LIST OF EQUIPMENT/SOFTWARE

1. Package 1: (Branch- Civil Department)

SL.NO	SPECIFICATIONS & DESCRIPTIONS	Qantity required
Civil Engg Lab (Specification details of Software.)		
1	Microsoft project standard 2021-Educational -10 users. Compatible to window 10/11, windows server 2019	01
2	Microsoft project standard 2021-Educational-20 users. Compatible to window 10/11 ,windows server 2019	01
3	Auto desk Recap pro 10User Compatible to window 10/11, windows server 2019	01
4	Auto desk Recap pro 20 User Compatible to window 10/11 ,windows server 2019	01
5	**GIS Software** GIS SOFTWARE:- Prefer ESRI ARC GIS 10.7.1 OPERATING SYSTEM S: Windows 10 home, pro and Enterprise (64 bit(EM64T)) CPU SPEED 2.2 GHz minimum, hyper-threading (HHT) or Multy-core recommended Memory/ Ram -Minimum 8 GB . Recommended -16GB or Higher Processor-Intel Pentium 4, Intel Core Duo or Xeon Processors, SSE2 minimum Or higher version **or any make of reputed company**	01 nos Rates are seaparates (for 10 User) & (30 users)
6	**GPS Hardware** Specification It should centered at 1575.42 MHz & registered in the ITU to occupy spectrum basically between 1560 MHz & 1590 MHz or at least two carrier frequencies at 1575.42 MHz & 1227.6 MHz Or 1176 MHz (Newer Satellite)	03 Nos
7	**DGPS Hardware** Specification For DGPS (Differential GPS) Receiver type multi channel (12-CH SBAS1-CH) all in view Frequency -1575.42 MHz ± 1MHz (C/A code) Sensitivity - -135 dBm for tracking Accuracy – 13m 2DRMS (C/A Code, HDOP < =4,SA off) 5m 2DRMS when DGPS corrected, 7m 2DRMS when SBAS corrected From 15-metre (49 ft) nominal GPS accuracy to about 1-3 Centimeter (0.39-1.18inch) in case of the best implementations. **OR any make of reputed company**	01 nos Rates are seaparates (for 10 User) & (30 users)
8.	**PHOTOGRAMMETRY SOFTWARE** PREFER-ERDAS IMAGINE VERSION2018 OPERATING SYSTEMS:- Windows 8.1(Standard), Professional & enterprise (64 bit) Windows 10 pro (64 bit) Memory/ Ram -16GB or More Strongly recommended Processor-64bit: Intel 64 (EM64T, AMD64, or equivalent) **OR any make of reputed company**	01 nos Rates are seaparates (for 10 User) & (30 users)
9.	MS PROJECT SOFTWARE Prefer-Microsoft project software standard 2021 -Educational OPERATING SYSTEMS: Windows 10 , 11, Windows server-2019	01 nos Rates are seaparates (for 10 User) & (30 users)

	Memory/ Ram -4 GB Ram or Higher Processor-1.6 GHz or faster **OR any make of reputed company**	
10.	DIFFERENTIAL GLOBAL POSITIONING SYSTEM (DGPS) Prefer- TRIMBLE R8s GNSS SYSTEM Receiver type – multi channel (12-CHSBAS1-CH) al in view Frequency-1575.42 mhz+/- 1 MHz (C/A code) Sensitivity -135dBm for tracking Accuracy-13m 2 DRMS (C/A code, HDOP<=4,SA OFF) 5m **OR any make of reputed company**	03 nos.

Package 2: (Branch- Electrical Department)

1.	**Basic PLC Trainer kit ,HMI,SCADA (Including Software)**		**10 User**
	Programming Standard	IEC 61131 standard	
	Consistent data storage of user program and documentation on the CPU	Yes	
	Work memory for program, integrated	300 KB or More	
	Work memory for data, integrated	1.5 MB	
	Load memory	Plug-in via Memory Card	
	Display PLC status	Yes	
	Command execution times		
	Bit operations	0.04 µs	
	Word operations	0.048 µs	
	Fixed-point operations	0.064 µs	
	Floating-point operations	0.256 µs	
	Bit memories, timers, counters		
	IEC counters	2048 each	
	IEC timers	2048 each	
	Bit memories	16 KB	
	I/O address range		
	Inputs	32 Digital and 6-8 Analogue or More	
	Outputs	32 Digital and 6-8 Analogue or More	
	Motion control		
	Typical number of positioning axes (at 4 ms servo/IPO cycle)	5	
	Max. number of positioning axes	10	
	Communication		
	PtP	Yes	
	PROFINET IO RT	Yes	
	PROFINET IO IRT	1 x PN IO IRT	
		(2-port switch)	
	PROFIBUS	Yes	
	OPC UA DA server	Yes	
	Web server	Yes	

	Automatic reporting of system events and presenting them on the display, in the web server, in the engineering on the inbuilt HMI system (Resolution: min. 128*160) operation; diagnostic information; change of IP address; user language selectable; pull and plug in use; password protection	Yes	
	Mounting rail as per the required size	Yes	
	Memory card	Yes	
	Suitable DC Power supply unit for operation	Yes	
	IO cards	Yes	
	Front connector module (35 mm) for digital I/O modules for 16-pin connecting cable power supply over screw-type terminal	Yes	
	Connecting cable 16-pin unshielded with IDC connectors, length 0.5m	Yes	
	Terminal module screw terminal	Yes	
	Brought outs		
	Toggle switch, PB switches, Indication Lamps, 3 to 4 mm Banana socket for all Digital and analog inputs and outputs along with 80 nos. of corresponding size of connecting cables ending with banana pins at both the ends (Red and Black/Blue) are also to be provided for interfacing external devices	In trainer kit	
	Potentiometer for voltage /current simulation	with scale	
	Digital ammeter, voltmeter	Reputed make	
	Junction Box for housing all above components	Reputed make	
	Programming Software		
	Required licensed copy of software package for Programming, SCADA application and HMI Application	Yes	

2	**Three Phase Energy Meter(5KW)** Three Phase 4 Wire current rating **10-40 Amperes** solid state (static) whole current electronic LT energy meters of accuracy class 1.0 with backlit LCD display and communication port for data downloading	01 no
3	**Three Phase Watt Meter(10KW)** w ith c o n tro l p a n e l	01 no
4	**Shunt Generator (5KW)** w ith c o n tro l p a n e l Power: 5 kW Voltage: 440 V AC Application: Induatrial Brand: Aarson Dimensions: 900 x 250 x 750 mm Frequency: 50 Hz	01 no

5	**DIGITAL MEGGER 5KV RANGE**: 0-10000M OHM • SUITABLE FOR 5000V • AC VOLTAGE: 5kV: 90-264 V rms, 47-63 Hz 100VA • BATTERY CHARGE TIME: 2.5 hrs- Deep discharge, 2 hrs- Normal discharge • BATTERY LIFE: 6 Hours continuous @ 5kv 100 m load. • TEST VOLTAGE: 250 V, 500 V, 1000 V, 2500 V, 5000 V, • VL LOCK TEST VOLTAGE: 100VL to 1 kV in 10 Steps -1kV to 5kV in 25 Steps. • TEST VOLTAGE ACCURACY: +4%,-0%,±10 V Nominal test voltage at 1 G load. • RESISTANCE RANGE: 10kohm to 10 T @ 5 kV. • RESISTANCE ACCURACY: 5000V 2500V 1000V 500V 250V• INTERFERENCE: 3 mA from 450V to 5kV. • VOLTMETER: 30V to 600V AC/DC, 45-Hz to 65 Hz. • VOLTAGE ACCURACY: ±3%, ±3V • TIMER ACCURACY: Up to 99 minutes 59 seconds, 15 seconds min setting. • TEST MODES: IR , IR(t), DAR, PI • MAX ALTITUDE: 3000 m • OPER TEMPERATURE: -25°C to 50°C • IP RATING: IP65. • SAFETY CATEGORY: CAT IV 600V. • GUARD TERMINAL SPECS: • DISPLAY: ANALOGUE: 100k? to 10T? • SHORT CKT/CHARGING CURRENT: 3mA @ 5kV • INSULATION TEST: Alarm 100k? to 10G? • CAPACITOR CHARGE	01

Package 3: (Branch- Mechanicall Department)

1. **CNC Vertical Milling Machine –** **Qty 1 No.**

CNC Vertical Machining Center	
Sl.. No.	Specification
1	Field of operations
1.1	Machining of single jobs and batch production.
1.2	Standard machining of press tool plate, die plates, mould plates, fixtures, Precision machining jobs in :
	- Face, shoulder and pocket milling.
	- Drilling & Boring application Tapping.
	- Die and Mould Machining
2	Material
2.1	Tool steel, low-medium-high alloyed (Toughened & Stainless steel, Casting steels, low,& medium carbon steels, Cast iron, Grey cast iron &Nodular cast iron ferritic /pearlitic type HRB 125-200 (Non hardened)etc.
2.2	Nonferrous metals like Aluminium and aluminium alloys, Copper and Copper alloys and Brass
3	Technical data
3.1	Work area dimensions: (approximately)

	Linear Traverses: X-Axis : 760 mm - 900 mm
	Y-Axis : 350 mm - 520 mm
	Z-Axis : 380 mm - 520 mm
3.2	Machine Table
	Table size: 900 mm × 300 mm or more
	Work holding: T-slot no/width - 3/14 mm or more
	T-slot Center Distance 100 mm minimum
	Table loading capacity 300 kg - 500kg
3.3	Machine Spindle & Head Stock
	Spindle speed: 6,000 rpm or more
	Balanced Spindle
3.4	Drive System: Direct Inline Drive or Integrated motorized Spindle
3.5	Spindle Motor Power: 3.7/5 kW or more
3.6	Spindle Cooling
3.7	For spindle – Jacket cooling or equivalent cooling
3.8	For Head – Jacket cooling or equivalent cooling
3.9	Synchronized with bed temp preferred.
3.10	Digital controlled AC Spindle Motor drive
3.11	Spindle with Pneumatic operated automatic tool changing and through spindle air blow cleaning while tool change.
3.12	Adjustable external coolant nozzles.
3.13	Tool adaptor support: BT 40
3.14	Power failure detection module.
3.15	Machine Size
	Machine Height- 2500 mm or more
	Floor space - 2500 mm x 2200 mm or more
	Mass of machine - 3000 kg or more
4	Coolant System
4.1	Tank & filter unit
4.2	Tank capacity minimum 200 lit or more
4.3	Coolant system pump capacity Minimum 30 lit / min.
4.4	First Fill of Coolant
5	Axis drives, Control& Accuracies
5.1	Digital controlled drive and motors for all axes.
5.2	LM Guide ways
5.3	Closed pitch ball screws, supported at both ends, pre-tensioned preferable.
5.4	Rapid transverse X/Y/Z: 15/15/10 rpm or more
5.5	Machining feed range in 3-Axis simultaneously resulting feed rate: 5m/min or higher.
5.6	Positional accuracy for full stroke in each axis: 0.012 mm or less
5.7	Repeatability: 0.01 mm or less
5.8	Note:- Positional accuracy and repeatability values should be reported as per B53 standard. If the manufacturer follows any other standards such as ISO / VDI/DGQ 3441 / JIS / ASME / ANSI for these measurements, the values should be reported as per the respective standard.
6.	CNC Control Unit Features

6.1	Controller: Latest version of Siemens/ Fanuc/ Equivalent OEM
6.2	Page for machine error compensation
6.3	USB Support and I/O Interface Ethernet/LAN Port
6.4	Rigid tapping function
6.5	Emergency stop on control panel, remote control
6.6	CNC controller to take care of Stored pitch error Compensation
6.7	Backlash compensation for cutting traverse
6.8	Backlash compensation for rapid traverse
6.9	Faster data processing rate
6.10	8.4" or more LCD Colour Monitor with soft keys.
6.11	Swiveling panel within-built keyboard, monitor &operating knobs.
6.12	Standard cycles for drilling, reaming, boring, thread cutting, tapping etc.
6.13	Control memory with Look ahead Function – 1GB or more
6.14	Display PLC ALARM message
6.15	Over travel control
6.16	Standard USB Port and memory card slot
6.17	RS 232 serial interface port
6.18	Background editing and simulation of NC Programme
6.19	Pitch error compensation
6.20	Machine hour reading
6.21	Spindle load display
6.22	Power Failure & Self diagnostic function
6.23	Panel AC
6.24	Feed control potentiometer 10% increment range from 0-150%
6.25	Spindle Speed control potentiometer 10% increment range from 50-120%
6.26	Emergency brake knob
6.27	Tool life management
6.28	Canned cycles
6.29	Inch/Metric conversion
7	Accessories
7.1	Fully enclosed splash guard with sight windows
7.3	Fully encapsulated housing with safety type window
7.4	Automatic Tool Magazine with Twin Arm for min. 20 tools and Changer with safety – guard
7.5	Maximum tool weight 5 kg or more
	Maximum tool length 200mm or more
7.6	Levelling pads
7.7	Door safety interlock
7.8	Manual Pulse Generator (MPG)
7.9	Work-piece washing gun
7.10	PLC controlled central lubrication system
7.11	Run hour meter
7.12	Warm up controller / timer
7.13	Preferred machine colour in two-tone
7.14	Panel AC for CNC Control Panel
7.15	Wi-Fi Connectivity

7.16	Pull stud - 20 Nos
7.17	Air compressor 2 stages reciprocating type(7-10 bar)
7.20	Voltage Stabilizer of 15kVA
8	Installation & Commissioning
8.1	Thecompleteinstallationandcommissioningincludingfirstfillof Hydraulic Oil and Coolant Oil must be carried out by the supplier at the project (at the final destination/premises)
8.2	The machine to be inspected as per accuracy chart before dispatch at supplier site. The suppliers to prove out the "Test Components" in all aspects. Acceptance and Qualification during Pre Dispatch Inspection (PDI), at the supplier end. Release of machine for dispatch after successful completion of acceptance test
	post PDI.
8.3	The complete installation and commissioning must be carried out by the supplier for all the machines at the final destination/premises. A final accuracy test with an identified test component to be conducted by the purchaser/consignee. Final accuracy test report is to be signed jointly by Purchaser/consignee and supplier. Final acceptance would be given after conducting the accuracy test at the installation location.
9	Training
9.1	To be provided for each type of machine at delivery location.
9.2	Operator training and programming training -15 days.
9.3	Maintenance course mechanical, electrical and electronics - 5days
10	Documents to be provided along with machine
10.1	Machine Manuals
10.2	Mechanical maintenance manual 2 sets each (one hard copy and one soft copy)
10.3	Electrical maintenance manual 2 sets each (one hard copy and one soft copy)
10.4	Detailed Layout plan
10.5	Operating and Programming Instruction
10.6	Installation and Commissioning instructions
10.6	Quality Test and Accuracy Test Chart Records
10.7	Circuit Diagrams
10.8	Maintenance/Repair Charts
10.9	Preventive Maintenance Instructions
10.10	Lubrication Chart & Lubricant list
10.11	Instruction manual for supplied Coolant Concentrate, Maintenance
10.12	Detailed packing list of all Items and devices and detailed prospect of machine & all other Accessories to be enclosed in the respective boxes. Lifting instruction to be shown in packing list.
11	Service
11.1	The manufacturer should have established after sales and service network in India.
11.2	The authorized service partner in India (Name & address), must be certified by the manufacturer and shown in the quotation.
11.3	Number of similar machine installed in India in a reputed organization.
12	Warranty

12.1	24 months from the date of Hand-over Report at the delivery location.

2.CNC Turning – **Qty 1 No.**

CNC HEAVY DUTY TURN CENTER	
Quantity	01 No.
SPECIFICATION	CAPACITY
Swing over bed	500 - 600 mm
Distance between centres	550 - 650 mm
Max. Turning Diameter	300 - 400 mm
Max. Turning Length between centre	500 - 600 mm
MAIN SPINDLE	
Spindle Bore	60 - 80 mm
Chuck Size	150 - 250 mm
Maximum Spindle speed	4000 rpm or more
Spindle motor power	11-15kW
Spindle nose	A2-6
Max. Bar Capacity	50 –65 mm
AXES SLIDES	
Transverse stroke: X-axis	150 - 200 mm
Transverse stroke: Z-axis	500 - 600 mm
FEEDS	
Rapids X Axis	20 - 25 m/min
Rapids Z Axis	20 - 25 m/min
TOOLING SYSTEM: TURRET	
No. of tool stations	8 or more
Maximum tool size (boring bar)	32 mm or more
Tool Size (Cross Sectional)	25 x 25 mm or more
TAIL STOCK	
Tail Stock Type	Hydraulic Operated
Taper	MT4 or more
Travel	400 - 450 mm
Thrust	300 kgf or more
ACCURACY (AS PER ISO / VDI DGQ 3441/ JIS)	
Positioning Uncertainty (P)	0.010 mm or better
Repeatability (Ps Medium)	0.007 mm or better
CNC CONTROLLER	

- Latest from Siemens / Fanuc / Equivalent OEM
- 8.4"or better colour display
- Manual data input
- Alarm/operation history display
- Self-diagnostics function
- Constant surface speed control
- Continuous Thread cutting cycles
- Feed rate override
- RS232 interface/Ethernet/USB/LAN Port
- External memory and sub-programme calling function
- Backlash compensation
- 512kb Part Programme storage memory
- Background editing
- Memory card input/output
- Hourly part count
- Colour graphics display
- Dynamic Simulation Display
- Panel AC

STANDARD FEATURES

- Stress relieved casting for headstock and bed
- Hardened and ground Linear Motion guide ways
- Spindle encoder for thread cutting operation
- Hydraulic operated 3 Jaw chuck with one set of hard & soft jaw.
- Minimum 8 station Servo bi-directional Turret
- Tailstock with hydraulic operated quill
- Slant/Integral type bed and LM guide ways for axis
- Coolant tank
- Chip Tray
- Foot switch for Chuck & Tailstock
- AC spindle Drive and axis drive
- Auto and manual coolant system
- Closed pitch ball screw, supported at both ends, pre-tensioned preferable
- Automatic centralized oil lubrication for guide ways and ball screw

STANDARD ACCESSORIES

Electronic hand wheel (manual pulse generator)

- Built in lighting system
- Boring bar holder (4nos.)
- Set of reduction sleeves
- 3jaw hydraulic chuck dia150mm (min).
- Programmable quill
- Full machine guard
- Coolant system
- Maintenance toolkit
- AC Spindle (Cartridge)
- AC Spindle Drive
- AC Servo Axes Drive
- Automatic programmable Centralized Oil Lubrication System
- Chip Tray to be provided
- Levelling screws and Mounting pads
- Machine operating manual and programming manual – 2 sets
- One set of installation, maintenance and spare parts manual
- Hard Jaws & Soft jaws – 4 sets each
- Taper shank drill sleeves (MT1, MT2, MT3)
- OD Tool holder clamping block
- Door safety interlock
- Fully enclosed splash guard with sight windows
- Fully encapsulated housing with safety type window
- Levelling pads
- Voltage stabilizer / Isolation Transformer of 15 kVA

DOCUMENTS to be provided along with machine

- Mechanical maintenance manual – 2 sets each (one hard copy and one Soft copy)
- Electrical maintenance manual 2 sets each (one hard copy and one softcopy)
- Detailed Layout plan
- Operating and Programming Instruction
- Installation and Commissioning instructions
- Quality Test and Accuracy Test Chart Records
- Circuit Diagrams
- Maintenance / Repair Charts
- Preventive Maintenance Instructions
- Lubrication Chart & Lubricant list
- Instruction manual for supplied Coolant Concentrate and CoolantMaintenance
- Detailed packing list of all Items and devices and detailed prospect of machine & all other Accessories to be enclosed in the respective boxes. Lifting instruction to be shown in packing list.

Warranty

- 24 months from the date of Hand-over Report at the delivery location.

Installation&Commissioning

❖ The complete installation and commissioning including first fill of Hydraulic Oil and Coolant Oil must be carried out by the supplier at the project (at the final destination/premises) ❖ The machine to be inspected as per accuracy chart before dispatch atsupplier site. The suppliers to prove out the "Test Components" in all aspects. Acceptance and Qualification during Pre-Dispatch Inspection (PDI), at the supplier end.Release of machine for dispatch aftersuccessfulcompletion ofacceptancetest post PDI. ❖ The complete installation and commissioning must be carried out by the supplier for all the machines at the final destination/premises. A final accuracy test with an identified test component to be conducted by the purchaser/consignee. Final accuracy test report is to be signed jointlyby Purchaser/consignee and supplier. Final acceptance would be given after conducting the accuracy test at the installation location.
Service
❖ The manufacturer should have established after sales and service network in India ❖ The authorized service partner in India (Name & address), must be certified by the manufacturer and shown in the quotation. ❖ Number of similar machine installed in India in a reputed organization.(Minimum 10 Nos.)
Training
❖ To be provided for each type of machine at delivery location. ❖ Operator training and programming training - 15days. ❖ Maintenance course mechanical, electrical and electronics - 5days.

3. CNC Simulator – Qty 30 nos.

Sl. No.	Brief Description
CNC Off-line Simulator	
	The offline CNC simulator Console shall be a complete setup of hardware and software- based training solution for CNC machining. The simulator shall be capable of simulating operation of the CNC controller in real life environment. Operation and handling similar to the real-life machine controller shall ensure that CNC program generated with the setup (hardware and software) shall be able to run on the CNC machine. It should work just like it would on the original control and therefore become familiar with all in-depth aspects of control programming.
1	**Didactic Software** The Interactive didactic software shall be user-friendly, efficient, and secure all-round solution for computerized training. The software shall be capable of • Broadcasting and sharing of the screen with theclassroom • Controllingaccess • Evaluation of work carried out by thestudents • Perform in an interactive whiteboardenvironment
2	**Console:** CNC SIMULATION LAB Console with Touch Screen & Built in Data Processing Unit. Will be Sheet Metal fabricated, rigid desktop type console unit with Machine control keyboard.

	Any of the following Control Panels to be quoted: Latest version of SIEMENS/ FANUC/ Equivalent OEM
3	**Min Required Details of inbuilt items in console:**
3.1	A) Touch Screen 1. Screen Size: 24 inchesMinimum 2. Display Type:LCD 3. Display Panel Diagonal size (mm): 604(Minimum) 4. Width of The Effective Display Area of The Panel (mm):527(Minimum) 5. Height of The Effective Display Area of The Panel (mm): 296(Minimum) 6. Backlight Technology:LED 7. Display Resolution (Pixels)1920X1080(Minimum) 8. Display Brightness (Nits): 250(Minimum) 9. Touch interface: Touch sensitive(Full) 10. Touch Technology:Capacitive 11. Number of touch points (Number):10(Minimum) 12. Response time (milliseconds): 5 (Minimum) 13. Operating System Compatibility: Windows 10(Minimum) 14. Number of Input HDMI ports: 1 (Minimum) 15. Number of USB 2.0 ports (Nos.): 1(Minimum) 16. Power Supply Voltage in AC (Volts):100-240 17. Power consumption (Watts): 23(Max.) 18. Operating Temperature Range (Degree Celsius): 0 –50 19. Operating Humidity (%) RH: 20 -80
3.2	B – Data Processing Unit: - a. CPU: Intel Celeron 2.17Ghz(Minimum) b. RAM: 2GBDDRL(Minimum) c. HDD :32GB(Minimum) d. Graphics: Intel HDGraphics e. OS: Windows 10 operatingsystem f. Audio Port should beavailable. g. USB Port-3(Minimum) h. HDMI Port – 1(Minimum) i. VGA Port – 1(Minimum) j. Audio Port: For Audioout/Mic-in k. Lan – RJ45 – 1Minimum l. Wi-Fi + BT
4	**Warranty** 24 months from the date of Hand-over Report at the delivery location.

SL.NO	SPECIFICATIONS & DESCRIPTIONS	Qantity required
Mechanical Engg Lab -1 (3rd SEM)		
4	**PARALLEL FORCE APPARATUS TO DETERMINE THE END REACTIONS IN SIMPLY SUPPORTED BEAM** Specifications: Consisting of two compression thrust type 10kg, tubular spring balances fixed on wooden polished board, a wooden bar with steel back plate. Complete with stirrups, hooks & two 1kg. Weights.	02 nos
5	**SEARIE'S APPARATUS TO DETERMINE YOUNG'S MODULUS** It comprises two metal frames connected by a link mechanism carrying a spirit level.. The wire under test is held in self centering steel chucks capable of holding wires of 1.2 mm diameter (18 SWG). A Micrometer head reading to 0.01 mm is provided for re-adjusting the sprit level.	02 nos

<table>
<tr><td>6</td><td>HARDNESS TESTING MACHINE(Rockwell)<table><tr><td>Test Loads</td><td>60,100,150 kgf (Rockwell)</td></tr><tr><td>Initial Loads</td><td>10 (kgf)</td></tr><tr><td>Maximum Test Height</td><td>222 mm</td></tr><tr><td>Depth of Throat</td><td>130 mm</td></tr><tr><td>Machine Height</td><td>627 mm</td></tr><tr><td>Net weight</td><td>Approx 65 kg</td></tr><tr><td>Size of base</td><td>Approx 450 * 265 mm</td></tr></table></td><td>01 no</td></tr>
<tr><td>7</td><td>FLASH POINT AND FIRE POINT APPARATUS
Specification: Fully automatic control Flash point: 490 c Power Source: 220 V , 1ph , 50 Hz Ac Supply Consists of brass test cup with handle removable. Cup cover with the spring operated rotated shutter having the oil test jet flame device, the stirrer with the flexible shaft. The assembly rests in air bath covered with dome shape metal top.</td><td>01 no</td></tr>
<tr><td>8</td><td>JOULES APPARATUS
consists fixed vanes encased in a wooden case lined with felt. The box can slide freely on a wooden base and is fitted with thermometer clamping device. A rotating cast aluminium cylinder rotates freely on a cast metallic pedestal and to its axle rotating vanes is provided which converts the kinetic energy into heat energy and temperature of water in copper vessel rises after two to three minutes of rotation. Two pulleys and fitted on aluminium sliding bracket. Complete as described & with two set slotted weights and cord. But without thermometer into heat energy and temperature of water in copper vessel rises after two to three minutes of rotation. Two pulleys and fitted on aluminium sliding bracket. Complete as described & with two set slotted weights and cord. But without thermometer. The above apparatus is also provided with non-resetable zero revolution</td><td>01 no</td></tr>
<tr><td colspan="3">REFRIGERATION AND AIR-CONDITIONING LAB (5TH SEM)</td></tr>
<tr><td>9</td><td>DOMESTIC REFRIGERATOR TEST RIG
Type- Domestic Refrigerator Test Rig, Usage/Application- Laboratory Equipment, Test Component- Compressor, Material- MS, Number Of Phases- 1, Power Supply- AC, Display Type- Digital, Load Capacity- 165 LITERS, Compressor Type- 1/8 HP, Grade- Manual, Weight- 8-10 KG, Voltage- 230 VOLTS, Frequency- 50 Hz</td><td>01 no</td></tr>
<tr><td>10</td><td>WATER COOLER TEST RIG
Test Component - WATER COOLER, Material- Stainless Steel, Number Of Phases- 1, Frequency-50, Power Source- AC, Voltage- 230
Range Of Experiments:
To demonstrate the basic Vapour Compression Cycle of Refrigeration.
To determine the Refrigeration effect, Work output, Actual C.O.P, Carnot C.O.P, Theoretical C.O.P.
Compressor: - Hermetically sealed compressor having cooling capacity of (as per water cooler) Emerson or Equivalent.
Condenser: Air cooled condenser made up of copper pipe & Aluminum fins of matching capacity with fan cooling. FHP fan motor with fan blade is provided.
Evaporator: - Material: S.S.Tank, Capacity: 15 liters.
Capillary Tube: Diameter : suitable, Material : copper
High Pressure and low pressure Gauge:Make: Wika or Equivalent.
Range 0-300 PSI High Pressure Gauge.
Range -30 to 150 PSI Low Pressure Gauges.
Multipoint Temperature Indicator:Range 0 to 250 °C,
Provided with cold junction compensation.
Service Required:Single phase 230 V AC, 6 Amp supply.Space required: floor space 2</td><td>01 no</td></tr>
</table>

	mtr x 1 mtr.	
11	**Vacuum pump set with accessories** Oil Lubricant Vacuum Pumps, Single Stage Automotive, Phase-single or double,	01 no
12	**Charging cylinder with accessories** For Complete charging of a domestic refrigerator.	02 nos
13	**Halide torch or any leak tester** Upon detection there is change of blue flame to green - Sensitive detector that support locating leaks as small as 20 ppm of CFC and HCFC refrigerants - Includes leak detector and probe hose - Detects all kinds of Halogenated Gases (Bromide). The unit responds to all halogenated Gases (with Chlorine, Bromine and fluorine included)Single Color LED display with 6-Level Leak Alarm,Real time sensitivity adjustment14 inches (35.5cm) flexible stainless steel probe	02 nos
HYDRAULIC MACHINES & INDUSTRIAL FLUID POWER LAB(5th sem)		
14	**Kaplan turbine Test Rig** with arrangements to find efficiency This Kaplan Turbine Test Rig 100mm size to develop 1 KW at 1050 RPM with a flow 1000 Ipm at 10 meter head suitable for supplying water to the above turbine. Monoblock Centrifugal Pump (7.5 HP, 3 Phases, 440V) Pump Size Suction size 100mm & Delivery size 100mm Pump Discharge 2500 LPM Delivery Head 7 meter Sump Tank MS Tank is used to store sufficient water for independent circulation through the unit experimentation and arrange within the floor space of main unit. Rope Bake Dynamometer is used to measure the output. Spring balance and dead weights are used to measure the load Runner Diameter 200mm. Discharge control valve used to control the flow rate of water. Spring Balance 6 Kg. Pressure Gauge of 4.2 kg/cm2is used to measure the pressure head. Rigid MS frame work compactly fitted with all the above items as a self-sufficient Package unit suitable for operation without any foundation. Switch and starter suitable for above motor pump set mounted on the control panel board.	01 no
CAD/CAM LAB (5th SEM)		
15	**AUTOCAD SOFTWARE 2D/3D** Attached separately	01 no
16	**CNC TURNING MACHINE** Attached separately	01 no
17	**Mastercam Educational Suite version 2022** Includes the following software moduls: Design Lathe 2 axis Router Wire EDM Data Translators: ASCII,CADL.DWG,EPS,IGES, Inventor, Parasolids, Solidworks, Solid Edge, STEP,STL,VDA (Educational Suite) 1st year Maintenance to avail inline support + New updates. Valid for 12	i. 10 Users ii.20 user

	months from the date of puirchase.	
18	**Mastercam Educational Suite version 2022** Includes the following software moduls: Design Lathe 2 axis Router Wire EDM Data Translators: ASCII,CADL.DWG,EPS,IGES, Inventor, Parasolids, Solidworks, Solid Edge, STEP,STL,VDA (Educational Suite) 1st year Maintenance to avail inline support + New updates. Valid for 12 months from the date of puirchase.	
	Theory of Machine and Measurement Lab(4th sem)	
19	JOURNAL BEARING APPARATUS Journal dia- 49.8.mm, length 50mm. Bearing dia – 50 mm. Pressure gauge – 10 Kg/cm2. Weight set to load the bearing upto 25 Kg. D.C. motor with variable speed control to drive journal. Torque arm and weights for measurement of friction torque. Oil outlet flow measurement arrangement. Thermometer to measure oil temperature Floor space of about 1m. x 1.5m.230v, single phase stabilized AC supply with earthing.SAE – 40 oil about 3lit. for testing purpose.Tachometer (can be supplied at extra cost.)	01 no
20	**CAM ANALYSIS APPARATUS** The apparatus is designed to study the cam profiles and performance of cam and follower system Cam -Eccentric, tangent and circular ARC type – one each. 2.Follower- mushroom, flat faced and roller type – one each. 3.Cams and followers are hardened to reduce wear of the surfaces. 4.Variable speed motor coupled to camshaft of suitable range and Variac. 5.A dial gauge to note the follower displacement. 6.A technical manual accompanies the equipment. SERVICES REQUIRE FOR CAM ANALYSIS APPARATUS: 1.230 V, A.C. stabilized supply along with earthing connection. 2.Bench area 0.5m x 0.5m x 0.5m height. 3.Tachometer to measure the jumping speed, (can be supplied extra)	01 nos
21	**VERNIER HEIGHT GAUGE** Resolution: 0.01mm/0.0005" Buttons: on/off, zero, mm/inch, ABS/INC, data hold, TOL, set ABS/INC is for absolute and incremental measurement TOL is for tolerance measurement Carbide tipped scribbler Made of stainless steel (except the base) SR44 or LR44 battery Data output Supplied with dial test indicator holder Optional accessory: data output cable	01 nos
22	**SLIP GAUGE** As the name suggests, Slip Gauge is comprised of rectangular blocks made up of steel and avoid the chances of wear and tear. This is known for its high accuracy, ergonomic design and dimensional accuracy. The offered range is used as a reference for measuring standards and precision ground. Moreover, this gauge is used as a reference	02 nos

	for measuring equipment like gap gauges, sine bars and dial indicators. Ergonomic design Fine finish High calibration Accurate result These Gauge Blocks are intended to set and calibrate fixtures as well as precision instruments. Manufactured under carefully controlled conditions allowing for the highest degree of accuracy when used at a temperature of 68 degrees F (20 degree C)All gauge block sets are assigned serial numbers and are accompanied with a certificate of inspection listing the deviation for each block. Each gauge block set meets or exceeds federal specification GGG-G-15C.All gauge block sets are made to special standards to resist corrosion and defacement. The coefficient of thermal expansion is 6.4 X 10 Material – OHNG Steel Class – Grade 0 to 1 Measuring Range – 125mm to 1000mm	
23	**SINE BAR** Material: Alloy Steel Usage/Application: Used For Precision Measurement, Setting Of Angles Size/Dimension: 145L x 20 W x 40H mm Center Distance Between Rollers: +-0.003 mm,Range: 100 mm, 150 mm, 208 mm, 250 mm & 300 mmHardness : 60 ±2 hrc	02 nos
MELAB –II(4th sem)		
24	**MODEL OF 2 STROKE DIESEL ENGINE** Cut section showing various internal parts	02 no
25	**MODEL OF 4 STROKE DIESEL ENGINE** Cut section showing various internal parts	02 no
26	**2STAGE AIR COMPRESSOR TEST RIG** SPECIFICATIONS: 1.Air compressor – Double cylinder, two-stage type driven by a 2-hp. Three – phase motor mounted on air receiver provided with delivery valve. 2.Air tank and orifice with water manometer for air intake measurement. 3.Pressure gauges at outlet on both stages. 4.Digital temperature indicator. 5.Energy meter to measure input power. 6.A technical manual accompanies the equipments. SERVICES REQUIRED: 1.Floor space of 2,5 X 1.5m. 2.440 V, 15A, 3ph. AC supply with neutral and earthing connection. 3.A hand tachometer.	01 no
27	**PRESSURE MEASURING DEVICES BOURDON TUBE PRESSURE GAUGE**. Nominal size. 100, 160 and 250 mm. Display ranges. -1...0 to bis 0...1600 bar. Mechanical design. Bayonet ring case. Case filling. None or glycerine. Connection material. Brass or stainless steel.	02 nos
28	**MODEL OF 2 STROKE PETROL ENGINE** Cut section showing various internal parts	01 no
29	**MODEL OF 4 STROKE PETROL ENGINE** Cut section showing various internal parts	01 no

Sr.No.	Description of Items	Qty.
	Automobile Engg Lab	

30	Chassis of a Car The model will be made out of full size original used vehicle part .The cut section model will be constructor such that all following systems can be demonstrated in working condition 1 Heavy MS metal stand provided 2. 3/4 cylinder prteol/Deisel engine 3 clutch 4 clear box 5 propeller shaft 6 Union Joint 7 Differentiol 8 Rear wheels with Drums 9 Moter Driver All Vehicle Mention Parts fitter and working on Heavy MS stand	1 nos
31	Differential of a Tractor The model will be made out of originel Tractor Differentiol with cut section screw Plamintary Gear Box PS with Locking systems.All following systems can be demonstration in working condition 1 Tractor differential 2 fitter on Heavy metal stand 3 Good P U Painted 4 Cut Sectional Model	1 nos
32	Hydraulic brake system of a car working model 1 Hydraulic Drums Provided 2 Master cylinder Provided 3 Sutable pipe Hydraulic type 4 Fitter on metal Stand 5 Good PU Pointed 6 working model	1 nos
33	Solex carburetor The original carbonator fitter on the wooden base .This is only demonstraion model NON-working type	1 nos
34	Maruti Car type carburetor The original Carborator fitter on the wooden base .This is only demonstration model NON-working type	1 nos
35	Cut section of a fuel pump 1 inline fuel pump 2 fitter on woodenbas base 3 cut section provided 4 Good PU Paint 5 NON-working model	1 nos
36	4 speed gear box Gear Box cut section model showing all parts	1 nos

Power Station Egg Lab

37	Stainless steel steam turbine(de lavel) test rig 1KW, 3000 rpm to determine various efficiencies	1 nos
38	Spring loaded Safety valve **(Non Working Model)**	1 nos
39	2STAGE AIR COMPRESSOR TEST RIG TO FIND OUT MECHANICAL EFFICIENCY SPECIFICATIONS: 1.Air compressor – Double cylinder, two-stage type driven by a 2-hp. Three – phase motor mounted on air receiver provided with delivery valve. 2.Air tank and orifice with water manometer for air intake measurement. 3.Pressure gauges at outlet on both stages. 4.Digital temperature indicator. 5.Energy meter to measure input power. 6.A technical manual accompanies the equipments. SERVICES REQUIRED: 1.Floor space of 2,5 X 1.5m. 2.440 V, 15A, 3ph. AC supply with neutral and earthing connection. 3.A hand tachometer.	1nos

40	Jet condenser Model	1 nos
41	OXYGEN CYLINDER	1 no
42	ACETYLENE CYLINDER	1 no
43	TIG/MIG WELDING SET UP	1 no
44	CIRCULAR SAW MACHINE	1 no
45	FURNACE OF HEARTH(WITH CENTRE BLOWER	1 no

4.

5. Package 4: (Branch- Metallurgy Department)

SL.NO	SPECIFICATIONS & DESCRIPTIONS	Qantity required
METALLOGRAPHY LAB		
1	**Belt Polisher:-** For polishing of metallography speciman Belt :- 100 MM width x 1000MM length Rotation:- 1400 rpm Power 220 V/50HZ,	01
2	**Polishing Mechine:-** Two disc type- 1/2 HP AC single phase Motor , 8" disc-10" Disc digital indicator variable speed from 400 to1400,RPM.	01
3	**Mounting Press:-** Automatic Diameter- 'ø25, ø30MM, ø40MM, ø50MM, Max Power:-1800W Temp^{n} Setting range=0-300$^{0}_{c}$ 220 volt AC supply tr	01
4	**Sample Cutter:-** Max Cutting section 55 MMX 55 MM Motor-1.5 KW, Rotating Speed 2800 rpm Power-3 Phase , AC 380V / 50 HZ	01
5	**Power Hacksaw:-** Cutting Speed 24-76 M/Minute	01
	Main drive-1440 rpm, Hydraullic-0.5 HP Cutting Capacity- 200 MM (Rounder), 200 X 200M (Square)	01
6	**Wheel Grinder :-** Wheel diamemeter 200 MM, Speed 3600 rpm Wheel width- 25 MM, Wheel bore= 32 MM Power-600 W,	01
7	**Automatic Polishing etching Machine:-** Power-230 V, Phase type 01 type, 50-60 HZ Material- SS, MS	01
8	**Upright Metallurgical Microscope:-** Up to 400 X with digital recording facility, 220V With illumination source,bionocular type	01
9	**Micro Hardness Tester:-** Load -0.1- 2000MN, Auto Measurement of hardnessvalue. 1000gm for Measuring case thicknees & grain size supported by soft ware as per ASTM standards, 230V Test Force-10-1000gm 5 HV-3000HV,	01

10	**Radiation Pyrometer:-** Temp –O-300^0_C Response time-2see-10see	01
11	**Inverted trinocular metallurgical Microscope:-** Maglitication 40 x to 1000 X Light source- Halogen or light, filters-green/blue, with digital recording facility for taking of photograph of structure	02
12	**Hot air drier :-** Automation grade material mild steel, S.S 220V single phase AC	01
13	**Electrolytic etching Machine:-** Inpat voltage 110-230V, Out put Voltage-5 to 25 V Size-250X200X100 MM, time- 1 to 3 see	01
14	**Tools for sample handling during heat treatment:-** Gloves-2 pair.TONGs for handling box,cast iron sample box.	As per requirement
Heat Treatment Laboratory		
15	**Muffle F/C :** Max Temp" 800^0_c Size 100 X 100X 225 MM RatingKW 1.5	01
16	**Muffle F/C :** Max Temp" 1000^0_c Size 125×125×250 MM Rating 2.0 KW	01
17	**Muffle F/C :** Max Temp" 1200^0_c Size 125 X125×250mm Power rating 3.00 kw	01
18	**Vaccum F/C :-** Temp-800^{0}c Melting Material MS, SS, copper etc Voltage-240,vaccum range – upto 760mm Hg,Temp.sensor PT100,chamber round or rectangular	01
19	**Gradient Muffle F/C :-** Max-1200^0_c power-230 V , 50 HZ AC Main digital timer	01
20	**Oil quenching bath:-** Accurancy ± 1^{o}c eapauty 10 litre, Material- MS, SS, V-220	01
21	Pt-Pt-Ro thermocouple with calibration curve:-	01
22	**UPrightMicroscope :** Upright trinocular metallurgical Microscope:- Maglitication 40 x to 1000 X Light source- Halogen or light, filters-green/blue, with digital recording facility for taking of photograph of structure Magnification 1000 x light source illumination through power supply	02
Foundry Lab		
23	Mould Boxes (Set),standard size	1Set
24	Different patterns (Set) (teak wood and plastic) each one set	2Set
25	**Melting F/C** For Aluminium induction type,.98 power factor in both application (melting cum heating also),variable frequency upto 9500 HZ,display with high tech feature. Upto-25 kg. melting of aluminium and cast iron.	01
26	**Silicon carbide crucible:-** 5 KG Capacity	01
27	**Graphite Crucible** 05 KG Capacity	01
28	Molding kit Box	03
NDT & PYROMETRY LAB		
29	**Optical Pyrometer :-** Digital standard size use for NDT	01

30	**Ultrasonic flaw detector** digital,Voltage-220	01
31	**Thermocouple**	01
32	**Magnetic particle tester kit:** 230 V AC, 50HZ, AS TM 1000AMP	01
MATERIAL TESTING LABORATORY		
33	**Vickers Hardness Tester:-** Max hight-200MM, Weight- 70KG, Powersupply -200V, 50HZ	01
34	**Universal testing M/C:-** Power required L>415 V AC, 1500W, Range 2000 KG X1 KG least count. Auto Measurement if Hardness Value. Case thickness & grain size supported by software as per ASTM standard.	01
35	**Microhardness Tester:** Test load range 0.1-2000MN. Load resolution 150nN Power consumption mans-20W (Without evaluation PC)	01
FUEL TESTING & CHEMICAL ANALYSIS LAB		
36	**Electrolytic Analyzer :-** Power requirement L> 60 watt Dimension L>300 (N) X 330(W)X 330(D) MM	01
Mineral Processing Lab Laboratory		
37	**Wet drum Magnetic Separator** Capacity -50kg , Rotating speed 35	01 No.
38	**Electrostatic Separator** Capacity -150KG, 115Volt 50-60HZ	01 No.
39	**Rod mill** 200 mm duax 250 MM 230 Volt	01 No.
40	**Cone classifier** 1 Phase Power 1.KW	01 No.
41	**Wilfley Table** Water hpm 1-6/Shopwt Lbs 360/ Shipvil cuit 26 / HP-33	01 No.
42	**Jigging Machine** Capacity 20-70KG, Feeding Size -33MM , Power -0.50KW, 1400 Rpm	01 No.