**NAME OF THE COURSE / COURSE GROUP**

**MECHANICAL ENGINEERING GROUP (ME/MH/MI)**

**(AICTE Approved Course)**

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**ANNEXURE - I MSBTE NORMS AND STANDARDS FOR EQUIPMENT**

**LIST OF EQUIPMENT & MACHINERY**

**(Essential equipment/ Hand Tools) (Required for conducting the Practical)**

**1. Name of course/ Department:- Mechanical Engg. Dept.**

**2. Name of laboratory : Thermal & Power Engineering**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Sr. No.** | **Name of Equipt./Machnery** | **Technical Specifications** | **Minimum Qtty./Nos. Required** | **Remark if any** |
| 1 | An experiment set up on solar flat plate collector used for water heating | 100 Litre, 600C | 1 |  |
| 2 | Photo voltaic cell panel. | Working Model (10Watt.) | 2 |  |
| 3 | Box type Solar cooker (Standard) | Working Model (4-pots.) | 2 |  |
| 4 | Model of horizontal axis wind mill(Different rotor style) | Actual working Model |  |  |
| 5 | Model of a biomass/ biogas plant | Cut section Model | 2 |  |
| 6 | Chart showing various waste heat recovery devices. | Plastic coated sheets for charts of size 3 feet X 3 feet | 2 |  |
| 7 | Chart showing various types ofWind mills | Plastic coated sheets for charts of size 3 feet X 3 feet | 2 |  |
| 8 | Chart showing various types of Bio- gas plants | Plastic coated sheets for charts of size 3 feet X 3 feet | 2 |  |
| 9 | Old Working model of four-wheelerEngine | Four stroke three/ four cylinder. | 1 |  |
| 10 | Old Working model of Two-wheelerEngine | Two/ four stroke single cylinder. | 1 |  |
| 11 | Working Model of i) single plate coil springii) Diaphragm spring type clutch. | Two-wheeler & four-wheeler | 1 each |  |
| 12 | Working Model of synchromesh gearbox | 3 forward & 1 reverse gear. | 1 |  |
| 13 | Working Model of differential. | for car/ truck engine | 1 |  |
| 14 | Working Model of Steering gearbox | i) Rack & Pinion Steering Gearbox ii) Power Steering | 1 each |  |
| 15 | Working Model of suspension | rigid axle suspension Mech/ Hydrualic ) | 1 |  |
| 16 | Working Model of hydraulic brake system | With master cylinder. | 1 |  |
| 17 | Battery and charging system multimeter. | Capable of charging 2-wheeler and 4-wheeler battery | 1 |  |
| 18 | LPG / CNG kit | Standard kit with all accessories suitable for 4-wheeler of min.30kg. Capacity | 1 |  |
| 19 | Single cylinder air cooled petrol engine with heat balance sheet | 3HP,3000RPM,ElectricDynamometer | 1 |  |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 20 | Multicylinder Diesel/Petrol engine for Morse test arrangement | 10HP, water cooled, 1500 rpm. | 1 |  |
| 21 | Exhaust gas Analyzer for petrol /diesel engine | showing percentage of CO,CO2NOX , ppm | 1 |  |
| 22 | Two-stage Reciprocating air compressor Test Rig. | Pressure-10kgf/sq cm Displacement -5meter cube/min Speed- 100RPMwith Air cooled Intercooler, Motor-7.5HP with arrangement of Torque Arm and spring Balance | 1 |  |
| 23 | Vapour compression refrigeration system test rig | Chillar capacity 20lit, hermatically sealed comp.-0.3HP with air cooled condensor1/2 hp, rotameter-100lit./hr, filter dryer, digital voltmeter and ammeter and temp. indicator, evaporator brine tank capacity20lit.Energymeter | 1 |  |
| 24 | Solar water heating system test rig | Heating water of capacity - 100Litres with single cover Flat plate collector size 3feet X 3feet | 1 |  |
| 25 | Model & Chart ofi) Babcock & wilcox Boiler ii) Cochran Boileriii) Lancashire Boiler iv) Loeffler boiler | Models of Acrylic / Aluminium material Plastic coated sheets for charts of size 3 feet X 3 feet | 1 Each |  |
| 27 | Model & Wall Chart's of BoilerMountings :-i) Water level indicator ii) Steam stop valveiii) Spring loaded/ Dead WeightSaftey Valveiv) Fusible Pulgv) Feed check Valve vi) Blow off cockvii) Bourdon Pressure gauge. | Models of Acrylic / Aluminium material Plastic coated sheets for charts of size 3 feet X 3 feet | 1 Each |  |
| 26 | Wall Chart's of Boiler Accessories:-i) Economiser ii) Superheater iii) Air Filter | Plastic coated sheets for charts of size 3 feet X 3 feet | 1 |  |
| 27 | Thermal conductivity of metal rod, Test Rig. | Brass/steel rod length 400mm, dia 20-30 mm, cylindricalshell, cooling water chamber , digital voltmeter, ammeter, temp indicator dimmerstat. Thermocouples, stop watch | 1 |  |
| 28 | Experimental Setup of Stefan- Boltzman’s law | Speciman disc m.s.150 mm dia., speciman copper/brass of 20 mm dia, 1KVA Geyser, Thermocople, Digital voltmeter ammeter, temp indicator, inlet outlet water valve. | 1 |  |
| 29 | Model & Wall Chart's of i) Radiator, ii)Evaporators, iii) Condensers, iv) plate heat exchangers | Models of Acrylic / Aluminium material Plastic coated sheets for charts of size 3 feet X 3 feet | 1 Each |  |
| 30 | Cut section working models of IC Engines-i) 2 stroke engine with gear box and clutchii) 4 stroke 4 cylinder diesel/petrol engine with cooling and lubrication systems | Scooter/motorcycle 1.5BHPCar engines 20-40 BHP | 11 |  |
| 31 | Models and Charts of –i) Gas turbine systemii) Turbo prop engineiii) Turbo jet engineiv) Ramjet | Models of acrylic or aluminium material. Standard charts of plastic coated sheetsSize 3ft x 3ft | 1 each |  |
| 32 | Charts of –i) Car suspension systemii) Battery charging system | Standard charts of plastic coated sheetsSize 3ft x 3ft | 1 each |  |
| 33 | Charts of different types of solar energy collectors | Standard charts of plastic coated sheetsSize 3ft x 3ft | 1 |  |

**ANNEXURE - I**

**MSBTE NORMS AND STANDARDS FOR EQUIPMENT**

**LIST OF EQUIPMENT & MACHINERY**

**(Essential equipment/ Hand Tools) (Required for conducting the Practical)**

**1. Name of course/ Department: Mech. Engineering Department**

**2. Name of laboratory: Drawing and Design Lab**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Sr. No.** | **Name of Equipt./Machinery** | **Technical Specifications** | **Minimum Qtty./ Nos. Required** | **Remark if any** |
| 1 | Charts showing Auxiliary views of any three object. | With first angle method of projection. | 03 set |  |
| 2 | Models of Intersection of solids | i) Cylinder to cylinder penitration. ii) Cylinder to prism iii) Cone to Cylinder iv) prism to prism. | 02 Each |  |
| 3 | Model & charts of Developments ofSurfaces. | Developments of Lateral surfaces of cube, prisms, cylinder, pyramids & cone | 02 Each |  |
| 4 | Standard chart for ConventionalRepresentation | i) Materialsii) Break in pipe, rod and shaft. iii) Ball and Roller bearing, pipe joints, cocks, valves, internal / external threads. iv) Various sections- Half, removed, revolved, offset, partial and aligned sectionsv) Knurling, serrated shafts, splined shafts, and chain wheels. vi) Springs with square and flat ends, Gears, sprocket wheelvii) Countersunk & counterbore. viii) Tapersix) Surface roughness x) Welding | 02 Each |  |
| 5 | Standard chart for Limits, Fits andTolerances | Standard chart | 02 |  |
| 6 | Model & charts of Assembly(Detailed part drawings) | 1. Couplings - Universal couplings & Oldham’s Coupling2. Bearing – Foot Step Bearing& Pedestal Bearing3. Lathe tool Post4. Machine vice & Pipe Vice5. Screw Jack6. Steam Stop Valve | 02 Each |  |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 7 | Model & charts of Assembly toDetails | 1. Pedestal Bearing2. Lathe Tail Stock3. Drilling Jig4. Piston & connecting rod5. Gland and Stuffing boxAssembly6. Valve – Not more than eight parts 7. Fast & loose pulley | 02 Each |  |
| 8 | Cut section model of 3D object | 3D object having slot, circular hole, etc. | 10 different model |  |
| 9 | Model & charts of Solids | of Prism, Pyramid, Cone, Cylinder, Tetrahedron & Cube | 02 Each |  |
| 10 | Model & charts of Sections of Solids | Sections of Solids Prism, Pyramid, Cone, Cylinder, Tetrahedron & Cube | 02 Each |  |
| 11 | Model & charts of Developments of Surfaces. | Developments of Lateral surfaces of cube, prisms, cylinder, pyramids & cone | 02 Each |  |
| 12 | Model & charts of Free hand sketches | Free hand sketches of nuts, bolts, rivets, threads, split pin, foundation bolts, keys and couplings. | 02 Each |  |
| 13 |  CAD Software | Auto CAD latest version or any CAD software | Any 1 SHEET with 10 Users lience. |  |
| 14 | working models of i) Cotter Joint, ii) Knuckle Joint, iii) Bell Crank Lever, iv) Turn Buckle, v) Off – Set link, vi) Pulley | working models / Acrylic / Aluminium Cast | 01 each |  |
| 15 | Working models of Shaft,(solid, hollow, spline) Keys,( parallel, taper, feather, tangent, woodruff etc.) Power Transmission devices:-belt drive, Chain drive. Gear drive, Clutches, gear trains, Coupling (rigid, Flexible). | working models / Acrylic / Aluminium Cast | 01 each |  |
| 16 | Working models of Bearings | Ball bearings-single, double row, angular contact and thrust, Rolling contact bearings-cylindrical, Taper roller, thrust, Pedastal, Journal, Pivot bearings,  |  |  |
| 17 | wall charts | Tolerances, surface finish, Limits, Fits |  |  |
| 18 | Models of Lead screw of lathe, feed screws of machine tools, Clamping screws, Toggle Jack screw, Screw jack | Metallic models |  |  |
| 19 | Wall charts of Helical Springs, bolted joints, Welded joints | Plastic coated Wall Charts of helical compression and Leaf Springs of different types, different types of screw joints and welded joints |  |  |
| 20 |  Wall chart of types of levers – bell crack lever, rocker arm, compound lever, brake pedals | working models / Acrylic / Aluminium Cast |  |  |
| 21 |  Models and wall charts of –Loci of points-involute, cycloidepi & hypocycloid, four bar mechanism | working models / Acrylic / Aluminium Cast |  |  |

 Note: All charts should be plastic or acrylic coated – size 3ft x 3 ft

**ANNEXURE - I MSBTE NORMS AND STANDARDS FOR EQUIPMENT**

**LIST OF EQUIPMENT & MACHINERY (Essential equipment/ Hand Tools) (Required for conducting the Practical)**

**1. Name of course/ Department: Mech. Engineering Department.**

**2. Name of laboratory: Theory of Machine**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Sr. No.** | **Name of Equipt./Machinery** | **Technical Specifications** | **Minimum Qtty./Nos. Required** | **Remark if any** |
| 1 | Model of quick return mechanism of a shaper machine. | Wooden /Aluminium dieCast/Acrylic Models | 1 |  |
| 2 | Model of Inversion i)Single Slider Crank chain ii) Rotary I.C. Engines mechanism iii) Whitworth quick return mechanismiv) Crank and Slotted lever quick return mechanismiv) Double Slider Crank Chain v) Scotch Yoke Mechanism vi) Oldham’s Coupling. | Wooden /Aluminium dieCast/Acrylic Models | 1 Each |  |
| 3 | Model ofi) Bicycle free wheel Sprocket mechanism.ii) Geneva Mechanism.iii) Ackerman’s Steering gear mechanismiv) Foot operated air pump mechanism | Wooden /Aluminium dieCast/Acrylic Models | 1 Each |  |
| 4 | Models of Different types cam &Followers- eccentric camps, tangent camps, roller and knife age followers  | Wooden /Aluminium dieCast/Acrylic Models | 1 Each |  |
| 5 | Model of governori) Fly ball governor ii) Watt governoriii) Porter governor iv) Hartnell governor | Wooden /Aluminium dieCast/Acrylic Models | 1 Each |  |
| 6 | Models of Mechanically operated braking mechanism for two wheelers.i) Shoe brakeii) Band Brakeiii) Internal expanding shoe brakeiv) Disc Brake | Wooden /Aluminium dieCast/Acrylic Models | 1 Each |  |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 7 | Models & Charts of Dynamometeri) Rope Brake Dynamometer ii) Hydraulic Dynamometeriii) Eddy current Dynamometer. | Wooden /Aluminium dieCast/Acrylic Models | 1 Each |  |
| 8 | Models & Charts of Clutch i) Single plate clutchii) Multiplate clutch iii) Centrifugal Clutch iv) Cone clutchv) Diaphragm clutch. Vi) Multiplate clutch. | Wooden /Aluminium dieCast/Acrylic Models | 1 Each |  |
| 9 | Balancing of several masses rotating in a single plane Test rig. | weight of rotor from 0.5-10kf.,dia-500mm,dist between bearing centres- 400mm, balancing speed-1200 | 1 |  |

**ANNEXURE - I MSBTE NORMS AND STANDARDS FOR EQUIPMENT**

**LIST OF EQUIPMENT & MACHINERY (Essential equipment/ Hand Tools) (Required for conducting the Practical)**

**1. Name of course/ Department: Mechanical Engineering Dept.**

**2. Name of laboratory: Refrigeration & Air Conditioning.**

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| --- | --- | --- | --- | --- |
| **Sr. No.** | **Name of Equipt./Machinery** | **Technical Specifications** | **Minimum Qtty./Nos. Required** | **Remark if any** |
| 1 | Water cooler test rig.(100 Ltr.) | capacity 60 lit. hermatically sealed comp.-0.6 HP with air cooled condensor 1/2 hp, rotameter-100lit./hr, filter dryer, Energymeter, digital voltmeter and ammeter and temp. indicator, evaporator tank capacity 60lit. | 1 |  |
| 2 | Ice plant test rig. | capacity 20kg/day , hermatically sealed comp.-0.3HP with air cooled condensor1/2 hp, rotameter-100lit./ hr, filter dryer, digital voltmeter and ammeter and temp. indicator, evaporator brine tank capacity 20lit. | 1 |  |
| 3 | Working Domestic refrigerator. | 160 litre | 1 |  |
| 4 | RAC Controls | i) L.P./H.P. cut outs ii) Thermostatiii) Overload protector, iv)solenoid valve . | 1 Each |  |
| 5 | Working Hermetically sealed compressor. | 1 Tonne capacity | 1 |  |
| 6 | Air Conditioning test rig. | 1 Tonne capacity with air cooled condensor cooling fan 0.1 hp, rotameter-100lit./hr, filter dryer, digital voltmeter and ammeter and temp. indicator, evaporator | 1 |  |
| 7 | Working Window Air Conditioner | Normal cooling capacity 2.0Ton, 6000 Kcal/hour, 24000BTU/hour, Single phase 230 volts voltage, frequency 50 Hz | 1 |  |
| 8 | Cut section model of Hermatically sealed compressor | 1 tonne capacity | 1 |  |
| 9 | Refrigeration equipment maintenance tool kit | Pipe bending, swaging tool, spanner set, pipe cutter, charging manifold, flexible hoges with quick actiting couplings, pressure gauges  | 2 sets |  |

**ANNEXURE - I MSBTE NORMS AND STANDARDS FOR EQUIPMENT**

**LIST OF EQUIPMENT & MACHINERY (Essential equipment/ Hand Tools) (Required for conducting the Practical)**

**1. Name of course/ Department: Mechanical Engineering Department**

**2. Name of Laboratory: Mechanical Measurement and Control Lab & MQC Lab.**

|  |  |  |  |
| --- | --- | --- | --- |
| **Sr. No.** | **Name of Equipt./Machinery** | **Technical Specifications** | **Minimum Qty./Nos. Required** |
| **A) Mechanical Measurement & Control Lab** |
| 1 | Strain guage trainer (strain /force measurement) | Sensor-four arm bridge with strain guage mounted on cantilever 2kg Display 3.5digit digital display | 1 |
| 2 | Measurement of speed using optical and inductive (magnetic) transduser | Sensor -inductive and optical sensor with sensor assymbly with speed motor Display 3.5digit digital display | 1 |
| 3 | Rotameter trainer for flow measurment | Sensor -stadenert glass rotameter, process tank with motor pump Display- float position on graduated scale | 1 |
| 4 | Displacement measurment using inductive transducer | Sensor -inductive (non linear) solenoid type on board with micrometer, micrometer screw guage assembly for displacement, bridge balance type circuit Display 3.5 digit digital display | 2 |
| 5 | Temperature measurment and control using thermocouple | Sensor- type k (Cr- Al)thermocouple, sensor assemblyand water bath with heating arrengement Display3.5digit digital display | 2 |
| 6 | Temperature measurment and control using thermister | Sensor- PTC thermister, sensor assemblyand water bath with heating arrengement Display3.5digit digital display | 2 |
| 7 | Thermocouple | for temperature and humidity measurement with probe range - 50to+50 deg. Cent. | 2 |
| 8 | Bi metallic Thrtmometer | -20 TO +70 DEG. CENT. | 2 |
| 9 | Multidigital stratoscope cum tacometer for speed measurement | upto 5000 rpm | 2 |
| 10 | Bourdon tube trainer | sensor - Bourdon tube C type with LVDT Display 3.5 digit display for pressure/ displacement | 2 |
| 11 | Level Measurement using capacitive Transducer | sensor capacitive Type, sensorassembly with glass jar fitted with water tap. Display3.5 digit display | 2 |
| 13 | Flow measurement using optical transducer | Standard disc optical sensor, Display 3.5 digit display. | 2 |
| 14 | MCLeod guage with high vacuum pump / Bourdon tube trainer | McLeod guage with arrangement for high pump | 1 |
| 15 | Stroboscope | Range upto 5000 RPM display – LED digital | 1 |
| 16 | Inductive pickup for speed measurement | Sensor – inductive , variable speed motor arrangement, 3.5 digital display | 1 |
| 17 | Load cell | Censor-4 arm bridge with strain guage capacity-2 kg, 3.5 digital display | 1 |
| **B) MQC Lab** |
| 1 | Radius gauge | Metric Set | 02 |
| 2 | Pitch screw gauge | Metric and BSW | 02 |
| 3 | Filler gauge | Metric Set | 02 |
| 4 | Vernier Caliper | 200mm LC 0.02 | 06 |
| 5 | Vernier Caliper | 300mm LC 0.02 | 02 |
|  | Digital Venier Caliper | 150mm L.C = 0.01mm |  |
| 6 | Vernier Height gauge | 300mm LC 0.02 | 02 |
| 7 | Vernier Depth gauge | 200mm LC 0.02 | 02 |
| 8 | Dial type vernier Caliper | 150mm LC 0.05 | 02 |
| 9 | Outside Micrometer | 0 -25mm LC 0.01 | 04 |
| 10 | Outside Micrometer | 25-50mm LC 0.01 | 04 |
| 11 | Inside Micrometer | 25- 75mm LC 0.01 | 02 |
| 12 | Tube micrometer | 0-25mm LC 0.01 | 01 |
| 13 | Slip gauge set | Metric 76 pieces workshop grade | 02 |
| 14 | Adjustable snap gauge | 25 -45mm,50 -65mm,  | 01 of each dimension |
| 15 | Plug gauge | 25 H 7 | 01 |
| 16 | Ring gauge | 40 p6 | 01 |
| 17 | Dial Indicator  | 0.01mm & 0.001mm | 02 of each |
| 18 | Comparator Stand | Small 60x 60mm table | 04 |
| 19 | High pressure pneumatic comparator Dial Type | Accurate make differential design Scale range 20mm & scale division 0.5mm with Air Plug Gauge and Two Master Ring Gauges and Air Ring Gauge and Two Master Plug gages of suitable dimension and a set of 10jobs corresponding to that dimension. | 01 |
| 20 | Sine bar and Sine center | 100, 200, 300mm | 01 each |
| 21 | Dial stand adjustable | Single knob adjustment | 02 |
| 22 | Screw thread micrometer | 0-25mm and 25 -50mm With set of interchangeable Anvils ( m1 to m 06)  | 01 of each |
| 23 | Floating carriage micrometer | With set of setting cylinders, set of wires and other accessories | 01 |
| 24 | Gear tooth vernier | 50mm, 2 to 25 module | 04 |
| 25 | Optical profile projector | 20X, 40X magnification | 01 |
| 26 | Test dial indicator |  Range 10.3mm , 0.002 mm | 02 |
| 27 | Test mandrel | Parallelism in 10microns | 01 |
| 28 | Angle dekkor with set of Angle Gauges | Accuracy 1 minute | 01 |
| 29 | Surface roughness measurement (surftest) | Ra, Rz digital with sample length adjustment setting | 01 |
| 30 | Surface Plate (Granite/cast iron) | 400x400mm Grade I | 04 |
| 31 | Vernier Bevel protractor | LC= 5sec | 02 |
| 32 | Set of angle gauges  | in degrees, minutes, seconds (13 pieces) | 01 set |
| 33 | Autocalimeter | With standard accessories like plain reflector, optical square, instrument base with leveling attachment, magnification10x , LC=1 sec |  |
| 34 | Optical flat | 25mm , 50mm | 1 each |
| 35 | Sprit level block | Base length 250 mm, bubble size 10 sec |  |
| 36 | Comparatorsi. Mechanical comparatorii. pneumatic comparatoriii. Electrical comparator | Magnification 200x/500x | 1 each |
| 37 | V Block | 900, 1200 | 1 each |
| 38 | Charts | 6 sigma, Normal distribution curveSampling plan chart | 1 each |

**ANNEXURE - I MSBTE NORMS AND STANDARDS FOR EQUIPMENT**

**LIST OF EQUIPMENT & MACHINERY (Essential equipment/ Hand Tools) (Required for conducting the Practical)**

**1. Name of Course/ Department: Mechanical Engineering Department**

**2. Name of Laboratory: Fluid Mechanics & Machinery, Fluid Power**

|  |  |  |  |
| --- | --- | --- | --- |
| **Sr. No.** | **Name of Equipt./Machinery** | **Technical Specifications** | **Minimum Qtty./Nos. Required** |
| **A) Fluid Mechanics & Machinery** |
| 1 | 1. Bourden pressure gauge
2. Dead Weight Pressure gauge.
 | 10 Kgf./cm2 | 01 Each |
| 2 | Experimental setup of Bernoulli’sTheorem | Apparatus for verification of Bernoulli’s Theorem complete with tank | 1 |
| 3 | Venturimeter Test Rig | Venturimeter( cast iron /Brass ) 25mm & 50mm. | 1 |
| 4 | Orifice meterTes Rig | Apparatus to determine of CD,CV, CC,OF Orifice with accessrios like collection tank, stand, scale & slide attachment. | 1 |
| 5 | Hydraulic Bench Setup for (Major& minor looses in pipe.) | Apparatus to determine looses in pipe due sudden enlargement & contraction with all accessrios such as collecting tank & differential manometer. | 1 |
| 6 | Pelton wheel Test rig | PELTON WHEEL TURBINE TEST RIG - 1.3 HP (1 Kw) Capable to visualise the operation& estimate B. H. P. & W. H. P. and various efficiencies of pelton turbine. Pelton wheel connected to a rope brake. Water supplied by centrifugal pump & flow measured by venturimenter & mercury manometer. Water jet is directed over the buckets by a nozzle & a spear operating inside the nozzle controls the water flow. | 1 |
| 7 | Centrifugal pump Test rig | CENTRIFUGAL PUMP TEST RIG AT CONSTANT SPEED- 5 HP capacity 1500 RPM – Centrifugal pump, provided with three phase motor,vacuum gauge at suction and pressure gauge on discharge pipe, gate valve at discharge, which facilitate estimation of pump performance at various discharge heads. AC MOTOR & PULLEY MOUNTED – As per constant speed type, only pump is provided with a three speed pulley, gate valve at discharge to vary the head. DC MOTOR VARIABLE SPEED —As per constant speed type, only pump is provided with a variable speed drive and gate value at discharge to vary the speed. | 1 |
| 8 | Reciprocating pump Test rig | RECIPROCATING PUMP TEST RIG – A recirculating type unit with reciprocating pump and vacuum gauge & pressure gauge at discharge by measuring input to motor and output of pump performance can be estimated at three different speed by using pulley. | 1 |
| **B) Fluid Power** |
| 9 | Model / Charts of Pumps | Centrigugal pump, Reciprocating Pumps, Vane pump, Gear Pump | 1 Each |
| 10 | Model / Charts of Valves | **Pressure control valves** – pressure relief valve, pressure reducing, pressure unloading, **Direction control valves** – Poppet valve, spool valve, 3/2, 4/2 D.C. valves, Sequence valves. **Flow control valves** – pressure compensated, non pressure compensated flow control valve. | 1Each |
| 11 | Model / Charts of Actuators | **Actuators** - Rotary Actuators - Hydraulic motors**Linear Actuators** – Cylinders - single acting, double acting | 1Each |
| 12 | Model / charts of Hydraulic Circuits | Hydraulic Circuits -1. Meter in & Meter out circuits ii) Bleed off circuit iii) Sequencing circuit iv) Hydraulic circuits for Milling machine & Shaper machine, v) Motion synchronization circuit.
 | 1 Each |
| 13 | Charts of Hydraulic & Punematic symbols. | Plastic coated sheet Charts of Hydraulic & Punematic components symbols. |  |
| 14 | Charts of Compressor & ControlValves | **Compressor** – Reciprocating & Rotary compressors**Control Valves** – Pressure regulating valves, Flow Control valves, Direction Control Valves. | 1 Each |
| 15 | Charts of Pneumatic Circuits | Pneumatic Circuitsi) Speed control circuits. ii) Sequencing circuits. | 1Each |
| 16 | Hydraulic Trainer kit | Basic component such as--- Valves(3/2 & 5/2) Profile plate , Pressure guage assembly, Dual Pressure valve, shuttle valve, Flow Control valve , Cylinder (Single & double acting), Filter Regulator with guage, Manifold Assembly, Pressure Regulator, gear pump. | 1 |
| 17 | Puematic Trainer kit | Basic component such as -- Valves(3/2 & 5/2) Profile plate , Pressure guage assembly, Dual Pressure valve, shuttle valve, Flow Controll valve , Cylinder (Single & double acting), Filter Regulator with guage, Manifold Assembly, Pressure Regulator, etc. | 1 |

**ANNEXURE - I MSBTE NORMS AND STANDARDS FOR EQUIPMENT**

**LIST OF EQUIPMENT & MACHINERY (Essential equipment/ Hand Tools) (Required for conducting the Practical)**

**1. Name of course/ Department: Mechanical Engineering Department**

**2. Name of laboratory: Automation**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Sr. No.** | **Name of Equipt./Machinery** | **Technical Specifications** | **Minimum Qtty./Nos. Required** | **Remark if any** |
| 1 | Computer P4 | Dual core,1GB Ram,80GB HDD, Optical Mouse, 17 " TFT Monitor | 20 Nos. |  |
| 2 | Printer | Laser Printer , 15ppm | 1 |  |
| 3 | Autocad Software | Latest version | 02 SheetsMinimum 10User Lience. |  |
| 4 | CNC Machine Turning Trainer Kit | Swing overbed-150mm, Swing over cross slide-50mm,Centre dist.-300 mm, Capable of turning Acrylic, Al, wood etc., compatable with FMS/DNC | 01 Nos. |  |
| 5 | CNC Machine Milling Trainer Kit | 3-Axis,Travel X-300mm,Y- 250mm, Z-125mm Capable of milling Acrylic, Al, wood etc., compatable with FMS/DNC | 01 Nos. |  |
| 6 | LCD/DVD Projector | 1200 /1500 Lumen (Min) | 02 Nos. |  |
| 7 | White Screen | 4feetX4feet | 02 Nos. |  |
| 8 | Sensors | Limit switches, proximity switches like inductive, capacitive and optical, Thumb wheel switches magnetic reed switches, Optical encoders- displacement measurement, rotary, incremental, optocouplers | 1 each |  |
| 9 | Actuators | solenoids, relays - DC motors, DC brushless motors, AC motors, stepper motors, servo motors | 1 each |  |
| 10 | PLC Trainer kit | Digital I/O -14 Nos., Analog I/O -04 Nos. With working model of- Speed control of motor- Motor start and stop by using two different sensors- Four road junction traffic controller Lift control- Washing machine control- Tank level control- Bottling plant | 1 |  |
| 11 | PLC Softwares | - Ladder logix programing- SCADA | 10 User Licence | Allen Bradlley, Siemens make |
| 12 | Electro pneumatic trainer kit. | Basic component such as--- Valves(3/2 & 5/2, ) Profile plate, Pressure guage assembly, Dual Pressure valve, shuttle valve, Flow Controll valve , Cylinder (Single & double acting), Filter Regulator with guage, Manifold Assembly, Pressure Regulator, Proximity switch reed contact, Pneumatic to Electric convertor , Electrical limit switch, Power supply unit, Adoptor Set, Electrical signal input, Relays, etc. | 1 |  |
| 13 | Electro hydraulic trainer kit. | Basic component such as-- Valves(3/2 & 5/2, ) Profile plate, Pressure guage assembly, Dual Pressure valve, shuttle valve, Flow Control valve, Cylinder (Single & double acting), Filter Regulator with guage, Manifold Assembly, Pressure Regulator, Proximity switch reed contact, Hydraulic to Electric convertor, Electrical limit switch, Power supply unit, Adoptor Set, Electrical signal input, Relays, etc. | 1 |  |

**MSBTE NORMS AND STANDARDS FOR EQUIPMENT**

 **LIST OF EQUIPMENT & MACHINERY (Essential equipment/ Hand Tools) (Required for conducting the Practical)**

**1. Name of Course/ Department: Mechanical Engineering Department**

**2. Name of Laboratory: Electrical & Electronics Lab**

|  |  |  |  |
| --- | --- | --- | --- |
| **Sr. No.** | **Name of equipment** | **Specification** | **Quantity required** |
| 1 | Voltmeter,Ammeter,WattmeterWith required accessories | Meco- 0 to 300 vMeco-0 to 5 ampMeco-0 to 5 amp/0 to 300/600v | 010101 |
| 2 | Dc shunt motor With required accessories | 200 v dc supply,3point starter with expt.set up | 01 |
| 3 | Head lightTurn indicatorHorn with required accessories | 12 v/35 watt12 v/25watt12 v/20-40 watt | 010101 |
| 4 | Resistor ,capacitor with colour code of different values | Resistor- 1 Ω -10kΩ, capacitor- 1pf-100 pf | 0505 |
| 5 | Experiment kit to study truth table of logic gates | Truth table for and, or, not, nand, nor | 01 |
| 6 | Experimental kit for study of half and full wave rectifier with filter, multimeter. | Digital multimeter var-200 mv to 1000 v/200 µa to 10 a/200 Ω / 2000kΩ  | 0101 |
| 7 | Experimental kit for study of load and line reguation using zener diode, multimeter. | Digital multimeter var-200 mv to 1000 v/200 µa to 10 a/200 Ω / 2000kΩ | 01 |
| 8 | Experimental kit for study of stroboscope with required accessories. | Strboscope  | 01 |
| 9 | Experimental kit for study of LVDT kit with required accesssories,Multimeter. | LVDT -0 to 5 cm, digital multimeter var-200 mv to 1000 v/200 µa to 10 a/200 Ω / 2000kΩ | 01 |
| 10 | Experimental kit for study of strain gauge with required accessories | Strain gauge 1 to 10 kg, digital multimeter var-200 mv to 1000 v/200 µa to 10 a/200 Ω / 2000kΩ | 01 |

**MSBTE NORMS AND STANDARDS FOR EQUIPMENT**

**LIST OF EQUIPMENT & MACHINERY (Essential equipment/ Hand Tools) (Required for conducting the Practical)**

**1. Name of course/ Department: Mechanical Engineering Department**

**2. Name of laboratory: Basic Electronics & Mechatronics**

|  |  |  |  |
| --- | --- | --- | --- |
| **Sr.****No.** | **Name of Equipment/ Trainer Kit** | **Technical Specifications** | **Minimum****Qty/ Nos****Required** |
| 01 | Digital Multimeter | 4.5 digit with R , V, I measurements, diode and BJT testing  | 06 |
| 02 | Analog Multimeter  | R , V, I measurements | 06 |
| 03 | Cathode Ray Oscilloscope or TFT Oscilloscope | 30 MHz dual trace  | 04 |
| 04 | Digital Storage Oscilloscope | 60 MHz dual trace, USB interface | 02 |
| 05 | Function Generator | 3 MHz , sine, square, triangular and pulse generator | 04 |
| 06 | Signal Generator | 100 MHz, sine wave | 01 |
| 07 | LCR-Q meter | L, R, C, Q, D measurements with four wire method | 01 |
| 08 | IC tester | Analog, digital IC testing 40 pins | 01 |
| 09 | Regulated power supply |  0- 30 Volt, 2 A with digital display, with S.C. protection | 06 |
| 10 | Dual tracking regulated power supply | 0- 30 Volt, 2 A Variable | 04 |
| 11 | Robot Trainer | **Robot** Robot simulation Software(Robot simulation Software along with hardware ,user manual & activity book ) | 01 |
| 12 | Camera Trainer | Trainer shall demonstrate automation / mechatronics of camera  | 01 |
| 13 | PLC Trainer | PLC trainer hardware and software for ladder programming , computer interface with digital and analog I/O. switches , relay lamp operation | 01 |
| 14 | Trainer kits for digital ICs  | Trainer kit shall consists of digital ICs for logic gates, flop flop, shift registers, counter along with toggle switches for inputs and bi-colour LED at outputs, built in power supply | 02 |
| 15 | Amplifier trainer kit | BJT based two stage RC coupled amplifier, in built power supply suitable to plot frequency response with various test point and transparent real panel. | 02 |

Laboratory shall have discrete components of various ratings -- such as resistors, capacitors , inductors , diodes, BJT, FET , SCR, UJT, TRIAC, DIAC , LED , Photodiode, IC 741, IC 555, seven segment display, switches , transformers , breadboard and cables. Components shall store in stack component organizer.

**ANNEXURE - I MSBTE NORMS AND STANDARDS FOR EQUIPMENT**

**LIST OF EQUIPMENT & MACHINERY (Essential equipment/ Hand Tools) (Required for conducting the Practical)**

**1. Name of course/ Department: Mechanical Engineering Department**

**2. Name of laboratory: Production**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Sr. No.** | **Name of Equipt./Machinery** | **Technical Specifications** | **Minimum Qtty./Nos. Required** | **Remark if any** |
| 1 | Break even analysis Chart | Plastic coated sheet Chart | 1 |  |
| 2 | Process and Product Layout Chart | Plastic coated sheet Chart | 1 |  |
| 3 | Chart showing different MaterialHandling Equipments | Types of conveyors, cranes, elevators & Hoists, Industrial vehicles, motor vehicles, Rail road cars, marine carriers , forklift truck, trolleys, Pipes, Automated Guided Vehicles (AGV’s) | 1 each |  |
| 4 | Various types of control charts | Control, Progressive Control, Gantt chart. | 1 each |  |
| 5 | Charts showing various recording methods - | Outline process chart, Flow process chart, Two Hand process chart, Multiple activity chart, Flow diagram, String diagram, Travel chart | 1 each |  |
| 6 | Time Study Equipments. | Stop Watch, Slide Rules | 2 |  |
| 7 | Economy Order Quantity ModelChart | Chart Showing --Inventory Cost relationship, Deciding Economic Batch Quantity, EOQ Model, Calculation of EOQ, | 1 |  |
| 8 | Charts showing various storage systems | Storage systems – One bin, Two bin system, Material issue request (MIR), bin card. | 1 |  |
| 9 | Chart showing Principle of location | 3-2-1 principle of location. | 1 |  |
| 10 | Chart showing Different types of locating and clamping devices | Types of locators and clamping devices. | 1 |  |
| 11 | Chart showing Different types of jigs and fixtures. | Types of jigs and fixtures. | 2 |  |
| 12 | Chart showing mechanics of chip formation | Schematic representation of machining process | 1 |  |
| 13 | Chart showing different types of chip | Continuous, discontinuous, built up chips | 1 |  |
| 14 | Chart showing different types of wears | flank, crater, localised, chipping off of the cutting edge | 1 |  |
| 15 | Chart showing different cutting ToolGeometry | Single point cutting tool, drills, reamers, milling cutters. | 1 each |  |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 16 | Chart showing Tool Terminology | Chart showing all tool angles |  1  |  |
| 17 | Chart showing different types ofDies | Simple Die, Compound Die, Progressive Die, Combination Die. | 1 each |  |
| 18 | Chart showing different types of Die Operations | Blanking, piercing, shearing, cropping, notching, lancing, coining, embossing, stamping, curling, drawing, bending, forming. | 1 each |  |
| 19 | Chart showing Constructional features of various dies | Pressure Die casting dies, metal extrusion dies, injection moulding dies, forging dies, plastic extrusion dies. | 1 each |  |

 Note: All charts should be of plastic coated sheets, size 3ft x 3ft

**ANNEXURE - I**

**MSBTE NORMS AND STANDARDS FOR EQUIPMENT**

**LIST OF EQUIPMENT & MACHINERY (Essential equipment/ Hand Tools) (Required for conducting the Practical)**

**1. Name of course/ Department: Production Technology**

**2. Name of laboratory: Manufacturing Processes**

|  |  |  |  |
| --- | --- | --- | --- |
| **Sr. No.** | **Name of Equipment** | **Technical Specification** | **Min Qty** |
| 1 | Centre Lathe | Max. swing over bed : 350 mmAdmit between centres : 1000mmSpindle bore : 52mm. Power of motor : 3HP, 3 phase, 50 Hz. With accessories. | 20 |
| 2 | Spot (Resistance) Welding Machine | Portable type spot welder rating 2.5 KVA for welding upto 2mm + 2mm M.S. Sheet, Max throat depth 20cms. | 1 |
| 3 | Radial Drilling Machine | 0mm size, Any standard make with radial arm movement 360 degree | 1 |
| 4 | Wood Turning Lather | Floor model, complete with standard accessories and electricalLength of bed: 1800mmHeight of centre : 200mmDistance between centre: 1200mmHP of motor: 1AC 440V. 50hz 1440 rpm, Compound saddke, o/s turning attachment, true chuck, live centre | 1 |
| 5 | Pattern Making and Mould Making Tools | Standard tools required for pattern making and mould making | 01 set |
| 6 | MIG Welding Equipment | Power source with integral wire feeder and rear stand for gas cylinder, for seam welding, spot welding, etc. current range 35-160 amp, open circuit voltage range 16-31V, 3 phase, input KVA 4.5, current 9 amp, with all accessories. Welding current at 60% duty cycle 160A / 22V, at 100 % duty cycle 125A / 21V. To weld ferrous and non ferrous metal alloys with pre heater, light and heavy duty gun assembly, cooling system and all standard accessories. | 1 |
| 7 | T.I.G. Welding Equipment | AC / DC Tig welding set for welding ferrous and non ferrous alloys, Max surrent capacity 150 amp. Control unit built in H.F. unit and controls, contractor, DC suppressor, water circulatory unit, torch with accessories box, set of tungsten electrodes, set of welding accessories. | 01 |

**ANNEXURE - I**

**MSBTE NORMS AND STANDARDS FOR EQUIPMENT**

**LIST OF EQUIPMENT & MACHINERY (Essential equipment/ Hand Tools) (Required for conducting the Practical)**

**1. Name of Course/ Department: Production Technology**

**2. Name of Laboratory: Advanced Manufacturing Processes**

|  |  |  |  |
| --- | --- | --- | --- |
| **Sr. No.** | **Name of Equipment** | **Technical Specification** | **Min Qty** |
| 1 | Universal Milling Machine | Length x width of working table 1200mm x 700mm. Number of T-slots 6. Longitudinal Traverse 1200mm. Cross Traverse 800mm. Table height from floor 940mm. Circular movement of table 360deg. No.of spindles 7.. Manual vertical adjustment of milling head 320mm. Swivel of milling head on either side 45 deg. Throat clearance 915 deg (distance between main spindle and column guide) Maximum diameter of circular milling 2600mm. Manual & Automatic feed. Accessories Draw bar, circular millinghead, high speed milling head, small radius milling head, Micro-depth stop formilling head, circular dividing attachment for rotary table, coolant equipment, special cutters, boring tools, tool holder, form cutting, collets  | 01 |
| 2 | Universal Dividing Head | With centres, index pate, chuck | 01 |
| 3 | Hydraulic Surface Grinding Machine | Maximum grinding length 750mm.Maximum grinding width 250mm Distance centre of wheel, over table 125mm (maximum), Longitudinal travel speed 12meters /minute. Standard wheel size 250mm x 25mm x 762mm. Speed of wheel 2100 or 2625 rpm. Lubrication centralized Automatic. Accessories Grinding wheel, wheel flange puller, wheel balancing mandrel, table guards pump with fittings, machine lamp, instruction manual, permanent magnetic chuck, wheel balancing stand, coolant equipment magnetic separator, demagnetizer, universal machine vices, dust and exhaust equipment unit, wheel dressr over wheel head. |  |
| 4 | Radial Drilling Machine | 20mm size, any standard make with radial arm movement 360 degree. | 01 |

**ANNEXURE - II MSBTE NORMS AND STANDARDS FOR EQUIPMENT**

**LIST OF EQUIPMENT & MACHINERY (Desired Equipment/ Hand Tools) (Optional Equipment)**

**1. Name of course/ Department: Mechanical Engineering Department**

**2. Name of laboratory: Thermal & Power Engineering**

|  |  |  |  |
| --- | --- | --- | --- |
| **Sr. No.** | **Name of Equipt./Machinery** | **Technical Specifications** | **Minimum Qty./Nos. Required** |
| 1 | Phtovoltaic Silicon Pyranometer | Capable of measuring solar radiation and instant response of 10 Microsecond | 1 |
| 3 | Solar Lantern | 10V Capacity | 1 |
| 4 | Solar operated household Appliances | used to run 6W Bulbs & a fan | 1 |
| 5 | Manuals of different make | for two wheeler & four wheeler | 1 |
| 6 | Wall charts of clutchs, gear box drives Axels | Wall charts of PVC / Acrylic material | 1 |
| 7 | Wall charts of Brake system hydraulic, Pneumatic brakes. Disc & Drum brake. | Wall charts of PVC / Acrylic material | 1 |
| 8 | Wall charts of Leaf spring, air suspension, McPherson & wishbone, trailing link suspensions, telescopic shock absorbers. | Wall charts of PVC / Acrylic material | 1 |
| 9 | Wheel Alignment and Balancing machine | Standard typecapable of balancing 4-wheeler | 1 |
| 10 | Wall charts of Ignition system | Wall charts should comprise of information on Electronic and CDI ignition system. | 1 |
| 11 | Wall charts of Lighting system | Wall charts should comprise of information on head light, tail light, indicator light & their circuits. | 1 |
| 12 | Working engine for assembling and dismanteling (4 stroke) | 4-stroke multicylinder diesel/petrol | 1 |
| 13 | Working engine for assembling and dismanteling (2 stroke) | 2-stroke single cylinder diesel/petrol | 1 |
| 14 | Working Domestic refrigertor for study and demonstration | 180liters capacity | 1 |
| 15 | Working window air conditioner for study and demonstration | 1tonne capacity. | 1 |
| 16 | Cut sectional model of steam turbine | Miniature metallic modell | 1 |
| 17 | Cut sectional model of steam condenser | Miniature metallic modell of Different Types of condenser. | 1 |
| 18 | Wall chart for diferent types of nozzels | Wall charts should comprise of information on Different types of nozzle with labelling. | 1 |
| 19 | Photovoltaic Pannel | Suitable for lighting two tube lights of minimum 40Watts | 1 |
| 20 | Wall chart of wind power generation plant | Wall charts should comprise of information on Working principle along with different components | 1 |
| 21 | Wall chart of Biogas plant. | Wall charts should comprise of information on Working principle along with different components | 1 |
| 22 | Wall chart of Hydraulic power plant. | Wall charts of PVC / Acrylic materialSize 3ft x 3ft | 1 |
| 23 | Wall Chart of Boiler :- i) Benson Boilerii) Lamont Boile ii) VeloxBoiler | Wall charts of PVC / Acrylic material Size 3ft x 3ft | 1Each |
| 24 | Wall chart of Themodynamic vapour process/Gas process | Wall charts of PVC / Acrylic material Size 3ft x 3ft | 1 |
| 25 | Wall chart of Geothermal Plant | Wall charts of PVC / Acrylic material Size 3ft x 3ft | 1 |
| 26 | Wall chart of i)Biogas Plantii) Biomass Plant iii)Bio-diesel Plant | Wall charts of PVC / Acrylic material Size 3ft x 3ft | 1Each |
| 27 | Wall chart of Nuclear Power Plant | Wall charts of PVC / Acrylic material Size 3ft x 3ft | 1 |
| 28 | Wall chart ofi) Heat Engine ii) Heat Pump iii) Refrigerator. | Wall charts of PVC / Acrylic material Size 3ft x 3ft | 1Each |
| 29 | Wall chart of Impulse and Reaction turbine. | Wall charts of PVC / Acrylic material Size 3ft x 3ft | 1 |
| 30 | Wall chart of Velocity & PressureCompounding of steam Turbine. | Wall charts of PVC / Acrylic material Size 3ft x 3ft | 1Each |
| 31 | Wall chart of i) Surface Condensor ii) Jet Condenser | Wall charts of PVC / Acrylic material Size 3ft x 3ft | 1Each |
| 32 | Wall chart of Cooling Towers:- i) Force draught ii) Natural draught iii)Induced draught. | Wall charts of PVC / Acrylic material Size 3ft x 3ft | 1Each |
| 33 | Wall Charts of –i) Rotary compressorii) Screw compressor | Wall charts of PVC / Acrylic material Size 3ft x 3ft | 1Each |

**ANNEXURE - II MSBTE NORMS AND STANDARDS FOR EQUIPMENT**

**LIST OF EQUIPMENT & MACHINERY**

**(Desired Equipment/ Hand Tools) (Optional Equipment)**

**1. Name of course/ Department: Mechanical Engineering Department**

**2. Name of laboratory: Drawing and Design**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Sr. No.** | **Name of Equipt./Machinery** | **Technical Specifications** | **Minimum Qtty./Nos. Required** | **Remark if any** |
| 1 | Auto CAD Software or ProE or Catia | Latest version | Any 1 SHEET with 10 Users lience. |  |
| 2 | Learning Software of Engg. Drawing | Learning Software of Engg. Drawing should comprise of information on Self learning Curriculum of Engg. Drawing. | 1 |  |
| 3 | CD/ Video Cassette of Engg. Drawing. | CD/ Viedio Casettte of Engg. Drawing should comprise of information on Self learing Curriculum of Engg. Drawing. | 1 |  |
| 4 | Solid works | CAD Solidworks | Any 1 SHEET with 10 Users lience. |  |

**ANNEXURE - II MSBTE NORMS AND STANDARDS FOR EQUIPMENT**

**LIST OF EQUIPMENT & MACHINERY**

**(Desired Equipment/ Hand Tools) (Optional Equipment)**

**1. Name of course/ Department: Mechanical Engineering Department**

**2. Name of laboratory: Theory of Machine**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Sr. No.** | **Name of Equipt./Machinery** | **Technical Specifications** | **Minimum Qtty./Nos. Required** | **Remark if any** |
| 1 | Models of following Mechanism i) Four bar link Mechanismii) Slider crank Mechanism iii) Ellipse tracer modeliv) Inversions of four bar mechanismsv) Inversions of slider crank mechanisms | Acrylic/ wood material/ Aluminium Cast. | 2 Each |  |
| 2 | Models of following Cams & followers 1. Plate cam
2. Tanget Cam
3. Cylinderical cam
4. Translating cam.
 | 1. Plate cam with flat face reciprocating follower.
2. Tanget cam with roller oscilating follower
3. Cylinderical cam with translating follower
4. Translating cam with reciprocating knife edge follower.
 | 2 Each |  |
| 3 | Model / chart of Bearing | 1. Ball Bearing
2. Roller Bearing

iii) Taper Bearing iv) Thrust Bearing | 2 Each |  |
| 4 | Models of Power Transmission i)Belt Drivesii) Chain Drivesiii)Gear Drives including reduction gearbox,worm & worm wheeliv) Rope Drives | Models / charts of i) Belt Drives :- flat belt, V– belt ii) Chain Drives:- Chain & Sprocket wheelsiii) Gear Drives :- Spur gear terminology, types of Differentgears and gear trainsiv) Rope Drives :-Wire ropes etc. | 2 Each |  |
| 5 | Gyroscope Models | Standard Gyroscope with revolving stool. | 1 |  |

**ANNEXURE - II MSBTE NORMS AND STANDARDS FOR EQUIPMENT**

**LIST OF EQUIPMENT & MACHINERY (Desired Equipment/ Hand Tools) (Optional Equipment)**

**1. Name of course/ Department: Mechanical Engineering Department**

**2. Name of laboratory: Refrigeration & Air Conditioning**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Sr. No.** | **Name of Equipt./Machinery** | **Technical Specifications** | **Minimum Qtty./Nos. Required** | **Remark if any** |
| 1 | Wall Chart of Vapour Compression refrigeration system | Wall charts of PVC / Acrylic material | 1 |  |
| 2 | Wall Chart of Steam jet refrigeration system | Wall charts of PVC / Acrylic material | 1 |  |
| 3 | Wall Chart of i) Vortex tube ii) Pulse tube refrigeration,1. Solar refrigeration
 | Wall charts of PVC / Acrylic material | 1Each |  |
| 4 | Wall Chart of 1. Heat Engine
2. Heat Pump
3. Refrigerator
 | Wall charts of PVC / Acrylic material | 1Each |  |
| 5 | Wall Chart of i) Bell Coleman air refrigerator1. PV Diagram & TS Diagram of Bell Coleman air refrigerator
 | Wall charts of PVC / Acrylic material | 1 |  |
| 6 | Wall Chart of i) Vapour Compression Cycleii) P-H and T-S diagram of VapourCompression Cycle | Wall charts of PVC / Acrylic material | 1Each |  |
| 7 | Wall Chart of aqua- ammonia system (simple & practical) | Wall charts of PVC / Acrylic material | 1 |  |
| 8 | Wall Chart of Li-Br AbsorptionSystem | Wall charts of PVC / Acrylic material | 1 |  |
| 9 | Wall Chart of Electrolux System | Wall charts of PVC / Acrylic material | 1 |  |
| 10 | Wall Chart of Superheating & under cooling. | Wall charts of PVC / Acrylic material | 1 |  |
| 11 | Wall Chart of Capillary tube, automatic Expansion valve, Thermostatic Expansion valve | Wall charts of PVC / Acrylic material | 1 |  |
| 12 | Wall Chart of Psychrometric chart | Wall charts of PVC / Acrylic material | 1 |  |
| 13 | Wall Chart ofi) Window Air Conditionerii) Package Type Air Conditioner 1. Split Type Air Conditioner
2. Year round Air Conditioner
 | Wall charts of PVC / Acrylic material | 1Each |  |
| 14 | Wall Chart of Charging Unit. | Wall charts of PVC / Acrylic material | 1 |  |
| 15 | Wall Chart of 1. Duct System
2. Diffussers
3. Grills
4. Fans and Blowers
 | Wall charts of PVC / Acrylic material | 1Each |  |

 Note: Wall chart size- 3ft x 3 ft

**ANNEXURE – II**

**MSBTE NORMS AND STANDARDS FOR EQUIPMENT**

**LIST OF EQUIPMENT & MACHINERY**

**(Desired Equipment/ Hand Tools) (Optional Equipment)**

**1. Name of course/ Department: Mechanical Engineering Department**

**2. Name of Laboratory: Mechanical Measurement and Control, MQC**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Sr. No.** | **Name of Equipt./Machinery** | **Technical Specifications** | **Minimum Qtty./Nos. Required** | **Remark if any** |
| 1 | Displacement measurement usingLVDT | Sensor -+/-10mm LVDT Display 3.5 digit dogital display | 2 |  |
| 2 | Snap Gauges | Go, No. Go 10,20,50 mm | 2 |  |
| 3 | Limit Gauges – 1) Plug gauges and 2) Ring Guages | Go, No. Go 10,20,50 mm | 2 |  |
| 4 | Thread Gauges | Go, No. Go BSW/Metric | 2 |  |
| 5 | Tool Maker Microscope | Magnification minimum 30x, Travel 25mm, Graduated in 0-360 degree with thread templates, occulars | 1 |  |
| 6 | Angle Dekkor | Magnification 10x, measuring range 0-60 minutes in x-y direction, LC=1 minute | 1 |  |
| 7 | Clinometer | Reading in degree & minutes, Range 0-360 degree | 1 |  |
| 8 | Ultrasonic Thickness Gauge | For measuring thickness of different material like Aluminium, Plastic, Mildsteel within an accuracy of 0.2 mm Range 0-30mm | 1 |  |

**ANNEXURE - II**

**MSBTE NORMS AND STANDARDS FOR EQUIPMENT**

**LIST OF EQUIPMENT & MACHINERY**

**(Desired Equipment/ Hand Tools) (Optional Equipment)**

**1. Name of course/ Department: Mechanical Engineering Department**

**2. Name of Laboratory: Fluid Mechanics and Machinery, Fluid Power**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Sr. No.** | **Name of Equipt./Machinery** | **Technical Specifications** | **Minimum****Qtty./Nos. Required** | **Remark if any** |
| 1 | 1. Simple and differential manometers
2. Pitot Tube
 | i) Simple manometers 50 cm scaleii) Differential manometers 50 cm scale | 1 |  |
| 2 | Wall chart of Hydroelectric power plant | Wall charts of PVC / Acrylic coated material | 1 |  |
| 3 | Wall chart of 1. Pelton
2. Francis
3. Kaplan turbine.
 | Wall charts of PVC / Acrylic coated material | 1Each |  |
| 4 | Wall chart of Centrifugal pumps – single stage, multi stage | Centrifugal pumps closed system with variable speed. | 1 |  |
| 5 | Wall chart of 1. Submersible pump
2. Jet pump
 | Wall charts of PVC / Acrylic coated material | 1Each |  |
| 6 | Wall chart of Reciprocating pumps | Reciprocating pumps closed system with variable speed. | 1 |  |
| 7 | P Simulator | Pneumatic and Electro Pneumatic Simulation software with user manual & Activity Book. | 1 |  |
| 8 | H Simulator | Hydraulic and Electro Hydraulic Simulation software with user manual & Activity Book. | 1 |  |

Note: Wall chart size 3ft X 3ft

**ANNEXURE-II**

**MSBTE NORMS AND STANDARDS FOR EQUIPMENT**

**LIST OF EQUIPMENT & MACHINERY**

**(Desired Equipment/ Hand Tools) (Optional Equipment)**

**1. Name of course/ Department: Mechanical Engineering Department**

**2. Name of laboratory: Automation**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Sr. No.** | **Name of Equipt./Machinery** | **Technical Specifications** | **Minimum Qtty./Nos. Required** | **Remark if any** |
| 1 | CAD/CAM Softwares | Any one of the following- Unigraphics NX4 Pro E Catia | 02 Nos. Minimum10 User Lience. |  |
| 2 | CAM Software | CNC Offline programmingTrainer | 10 User Licence |  |
| 3 | Working Model of Robot | 5 axis Robot | 1No. |  |
| 4 | Robox | **Robox** Robot simulation Software(Robox simulation Software with User manul & activity book.) |  |  |
| 5 | Mechatronics Simulation Software | Mechatronics Simulation Software(Mechatronics Simulation Software with user manual & activity book) | 1 |  |
| 6 | LSM Controller Package | 1. LSM Controller +4-Axis,PLC
2. DC Servomotor

iii) Optical incremental encoderiv) Techogenerator v) PWM 4 Quadrant motor drivevi) power supply for drive | 1 |  |