Lugs for cables | As per re requirement | | |
| 108 | Oxygen Cylinder | 1 | - | |
| 109 | Acetylene Cylinder | 1 | - | |
| 110 | Trolley for Cylinders | 1 | - | |
| 111 | Gas welding table | 1 | - | |
| 112 | Carpentry set of hand tools | - | 02 Set | |
| 113 | Moulding set of hand tools | | 02 Set | |

| Sr. No. | Name of the tools & Equipments | Qty. Req. For Instructor | Qty. Req. For Trainees | Remark |
|---|---|---|---|---|
| 114 | Inclined Plane with glass surface | | 02 Set | |
| 115 | Weighing box (1 to 500 gms)with pan | | 02 Set | |
| 116 | Slotted weights with hooks of 500 gms | | 02 Set | |
| 117 | Laboratory Model of simple wheel and axle | | 2 | |
| 118 | Laboratory Model of screw jack | | 2 | |
| 119 | Laboratory Model of simple Pulley block | | 2 | |
| 120 | Centrifugal Pump | | 1 | |
| 121 | Reciprocating pump | | 1 | |
| 122 | Star Delta Starter | | 1 | |
| 123 | Fire buckets with stand | - | 2 | |
| 124 | Safety Goggles | 1 | 10 | |
| 125 | Almirah | 1 | 6 | |
| 126 | Trainees Locker – Pigeon Holes – 10 Nos | - | 2 | |
| 127 | Fire Fighting Equipments, First Aid Box | 1 | 1 | |
| 128 | Storage Rack and Storage Self | As per re requirement | | |
| 129 | Table and Chair for Instructor | 02 e ach | | |
| 130 | Lathe general purpose S.S.S.C Cone Pulley type, | - | 8 | |
| 131 | Lathe general purpose S.S.S.C all geared head- | - | 2 | |
| 132 | Pedestal grinder – Double Ended with<br>170 mm wheels (one fine, one rough) | - | 2 | |
| 133 | Surface Grinding Machine – wheel dia<br>180 mm (approx) Reciprocating Table,<br>Longitudinal Table Traverse 200 mm<br>(approx) fitted with Adjustable Traverse stop | - | 1 | |
| 134 | Cylindrical Grinder with Internal<br>Grinding attachment – Centre height – | - | 1 | |
| | 130 mm with standard accessories | | | |
| 135 | Milling Machine – Universal with standard accessories, attachments and different size and shape milling cutters | - | 2 | |
| 136 | Shaper Machine up to 40 cm stroke length with | - | 1 | |
| 137 | Slotter Machine with standard accessories | - | 1 | |
| 138 | CNC Simulation software latest | 1 | 1 | |
| 139 | Drilling Machine – Pillar type 20 mm capacity | - | 1 | |
| 140 | Hand Drilling Machine (12mm) electric | - | 2 | |
| 141 | Power Hack Saw Machine<br>(Hydraulic with all accessories) | - | 1 | |
| 142 | Disc Grinder (Hand grinder) – 100 mm | - | 2 | |

| Sr. No. | Name of the tools & Equipments | Qty. Req. For Instructor | Qty. Req. For Trainees | Remark |
|---|---|---|---|---|
| 143 | Cutter off (Hand Shear electric) | - | 1 | |
| 144 | Anvil (Standard size) | - | 1 | |
| 145 | Transformer welding set with all accessories – | - | 1 | |
| 146 | Arc Welding Machine Set Rectifier type 300 Amp with all accessories | - | 1 | |
| 147 | TIG Welding Machine Set, 300 Amp AC/DC with water cooled torch and standard accessories | - | 1 | |
| 148 | Arc Welding Table all metal with positioner | As per re requirement | | |
| 149 | Desktop Computer with 4th Generation Core i5 TB HDD, 18" TFT/LED Monitor, 2 GB Card. | 1 | 5 | |
| 150 | Laser Printer / Lan Printer | 1 | 1 | |
| 151 | Wireless LCD Projector | 1 | - | |
| 152 | UPS | As per re requirement | | |
| 153 | Lan Switch 16 Port | As per re requirement | | |
| 154 | Drawing board half imperial size with 'T' – square | 1 | 20 | |
| 155 | Auto CAD Latest Version Software | 1 | 5 | |
| 156 | Computer table with chairs | As per re requirement | | |
| 157 | Black Board / White Board / smart board | As per re requirement | | |
| 158 | Adjustable Spanner | 1 | 2 | |
| 159 | Hydraulic Hand Press Machine with all accessories | -- | 1 | |
| 160 | Single Stage Air Compressor | -- | 1 | |
| 161 | Two Stroke I.C. Engine Model ( Petrol and | -- | 1Each | |
| 162 | Four Stroke I.C. Engine Model ( Petrol and | -- | 1Each | |
| 163 | Induction Furnance with temp. Controller | 1 | -- | |
| 164 | Hardness Testing Machine | 1 | -- | |
| 165 | Vacuum Cleaner | 1 | -- | |

# Mechanical Technology (IA, IB, IC)

## List of Raw Materials

**(For the batch of twenty students)**

| Consumable | Semi Consumable | Miscellaneous |
|---|---|---|
| 1) M.S. Round Bar (Assorted Size) | 1) H.S.S. Tool bit | 1) Nut and bolts Assorted |
| 2) M.S. Flat (Assorted Size) | 2) Carbide tools (Brazed tip assorted | 2) Washers (Assorted) |
| 3) M.S Angle (Assorted Size) | 3) Drill bits (Parallel and taper | 3) Studs/Rivets (Assorted) |
| 4) C.I. Block 50x50x50 | 4) Centre/Combination Drill | 4) Belts/Ropes |
| 5) Hack Saw Blades | 5) Cleaning Brush | 5) Strings |
| 6) Power Saw Blades | (Machine cleaning) | 6) Handles for files, |
| 7) Lubricating Oil | 6) Wire brush | 7) Hooks |
| 8) Coolant (cutting) Oil | 7) Bearing (Assorted size and type) | 8) Assorted weights |
| 9) Gear Oil | 8) Electric fitting material | |
| 10) Grease | 9) Milling cutters | |
| 11) Kerosene/Diesel/Petrol | 10) Shaper tools | |
| 12) Cotton waste | 11) Slotter tools | |
| 13) Emery Paper/Cloth | | |
| 14) G.I/Plastic pipe and fittings | | |
| 15) Hole tight | | |
| 16) Teflon tape | | |
| 17) Electrodes (Assorted) | | |
| 18) Gas welding rods | | |
| 19) Flux | | |
| 20) Soap/Detergent Powder | | |
| 21) Soldering Stick | | |
| 22) Galvanized/M.S Sheet | | |
| 23) Welding Gas (OxygenAcetylene) | | |
| 24) Aluminum Rod for CNC Machine Job | | |
| 25) Match Box/Gas Lighter | | |
| 26) Welding Screen glasses plain & dark | | |
| 27) First aid material | | |

**MECHANICAL TECHNOLOGY (IA, IB, IC)**

**Scheme of Examination**

**Std. –XI**

| Paper | Title of the Paper | Theory | | Practical | | Term work | Project work | I.V | Total Marks |
|---|---|---|---|---|---|---|---|---|---|
| | | Marks | Time (Hrs) | Marks | Time (Hrs) | | | | |
| 1 | Basic Machine Shop practice - I | 80 | 3 | 80 | 3 | 20 | 10 | 10 | 200 |
| 2 | Machine Shop Practice - II | 80 | 3 | 80 | 3 | 20 | 10 | 10 | 200 |
| 3 | Engineering Graphics& Calculations | 80 | 3 | 80 | 3 | 20 | 10 | 10 | 200 |

I.V.: Industrial Visits

OJT: On the Job Training should be conducted as & when required as per syllabus.

**MECHANICAL TECHNOLOGY (IA, IB, IC)**

**Scheme of Examination**

**Std. – XII**

| Paper | Title of the Paper | Theory | | Practical | | Term work | Project work | I.V. | Total Marks |
|---|---|---|---|---|---|---|---|---|---|
| | | Marks | Time (Hrs) | Marks | Time (Hrs) | | | | |
| 1 | Operation & Maint. Of M/C tools -I | 80 | 3 | 80 | 3 | 20 | 10 | 10 | 200 |
| 2 | Operation & Maint. Of M/C tools -II | 80 | 3 | 80 | 3 | 20 | 10 | 10 | 200 |
| 3 | Engineering Science & Utilities machinary | 80 | 3 | 80 | 3 | 20 | 10 | 10 | 200 |

I.V.: Industrial Visits

OJT: On the Job Training should be conducted as & when required as per syllabus.

# Mechanical Technology (IA, IB, IC)
## Std XI
## Paper I : Basic Machine Shops Practice -I

Objectives :

1) Gain knowledge about Metal and non Metals
2) Gain Knowledge about Measuring Instruments
3) Develop measuring skills with the help of precision Instruments
4) To develop the skills in fitting work.
5) To develop the skills in welding specially in fabrication work.
6) Gain knowledge about Carpentary work specially Furniture making
7) Gain knowledge and skill about Plumbing work.
8) Gain knowledge about safety rules
9) Gain knowledge about sheet metal work

| Sr. No. | Unit | Sub Unit | Periods |
|---|---|---|---|
| 1 | Engineering Material | 1.1 Introduction to Material<br>1.2 Metals<br>1.3 Non-Metals<br>1.4 Section of Engineering materials.<br>1.5 Applications of commonly used Engineering materials.<br>1.6 Alloy Metals<br>1.7 Effect of Alloying on base metal<br>1.8 Steel Classification<br>1.9 Physical properties of Metals.<br>1.10 Mechanical properties of Metals<br>1.11 Study of Heat Treatment process<br>1.12 Testing of Materials | 15 |
| 2 | Measuring Instruments | 2.1 Introduction<br>2.2 Classification of Measuring Instruments<br>2.3 Study of Non-Precision Instruments<br>2.4 Study of Precision Instruments<br>2.5 Study of Comparator Instruments<br>2.6 Study of Angular Measuring Instruments<br>2.7 Introduction to Gauges<br>2.8 Study of inspection Gauges.<br>2.9 Classification of Gauges<br>2.10 Care and Maintenance of Measuring Instruments | 15 |
| 3 | Safety Rules | 3.1 Definition of Accident<br>3.2 Need of Safety<br>3.3 Safety Rules in work shop<br>3.4 Safety Equipments<br>3.5 Fire and Electrical Safety<br>3.6 Factory act 1948<br>3.7 Labour law | 8 |

| | | | |
|---|---|---|---|
| 4 | Fitting and Bench Work | 4.1 Necessity of Bench work.<br>4.2 Mechanics of manual metal cutting process.<br>4.3 Hand tools used in fitting work<br>4.4 Marking tools and cutting tools used in fitting shop.<br>4.5 Operations in fitting shop<br>4.6 Interchangeability<br>4.7 SIZE, Actual Size, Nominal Size<br>4.8 Limit Fit and Tolerance<br>4.9 Allowance and Clearance<br>4.10 Surface roughness symbols<br>4.11 Introduction to inspection and quality control. | 25 |
| 5 | Welding | 5.1 Introduction<br>5.2 Classification of Welding processes<br>5.3 Welding tools<br>5.4 Welding terms, definitions and welding symbols.<br>5.5 Arc Welding power sources & its applications.<br>5.6 Oxy-Fuel Welding & Cutting<br>5.7 Soldering and Brazing<br>5.8 Pipe welding<br>5.9 MIG and TIG welding<br>5.10 Submerged & Thermit welding<br>5.11 Resistance welding<br>5.12 Plazma welding<br>5.13 Mechanical joining & adhesive bonding<br>5.14 Defects and Remedies in welding<br>5.15 Introduction to CNC machine | 25 |
| 6 | Plumbing | 6.1 Introduction<br>6.2 Pipe Material & Commercial Used sizes & their applications.<br>6.3 Plumbing Hand tools and equipments<br>6.4 Plumbing fittings joints<br>6.5 Designing a pipe fitting & distribution system for 10 story building with storage tank. | 10 |
| 7 | Carpentary | 7.1 Introduction & Necessity to carpentary<br>7.2 Common woods , plywood and carpentary materials<br>7.3 Wood Joints<br>7.4 Wood Fasteners & Adhesives<br>7.5 Cabinet Furniture designing & Fabrication for different Applications | 7 |

| | | | |
|---|---|---|---|
| 8 | Sheet Metal Work | 8.1 Importance of sheet metal work.<br>8.2 Types of sheet metals.<br>8.3 Sheet metal products, shapes & Drawing<br>8.4 Sheet metal marking layouts & hand tools<br>8.5 Types of sheet metal joints.<br>8.6 Development of pattern layout<br>8.7 Machines used in sheet metal shops.<br>8.8 Sheet metal operations.<br>8.9 Geometrical Construction & Drafting | 15 |
| | | Total | 120 |

# Std. XI
# Paper I : Basic Machine Shop Practice - I
## Practical

| Sr. No. | Name of the Practicals | Periods |
|---|---|---|
| 1 | Draw the Layout plan & machine location plan of the workshop | 8 |
| 2 | Identification of metals & non metals provided in workshop | 2 |
| 3 | Study the effects of various alloying elements on properties of base metal. | 2 |
| 4 | Identifications of Scales, vernier callipers, micrometer (inside, outside) height gauge, depth gauge | 8 |
| 5 | Measurement practicals by angular measuring instruments | 4 |
| 6 | Least count of vernier calliper & micrometer. Exercise on the use of vernier calliper & micrometer | 4 |
| 7 | Marking & Sawing practice | 8 |
| 8 | Filing a flat surface & check for flatness | 12 |
| 9 | Filing at right angle & Check for right angle & straightness – 1 Job | 8 |
| 10 | Filing a square – 1 Job | 12 |
| 11 | Step Filing and form filing – 1 Job | 12 |
| 12 | Fitting male & female – 1 Job | 12 |
| 13 | Drilling & Tapping on above fitting job | 4 |
| 14 | Preparation of square bolt by using fitting practice | 8 |
| 15 | Identification of welding hand tools in a workshop | 4 |
| 16 | Identification of AC & DC power sources for welding. Study the specifications for power rating of power sources. | 4 |
| 17 | Welding edge preparation practice | 8 |
| 18 | Welding by using AC or DC power source<br>1. Arc Welding by depositing straight & wearing beats on MS in flat position.<br>2. Produce arc welded filet lap & T joints in mild steel in flat position<br>3. Produce arc welded inside corner joint in mild steel in flat position | 24 |

| | | |
|---|---|---|
| | 5. Produce arc welded single V butt joint in mild steel in flat position. | |

| | | |
|---|---|---|
| 19 | Brazing & soldering practice | 4 |
| 20 | Welding by using oxy fuel welding for different welding joints. | 12 |
| 21 | Metal cutting by oxy-fuel cutting process | 4 |
| 22 | Plumbing practice, Cutting pipe, threading &connecting various plumbing joints. | 8 |
| 23 | Designing piping system of your institutes or ten story buiding | 4 |
| 24 | Identification of different tools & materials used in carpentary Shop | 4 |
| 25 | Fabrication of simple cabinet furniture. | 8 |
| 26 | Identification of different tools used in sheet metal shop. | 4 |
| 27 | Drawing different geometrical construction of different shapes in sheet metal shop. | 4 |
| 28 | Draw the different safety charts in mechanical workshop. | 4 |
| 29 | Industrial Visit &Prepare a project report on Industrial safety by visiting any nearby factory. | 40 |
| | **Total** | **240** |

**Std XI (Theory)**
**Paper II Machine Shop Practice -II**
**Theory**

**Objectives:**

1. Gain Knowledge about metal cutting process.
2. To gain the knowledge about lath, planning slotting Broaching & sawing processes , Drilling Machine
3. To gain the knowledge about HOT& Cold working process
4. To gain the knowledge about plastic moulding process.

| Sr.No. | Unit | Sub Unit | Periods |
|---|---|---|---|
| 1 | Cutting Tool Geometry | 1.1 Selection of cutting tools.<br>1.2 Materials of cutting tools<br>1.3 Single point cutting tool with tool nomenclature<br>1.4 Effect of cutting angles in metal cutting process<br>1.5 Mechanics of metal cutting process<br>1.6 Speed, feed, meaning and their relative significance in metal cutting process<br>1.7 Types of chips formation<br>1.8 Lubricants & coolants, Types of lubricants, Types of coolants, their properties & applications. | 10 |
| 2 | Lathe Machine | 2.1 Introduction to Manufacturing process<br>2.3 Study of different manufacturing processes<br>2.4 Working Principle of Lathe machine<br>2.5 Classification of Lathe machine<br>2.6 Size & specification of Lathe machine<br>2.7 Main parts of Lathe machine with their functions.<br>2.8 Lathe Accessories<br>2.9Lathe Attachments<br>2.10 Lathe Operations<br>2.11 Cutting process like oblique & orthogonal<br>2..12 Cutting speed, feed and depth of cut and machining time<br>2.13 Installation, Care & Maintenance of Lathe Machine. | 35 |
| 3 | Drilling machine | 3.1 Introduction<br>3.2 Classification and specification<br>3.3 Study of different types of dirlling m/c<br>3.4 Tool holding and job holding devices used on drilling machine<br>3.5Operations on drilling machine<br>3.6 cutting speed, feed<br>3.7 Care & maintenance of drilling machine | 15 |

| | | | |
|---|---|---|---|
| 4 | Mechincal Drives | 4.1 Introduction<br>4.2 Methods of Drive<br>4.3 Elements of Power transmision<br>4.4 Study of different types of drive<br>4.5 Study of break system | 10 |
| 5 | Bearing | 5.1 Study of bearing<br>5.2 Classification of Bearing<br>5.3 Material used for manufacturing of Bearing<br>5.4 Bearing Mounting & dismentaling<br>5.5 Care & maintenance of Bearing & Mechanical drives | 10 |
| 6 | Broaching and Sawing Process | 6.1 Intoductioin to broaching process<br>6.2 Broaching Tools, machining Operations<br>6.3 Sawing process , Power hacksaw & bandsaw machine<br>6.4 Hacksaw blade , material & types<br>6.5 Specification of Hecksaw Machine<br>6.6 Care & Mataince of Hecksaw Machine | 10 |
| 7 | Press & Press Work | 7.1 Introduction<br>7.2 Classifiacation<br>7.3 Specification<br>7.4 Pressed Tools & Job Holding devices<br>7.5 Method of Punch Support<br>7.6 Method of Dies Support | 10 |
| 8 | HOT & COLD Working Process | 8.1 Introduction<br>8.2 Classification of HOT & COLD Process<br>8.3Study of HOT & COLD rolling Process<br>8.4 Advantage & Disadvantges of HOT & COLD working process.<br>8.5 Forging operation | 10 |
| 9 | Plastic Moulding | 9.1 Introduction to Plastic moulding<br>9.2 Intrdouction to polymer, thermo plastic & thermo setting plastic<br>9.3 Important plastic moulding & forming process<br>9.4 Thermo forming & extrusion | 10 |
| | | | 120 |

# Std.XI (Practical)
## Paper-II Machine Shop Practice-II
## Practical

| Sr.No | Name of the Practicals | Periods |
|---|---|---|
| 1 | Study of single point cutting tool nomenclature & identify each part of cutting tool & tool holders | 4 |
| 2 | Practice on cutting tool grinding & measurement of angles. | 4 |
| 3 | Align and fitting of single point cutting on lathe machine | 4 |
| 4 | Facing -1 Job | 10 |
| 5 | Centering - 1 Job | 10 |
| 6 | Plain Turning -1 Job | 10 |
| 7 | Step Turining-1 Job | 10 |
| 8 | Taper turning -1 Job | 10 |
| 9 | Knurling & Chamfering -1 Job | 10 |
| 10 | Grooving -1 Job | 10 |
| 11 | Form Turning -1 Job | 10 |
| 12 | Composite job on lathe - 3 Job | 36 |
| 13 | Practice of Drilling a hole of different sizes by using piller drill m/c or sensative drill machine | 12 |
| 14 | Perform reaming operation on drilling m/c | 12 |
| 15 | Study the specification of Power hacksaw machine | 4 |
| 16 | Study the specification of Press machine | 4 |
| 17 | Study of factory laws & rules | 10 |
| 18 | Study of safety rules & Equipments | 10 |
| 19 | Study the different types of mechanical drives ( Belt, Chain, Gear ,Capling) | 10 |
| 20 | Removing & mouting Bearing on shaft | 10 |
| 21 | Local Industrial Visit (rolling industry plastic industry )<br>Local Industrial Visit must be include Press shop , W/s , & related topics | 40 |
| | | 240 |

**Std. XI (Theory)**

**Paper-III: ENGINEERING GRAPHICS & CALCULATIONS**

**Theory**

**OBJECTIVES:**

1 Impart Knowledge about engineering drawing instruments.
2 Develop adequate knowledge of interpretation of Machine drawing
3 Develop skill in drawing orthographic & isometric views
4 Impart knowledge about types of threads.
5 Develop the skill in Machine drawing
6 Impart knowledge about different conventional symbols.
7 Impart Knowledge of welding & riveted joints.
8 To Develop the skill in Auto CAD, 2D and 3D

| Sr. No. | Unit | Sub Unit | Periods |
|---|---|---|---|
| 1 | Engineering Drawing | 1.1 Introduction to engineering drawing & its application.<br>1.2 Introduction to Drawing Instruments & accessories<br>1.3 Patterns of Lines, lettering & numbers<br>1.4 Dimensioning Techniques & drawing scale | 8 |
| 2 | Geometrical Construction | 2.1 Simple geometrical construction<br>2.2 Engineering curves. | 7 |
| 3 | Orthographic Projection | 3.1 Concept of projection<br>3.2 Method of Projection<br>3.3 Sectional Views | 25 |
| 4 | Isometric Projection | 4.1 Isometric views | 20 |
| 5 | Development of Surfaces | 5.1 Development of Surfaces | 10 |
| 6 | Screw threads, fasteners and welding joints | 6.1 Types of thread<br>6.2 Types of fasteners<br>6.3 Rivets and foundation bolts<br>6.4 Welding joints<br>6.5 Freehand sketches of different joints and tools | 10 |
| 7 | Auto CAD | 7.1 Introduction to CAD<br>7.2 Sketching (2D)<br>7.3 Introduction to Surface modelling<br>7.4 Assembly of parts<br>7.5 Drafting<br>7.6 Introduction 3D | 30 |
| 8 | Engineering Calculations | 8.1 Mensuration<br>8.2 Logarithm<br>8.3 Trigonometry<br>8.4 Calculations, measurements, and conversions | 10 |
| **Total** | | | **120** |

**Std. XI (Pratical)**
**Paper III: ENGINEERING GRAPHICS**
**Practical**

| Sr. No. | Name of the Practicals | Periods |
|---|---|---|
| 1 | Drawing instruments & their uses | 4 |
| 2 | Lines & Lettering | 8 |
| 3 | Drawing conventions as per IS 696 – 1972 | 8 |
| 4 | Geometrical Constructions | 12 |
| 5 | Orthographic Projection by first angle method | 20 |
| 6 | Orthographic Projection by third angle method | 20 |
| 7 | Isometric views | 30 |
| 8 | Types of screw & threads with specifications | 8 |
| 9 | Rivets & foundation bolt | 8 |
| 10 | Free hand sketches of welding joints | 6 |
| 11 | Development of Surfaces | 16 |
| 12 | Auto CAD :<br>Window dialog box, Menu bars, tool bars & command window,<br>UCS coordination system – X, Y & Z coordination, Units, Drawing Limits, Grids, Function keys, Paper size & shortcut keys | 40 |
| 13 | Sketching :-<br>Practice on draw commands – Line, Circle, Rectangle Ellipse, Polygon, Point, Region & parabola.<br>Make a block, write it & then insert it in any file<br>Modifying commands – Erase, Copy, Mirror, Offset, Array, Scale, Stretch, Trim & Extend.<br>Practice on chamfering & filleting corners of drawing. Modifying the sketch in grid spacing. Creation of parametiric dimensions Delete & Add dimensions. | 20 |
| 14 | Industrial visit in manufacturing/auto sector industries in which a CAD/CAM software are used for designing & drawing. (for Solite modeling surface modeling & assembly of parts. | 40 |
| **Total** | | **240** |

**MECHANICAL TECHNOLOGY (IA, IB, IC)**

**Scheme of Examination**

**Std. –XI**

| Paper | Title of the Paper | Theory | | Practical | | Term work | Project work | I.V | Total Marks |
|---|---|---|---|---|---|---|---|---|---|
| | | Marks | Time (Hrs) | Marks | Time (Hrs) | | | | |
| 1 | Basic Machine Shop practice - I | 80 | 3 | 80 | 3 | 20 | 10 | 10 | 200 |
| 2 | Machine Shop Practice - II | 80 | 3 | 80 | 3 | 20 | 10 | 10 | 200 |
| 3 | Engineering Graphics& Calculations | 80 | 3 | 80 | 3 | 20 | 10 | 10 | 200 |

I.V.: Industrial Visits

OJT: On the Job Training should be conducted as & when required as per syllabus.

**MECHANICAL TECHNOLOGY (IA, IB, IC)**

**Scheme of Examination**

**Std. – XII**

| Paper | Title of the Paper | Theory | | Practical | | Term work | Project work | I.V. | Total Marks |
|---|---|---|---|---|---|---|---|---|---|
| | | Marks | Time (Hrs) | Marks | Time (Hrs) | | | | |
| 1 | Operation & Maint. Of M/C tools -I | 80 | 3 | 80 | 3 | 20 | 10 | 10 | 200 |
| 2 | Operation & Maint. Of M/C tools -II | 80 | 3 | 80 | 3 | 20 | 10 | 10 | 200 |
| 3 | Engineering Science & Utilities machinary | 80 | 3 | 80 | 3 | 20 | 10 | 10 | 200 |

I.V.: Industrial Visits

OJT: On the Job Training should be conducted as & when required as per syllabus.

**Std. XII (Theory)**

**Paper I: Operations and Maintenance of Machine Tools -I (IA)**

**Theory**

**BJECTIVES:**

1) Develop the skill as a turner
2) Gain knowledge of working principle and operation of CNC lathe.
3) To develop efficiency and sound working and operational knowledge of different machin tools like all geared lathes,milling machine,shaping machine,drilling machine,power hacksaw machine and so on.
4) To gain knowledge about installation and alingnment of machine Tools
5) To gain knowledge of preparing practical and geometrical test chart of machine tools.
6) To Acquire definite vocational skill required for industries.

| Sr. No. | Unit | Sub Unit | Periods |
|---|---|---|---|
| 1 | Center Lathe | 1.1 Working principle of lathe machine<br>1.2 Block Diagram and specifications<br>1.3 Special operations like drilling,boring, threading , Taper turning operations.<br>1.4 Cutting speed, feed , depth of cut and machining time<br>1.5 Care and Maintenance of Lathe Machine | 12 |
| 2 | Capston and Turrent Lathe Machine | 2.1 Introduction as a mass production Lathe<br>2.2 Classification of Machine<br>2.3 Difference between capstan Lathe and Turret lathe<br>2.4 Study of main parts of capstan and Turret Lathe<br>2.5 Turret tooling layout<br>2.6 Capstan and Turret Lathe oprations | 12 |
| 3 | Shaping Machine | 3.1 Working Principle of Shaping machine<br>3.2 Classification of Shaping machines<br>3.3 Size & specification of Shaping machines<br>3.4 Main parts of Shaping machine with their functions<br>3.5 Shaping Operations<br>3.6 Installation, Care & Maintenance of Shaping Machine | 12 |
| 4 | Planning Machine | 4.1 Working Principle of Planning machine<br>4.2 Classification of Planning machines<br>4.3 Size & specification of Planning machine<br>4.4 Main parts of Planning machine with their functions<br>4.5 Planning Operations<br>4.6 Installation ,care & Maintenance of Planning machine | 12 |

| | | | |
|---|---|---|---|
| 5 | Slotting Machine | 5.1 Working Principle of Slotting machine<br>5.2 Classification of Slotting machines<br>5.3 Size & specification of Slotting machines<br>5.4 Main parts of slotting machine with their functions<br>5.5 Slotting Operations<br>5.6 Installation,Care & Maintenanace of Slotting Machine | 12 |
| 6 | Errection & testing of Machines | 6.1 Intoduction<br>6.2 location & foundation<br>6.3 Errection<br>6.4 Testing Practical geometrical check of Machnie<br>6.5 Test Chart | 10 |
| 7 | CNC Lathe Programming | 7.1 Introduction to NC and CNC machine<br>7.2 Advantages and dis advantages of CNC machine<br>7.3.Classifications of CNC machine (Two Axis and Three axis)<br>7.4 Types of CNC machine (Turning center and milling center)<br>7.5 Special features of CNC like servomotor ball lead screw etc.<br>7.6 Feedback control open and close loop control<br>7.7 Reference position m/c zerox point tool reference position and work zerox point.<br>7.8 Absolute co-ordinate system.<br>7.9 Incremental co-ordinate system.<br>7.10 Tool selection and tooling material<br>7.11 Tool holdings ( Turret head and magazine)<br>7.12 Construction working of A.T.C.<br>7.13 Cutting speed spindle speed and feed.<br>7.14 CNC control panel over view<br>7.15 Manual programme writing<br>7.16 Programming writing by using compliare.<br>7.17 Programming configuration format(Fanuc Control)<br>7.18 Preparatory function (G Codes) (common for lathe & milling<br>7.19 Miscellaneoes function (M Code)(Fanuc Control)<br>7.20 Multiple Repetitive cycles (G76)<br>7.21 Programming on CNC Lathe using (G00,G01, G02, G03) | 50 |
| **Total** | | | **120** |

**Std. XII (Practical)**
**Paper I: Operations and Maintenance of Machine Tools -I (IA)**
**Practical**

| Sr. No. | Name of the Practicals | Periods |
|---|---|---|
| 1 | Parallel-cylindrical turing & boring to size | 12 |
| 2 | Internal thread cutting | 12 |
| 3 | Taper turing using off-set method | 8 |
| 4 | To prepare a cast iron blocks in different shapes on shaping machine | 12 |
| 5 | To prepare acompostie assembly involving operations on lathe , milling,shaping and drilling machines. | 24 |
| 6 | Inspections and overhauling of machines(Lathe,shaper,slotter,planner,drill machine ,power hacksaw) | 12 |
| 7 | Study the mechanics of CNC | 4 |
| 8 | Identiity the CNC coordinates | 4 |
| 9 | Perform part program for CNC | 4 |
| 10 | Perform CNC manual operations by using simulation | 4 |
| 11 | Perform the CNC offset | 4 |
| 12 | Study the siemens / Fanuc control panel overview | 4 |
| 13 | Perform the turning centre loading programme zero | 4 |
| 14 | Perform the Turning centre program storage | 4 |
| 15 | Perform Turning centre first part run | 8 |
| 16 | Perform the Turning Centre program execution | 8 |
| 17 | Demonstrate Machine starting & operating in Reference Point, | 4 |
| 18 | JOG and Incremental Modes. | 4 |
| 19 | Carryout Co-ordinate system points, assignments and simulations. | 4 |
| 20 | Carryout Absolute and incremental programming assignments | 4 |
| 21 | and Simulations. | |
| 22 | Demonstration of machine over travel limits and emergency stop. | 4 |
| 23 | Demonstrate Work & Tool setting | 6 |
| 24 | Carryout Part program preparation, Simulation | 6 |
| 25 | Execution for the exercise on Simple Turning & Facing (Step Turning.) | 10 |
| 26 | Carryout Part program preparation, Simulation | 8 |
| 27 | programming contours with TNRC.(study) | 4 |
| 28 | Studyof Chuck removal and mounting on CNC Lathe. | 4 |
| 29 | Demonstrate Tool change in CNC turning & MPG mode operation. | 8 |
| 30 | Carryout Part program preparation, Simulation | 8 |
| 31 | Execution for the exercise on Turning with Radius / Chamfer with TNRC. | |
| 32 | Carryout Part program preparation, Simulation<br>Execution of CNC machine for the<br>a) Practical on stock removal cycle OD<br>b) Practical on Drilling / Boring cycles.<br>c) Practical on Stock removal cycle ID<br>d) Preparation of part programs for thread cutting for CNC turning centers and simulations on computers. | 8 |
| 33 | Visit to CNC shop to study different operations of CNC machine & prepare a report on type of CNC machines, their brand names, types,specifications, operations perform, product, application of product in industry. | 24 |
| | **Total** | **240** |

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**Std XII (Theory)**

**Paper II Operatin & Matainence Of Machine Tools -II (IB)**

**Theory**

Objective

1 To develop the students as a skill machinist

2 To develop the student Proficiency and sound working operational knowledge of Milling machine, Grinder machine etc

3 To gain knowldge about modern methods of machining

4 To develop the skill in machine tools maintaince

5 To Gain knowledge of modern super finishing operations.

| Sr No | Unit | Sub Unit | Periods |
|---|---|---|---|
| 1 | Milling Machine | 1.1 Introduction<br>1.2 Working Principal<br>1.3 Classifiacation<br>1.4 Specification<br>1.5 Work Hold devices<br>1.6 Cutter holding Devices<br>1.7 Milling Citters<br>1.8 Milling Opeartion<br>1.9 Indexing & Dividing head<br>1.10 Indexing method<br>1.11 Cutting speed feed & depth of cut<br>1.12 Spur gear milling operation<br>1.13Care & maintaince of Machine<br>1.14 Introduction to CNC Milling | 45 |
| 2 | Grinding Machine | 2.1 Introduction<br>2.2 Classification<br>2.3 Specification<br>2.4 Grinding machine cylindrical & surface<br>2.5 Grinding Wheel<br>2.6 Abrasives<br>2.7 Bonds Bounding Process<br>2.8 Grinding Wheel balancing dressing & truing<br>2.9 Care & maintaince of Machine | 25 |
| 3 | Modern Method of Machine | 3.1 Introduction<br>3.2 Classification<br>3.3 Study according to Machnical Energy (Ultrasonic Machining , Abrasive jet Machining)<br>3.4 Study According to Chemical Energy (ECM,EGM)<br>3.5 Study according to Thermo electrical energy (IBM, PAM, EDM,EBM,LBM) | 20 |

| Sr No | Unit | Sub Unit | Periods |
|---|---|---|---|
| 4 | Mechanical Preventive Maintenance | 4.1 Necessity<br>4.2 Classification<br>4.3 Merits & Demerits of break down & Preventive Maintennance<br>4.4 Regular Programming inspection & record keeping of maintenance<br>4.5 Preparation of Preventive maintenance chart<br>4.6 Preparation of history sheet of machine<br>4.7 introduction to total productive maintenance (T.P.M) | 15 |
| 5 | Super finshing Operations | 5.1 Necessity<br>5.2 Merits & demerits of super finishing operation<br>5.3 Study of lapping , honing<br>5.4 Study of Electroplating & anodizing | 15 |
| | | | 120 |

**Std XII ( Practical)**

**Paper II Operatin & Matainence Of Machine Tools -II (IB)**

**Practical**

| Sr.No | Name of the Practicals | Periods |
|---|---|---|
| 1 | Preapration odf different shapes from MS round bar<br>a. Square - 1 Job | 12 |
| | B. Hexagonal -1 Job | 18 |
| 2 | Cutting Key way on shaft- 1Job | 18 |
| 3 | Cutting Spline on Shaft -1Job | 18 |
| 4 | Cutting spur gear on CI blank (one gear for batch of four students | 24 |
| 5 | Preparation of slot with steps on Ci block (all operation on one job& one job for batch of four students) -1. Dovetail 2.Rectangle 3.Square | 32 |
| | 4.V Slot | |
| 6 | Surface grinding on MS plate on surface grinding Machine -1 | 16 |
| 7 | Preparation of preventive maintaenance programme for workshop m/c | 10 |
| 8 | Dismantling & Assembling of milling machine table. | 10 |
| 9 | Dismantling & Assembling of dividing head | 10 |
| 10 | Study of modern methods of machine -Any one | 10 |
| 11 | Study of super finishinbg operation -Any one | 10 |
| 12 | Prepare a history sheet & general insection chart for maintenance of milling machine | 12 |
| 13 | Industrial visit Any two | 40 |
| | | 240 |

**Std XII (Theory)**

**Paper III : Engineering Science and Utilities Machinery (IC)**

Objectives :

1) Gain knowledge about force, work, power ,energy,and friction
2) To gain adequate knowledge about lifting machines
3) To develop skill in manufacturing jigs and fixtures
4) To gain adequate knowledge about electric motors transformers and I C Engines
5) To gain adequate knowledge about hydraulic and Pneumatic System
6) To gain basic knowledge about refrigeration

| Sr.No. | Unit | Sub Unit | **Periods** |
|---|---|---|---|
| 1 | Unit System | 1.1 Introduction<br>1.2 Types of Unit<br>1.3 Unit Systems | 5 |
| 2 | Force work , Power and Energy | 2.1 Defination of force<br>2.2 Effect of Force<br>2.3 Composition and Resolution of force<br>2.4 Defination of Work , Unit of work<br>2.5 Defination of Power , Unit of Power<br>2.6 Engine Power (IHP , FHP, BHP)<br>2.7 Defination of Energy , Unit of Energy<br>2.8 Types of Energy , Total Energy<br>2.9 Law of Conservation of Energy | 15 |
| 3 | Friction | 3.1 Introduction<br>3.2 Types of Friction<br>3.3 Laws of Friction<br>3.4 Limiting frictional Force<br>3.5 Co-efficient of friction<br>3.6 Angle of friction<br>3.7 Advantages and disadvantages of friction | 10 |
| 4 | Simple lifting Machine and conveyour system | 4.1 Introduction ( defination of machine)<br>4.2 Types of machine<br>4.3 Some important terms of machine M.A, V.R, efficiency , ideal machine etc.<br>4.4 Relation between input and output of machine<br>4.5 Study of some simple lifting maching like simple axle and wheel , screw jack etc.<br>4.6 Study of some simple conveyor system | 15 |
| 5 | Jigs and Fixtures | 5.1 Introduction<br>5.2 Necessity of jig and fixture<br>5.3 Study of Simple Drilling jigs<br>5.4 Study of fixtures | 10 |

| Sr.No. | Unit | Sub Unit | **Periods** |
|---|---|---|---|
| 6 | Internal Combustion Engine | 6.1 Introduction<br>6.2 Difference between I C Engine and E C engine<br>6.3 Classification of I C Engine<br>6.4 Study of I C engine main parts<br>6.5 Petrol and diesel cycle of combustion<br>6.6 Two stroke and Four stroke engine<br>6.7 Cooling system of I.C.engine<br>6.8 Ignition system of petrol engine<br>6.9 Fuel supply system | 20 |
| 7 | Electric Motor and transformer | 7.1 Introduction<br>7.2 Classification of motor<br>7.3 Motor connection<br>7.4 Care and maintenance of motor<br>7.5 Introduction to transformer<br>7.5 Classification of transformer | 15 |
| 8 | Hydraulics | 8.1 Introduction<br>8.2 Pump defination and classification<br>8.3 Study of Hydraulic shaper and Hydraulic Jack<br>8.4 Study of different hydraulic valves<br>8.5 Advantages and disadvantages of hydraulic system<br>8.6 Care and maintenance of hydraulic system | 15 |
| 9 | Pneumatics | 9.1 Introduction<br>9.2 Aims and Objectives of compressed Air<br>9.3 Classification of Air Compressor<br>9.4 Study of Single Stage Air Compressor<br>9.5 Advantages and disadvantages of Pneumatic system<br>9.6 Care and maintenance of Pneumatic system | 15 |
| | Total | | **120** |

**Std. XII (Practical)**
**Paper III : Engineering Science and Utilities Machinery (IC)**
**Practical**

| Sr. No. | Name of the Practicals | Periods |
|---|---|---|
| 1 | To find resultant force by resolution method<br>a. Parallogram law of force<br>b. Triangle law of force | 12 |
| 2 | To find out coefficient of friction between two surface<br>a. Glass & Wood<br>b. Wood & Wood | 16 |
| 3 | To find out M.A., V. R. & Efficiency of following simple machines<br>a. Simple wheel & Axle<br>b. Simple Screw jack<br>c. Simple pulley block | 24 |
| 4 | Prepartion of simple model of jig and fixture | 20 |
| 5 | Study of petrol Engine | 10 |
| 6 | Study of Diesel Engine | 10 |
| 7 | Study of Centrifugal Pump and its dismantaling and Assembling | 12 |
| 8 | Study of Hydraulic Shaper mechanism with schematic drawing | 12 |
| 9 | Study of Water hammer by schematic drawing | 4 |
| 10 | Study of Hydraulic jack by schematic drawing | 8 |
| 11 | Study of Pneumatic system with schematic drawing (Air Compressor) | 12 |
| 12 | Study of Bore Well Pump and its dismantaling and assembling | 12 |
| 13 | Study of Star - Delta , Starter connection with diagram | 12 |
| 14 | Study of Reciprocating Pump | 12 |
| 15 | Study of single stage air compressor | 12 |
| 16 | Preparing layout of electrical wiring of machinary & study the Electrical | 12 |
| 17 | Industrial Visit ( Any Two ) | 40 |
| | | 240 |