

No.GPR./ EQUIP/TENDER-1/ 2016-17 / 513

Raipur, Date.: 17.12.2016

TENDER NOTICE – 01 / 2016-17

Open Tender for Supply of Laboratory Equipments

Last date for Receiving sealed tender	: 17th January 2017, 2:00 PM
Date and time of opening the tender	: 17th January 2017, 3:00 PM
Cost of Tender	: Rs. 500.00 (Rs Five Hundred only)

Sealed Tenders are invited from are invited from manufacturers/authorized dealers of manufacturers/ authorized suppliers who are willing to undertake supply and installation of items listed in Annexure - III of this OPEN TENDER. The Tender Schedules containing detailed specifications may be obtained from the office of undersigned from 19th December 2016 on any working day between 11:00 am to 5:00 pm by paying a tender fee of Rupees Five Hundred. The tender can also be downloaded from the website www.cgdteraipur.ac.in. If downloaded from the website tender fee of Rupees Five Hundred in form of demand draft payable to Principal, Government Co-Ed Polytechnic Raipur should be enclosed at the time of submission of the tender.

Eligibility Criteria:- Firm/bidders blacklisted at any stage or by any NITs/IITs/IIITs/Central Universities/State Universities, Central/State Government institutions/body/PSUs etc. need not to apply.

(a) The bidder should be a manufacturer/authorized dealer of manufacturers/ authorized engaged in respective area of works. The bidder should have sufficient Infrastructure, technical expertise and financial strength to undertake the contract.

(b) **Minimum AVERAGE ANNUAL TURNOVER of Rs. 30 lakh** in the last 3 financial years. (Balance sheet/CA certificate to be enclosed, duly supported by the income tax return for financial years 2013-14, 2014-15,2015-16).

(c) The bidder should have experience of similar work experience with at least 3 orders from reputed organization, in last 03 years. The nature of completed work should be supply & satisfactory completion of project in various Government Institutes/Reputed Firms/PSUs. [**NOTE: The documentary proof of *Purchase orders* in respect of works mentioned in bid **MUST** be submitted along with the bid.**]

(d) Tenderer should submit documents in support of minimum eligibility criteria along with the tender/bid. NO document in support of minimum eligibility criteria will be accepted / entertained after opening of tender.

(e) The Bidder/Tenderer should provide the following mandatory information:

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Government Co-Ed Polytechnic, Byron Bazar, Raipur (CG) – 492001
Phone 0771-2433045 Email: principalgpraipur@gmail.com

- i. Bidder/Tenderer must provide the information on the similar works completed successfully & satisfactory in last 3 years. Bidder/Tenderer must submit satisfactory documentary proof from end-users.
- ii. List of Organizations/Customers dealt by them.
- iii. Last three year's copies of Income Tax Return Form and PAN number.
- iv. Copy of Registration of Firm.

(f) Tenders/bids not meeting any of the above — Eligibility Criteria shall be rejected.

Earnest Money Deposit (EMD): An EMD of Rs. 60,000/- (Rupees Sixty Thousand) only in the form of an Account Payee Demand Draft payable in favour of Principal Government Co-Ed Polytechnic Raipur is required to be submitted along with the bid/tender.

Performance Guarantee:- Successful Bidders must have to submit the performance security @ 10 % of the purchase order value or Contract value in the form of Fixed Deposit, Bank guarantee from a schedule commercial bank and will be retained up to the warranty Period.

Instructions for submitting the Tender:

1. Tender will be submitted in four sealed envelope A, B, C and D as mentioned below:

(A) Envelope 'A' shall contain

I. EMD and Tender Fee

(B) Envelope 'B' shall contain

I. Technical Bid as per Annexure – I along with all documents

II. Technical Literature and Original Leaflets of equipments offered.

III. Authorized dealer/Manufacturer certificate for the items offered

IV. Undertaking of fulfillment of all condition

(C) Envelope 'C' shall contain

I. Commercial Bid for quoted Items / Equipment / Machines as per Annexure - II

II. Discount Offer, if Any

(D) Envelope 'D' shall contain

All three afore said sealed envelope A + B + C.

Sealed envelope "D" should be super scribed as No. GPR/EQUIP/TENDER-1/2016-17/Raipur. And it should be addressed to Principal, Government Co-Ed Polytechnic, Byron Bazar, Raipur, C.G – 492001.

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Please super scribe the above mentioned Title **“Open Tender for Supply of Laboratory Equipments”** and Tender Notice No. on the sealed cover to avoid the bid being declared invalid.

2. The address and contact numbers for sending bids or seeking clarifications regarding this OPEN TENDER are given below –
Bids/queries to be addressed to: Principal, Government Co-Ed Polytechnic, Byron Bazar, Raipur
Postal address for sending the bids: Principal, Government Co-Ed Polytechnic, Byron Bazar, Raipur - 492001
E-mail ID: principalgpraipur@gmail.com
Tel: 0771 - 2433045
3. This OPEN TENDER is being issued with no financial commitment and the buyer reserves the right to change or vary any part thereof at any stage. Buyer also reserves the right to withdraw the OPEN TENDER, should it become necessary at any stage.
4. No tender document shall be sold by the institute. Prospective bidder may download the tender paper from the institute website and submit the bid in the institute in due time & date as mentioned in the tender document.

TERMS AND CONDITIONS:

1. Terms and conditions for supply of Items / Equipment / Machines as per enclosed list for Government Co-Ed Polytechnic, Raipur
 - a. The tender is liable to be rejected if not submitted as per the prescribed conditions and in the prescribed format.
 - b. The bidder should quote their offer / rate in clear terms without any ambiguity.
 - c. The tender will be opened as per the date and time given above in the presence of such tenderer (s) or their representatives who are desirous to be present.
 - d. Tender received after due date and time will not be entertained.
 - e. The tender form is non transferable.
 - f. Item No. and page no. of the tender form should be strictly in chronological order. Make, name of the manufacturer with complete address should be mentioned against each item and equipment.
 - g. Printed condition on the back of the tender will not be binding unless separately mentioned. The tenderer must furnish complete and detailed specification supported by printed literature of the equipment offered.
2. All the Envelopes should be signed & sealed tape on all joints.
 - a. The rate should be FOR destination including Excise and PFFI. Nothing extra will be paid in such case except the VAT / CST on the cost of the equipment.
 - b. If rates are quoted Ex-Godown / Ex-Factory then Excise duty, and PFFI charge should be clearly indicated for proper rate compatibility / comparability.
 - c. Taxes, if liable extra, should be clearly indicated failing which the rate quoted in the tender will be considered as inclusive of all taxes.

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- d. There should be no alterations / corrections made in the Tender. The quoted rate should be in figures and words.
 - e. The tender should clearly indicate whether the equipment is complete in itself. If in the opinion of the tenderer, certain accessories are necessary with the type of the equipment tendered, the tenderer must quote for aforesaid accessories under the heading Extra but Essential.
3. Bidders are required to submit Earnest Money Deposit (EMD), in the form of an Account Payee Demand Draft in favour of Principal Government Co-Ed Polytechnic Raipur, for amount of Rs. 60,000/- (Rupees Sixty Thousand) along with their bids. The EMD is to remain valid for a period of 90 days. EMD of the unsuccessful bidders will be returned to them at the earliest. The EMD will be forfeited if the bidder withdraws or amends impairs or derogates from the tender in any respect within the validity period of their tender.
 4. The EMD will be adjusted towards the Performance Security in case of successful/selected tenders. The Performance Security will be forfeited in case of breach of agreement towards the supply of materials and installation - commissioning by the Tenderer (Supplier).The order shall stand cancelled and Performance Security shall be forfeited:
 - (i) If supplier expresses his inability to execute the order for the quoted items within validity period of the tender at the rate quoted in the tender and for makes / brand quoted in the tender.
 - (ii) If the complete equipment is not supplied within the delivery period mentioned in the order or within the extended period permitted.
 - (iii) If the supplier executes only part of the order.
 5. Any Equipment / Trainer breakdown must be attended within 7 days during the valid warranty period of the equipment free of cost.
 6. Payments shall be released only after the successful installation and demonstration of the machine / equipment.
 7. The training for handling the machine / equipment shall be provided by the supplier at his own cost. The tenderer may be asked to give demonstration of the equipments / software preferably at Raipur.
 8. Extension of Delivery Period and Penalty – One time extension in the delivery period may be granted at the discretion of the undersigned. The penalty at a rate of 2% per month (of the cost of the equipment) is liable to be charged for the extension of the delivery period. In addition penalty will also be levied if equipment/item (s) is received after the delivery period or is dispatched after the delivery period mentioned in the order.
 9. If defects of any kind or deviations from the specification are detected and reported to the supplier, the supplier should make replacement or rectify the defects free of cost within 30 days from the date of report, failing which the equipment will not be accepted and will be returned to the supplier at his own cost and risk, and the EMD/ Performance Security will be forfeited. In case the equipment is sent for repairs to the firm, it should be repaired within 30 days, from the

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date of receipt of equipment failing which the same will not be accepted and EMD/ Performance Security will be forfeited. However the undersigned may condone the delay in deserving cases at his discretion.

10. The undersigned reserves the right to increase / decrease the quantity of the equipment to be supplied.
11. The submission of the tender will be deemed to be the acceptance of all the terms and conditions of the tender.
12. Tender-Rates should be valid for at least Twelve months from the date of opening of the tender. The prices should be firm without variations of any kind.
13. The undersigned reserves the right to accept the lowest or any tender and also of rejecting all or any tender without assigning any reasons for the same or to split up the tender as he may deem fit.
14. Exact and earliest possible time of delivery should be indicated in the tender against each item. The delivery period given in the order will be the date of receipt of the equipment in the institute and not the date of dispatch of the equipment by the supplier.
15. All items quoted must conform to the BIS / ISO or other certifications as far as possible related to item categories.
16. No advance payment shall be made.
17. The Tenderer/Bidders shall provide TIN No. certificate having mentioned tendered item. ST Clearance certificate from the concerned authority should also be attached with the tender. In case of imported Machinery bill of clearance is required. If, tender received without these certificates shall be rejected without assigning any reason.
18. The Minimum Warranty / Guarantee period for the equipment supplied by the Supplier, will have to be mentioned clearly which should not be less than one year from the date of installation. The tenderer will be required to undertake repair / replacement of defective parts free of cost at the institution during the warranty / guarantee period.
19. All the disputes with regard to the contract of purchase of equipment etc. is subjected to Raipur, Chhattisgarh Jurisdiction only.
20. In the event of the order, supplier who are the manufacturer of the equipment will be required to furnish a certificate to the effect that they are manufacturers of such and such make whereas the authorized agent or stockist will have to furnish certificate issued by the manufacturer, importer certifying that M/S is their Authorized Agent / Reseller / Retailer under the brand name, no equipment without this certificate will be accepted.
21. The Equipment / Machinery calibrated in metric system need be quoted.
22. The tenderer shall guarantee that after sales service shall be provided as and when required.
23. The supplier will render necessary assistance, if required, in the installation of the Equipment / Machinery in the designated institute (s) / site free of charge.

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24. No offer should be made for imported item for which import license has to be arranged by the undersigned. The entire imported item will have to be delivered in the designated institute (s) and payment will be made in Rupees.
25. The payments shall be released only after satisfactory and successful commissioning and installation of the Equipment / Machinery.
26. The rate should be quoted as per given format in Annexure-II. Packing, forwarding, freight, insurance and other incidental charges should be included in the offer price.
27. In the event of any dispute arising out of the bid or from the resultant contract, the decision of the Government Co-Ed Polytechnic, Raipur shall be final.
28. The bid document /resultants contract will be interpreted under Indian laws.
29. If the successful Tenderer / Bidders, on receipt of the order, fails to execute the order within the stipulated period, in full or part, it will be open to the Govt. Girls' Polytechnic, Raipur, to recover liquidated damage from the firm at the rate of 2% of the value of undelivered goods per month or part thereof, subject to a maximum of 5% of the value of undelivered goods. Alternatively, it will also be open to the Government Co-Ed Polytechnic, Raipur, to arrange procurement of the required goods from any other source at the risk and expenses of the Tenderer / Bidder.
30. The undersigned is not responsible for any loss or damage to the equipments during transit irrespective of the fact that they are insured or not insured or delivery is ex-godown or factory station.
31. The Tenderer / Bidder is required to execute the agreement bond duly signed and witnessed to this office along with the letter confirming the acceptance of the order. It should be noted that in the event of failure to submit agreement bond duly filled in within the stipulated period, i.e. 10 days (Ten days), entire amount of Earnest Money / Performance Security is liable to be forfeited and order cancelled and if supply have been made in the meanwhile, they will be at the risk and responsibility of the supplier.
32. No claim shall be entertained in respect of interest on Earnest Money / Performance Security.
33. Inspection of the equipment will be carried out at the institution after receipt of the equipments. Any request for the inspection of the same at the firm's factory / go-down / showroom etc. will not be entertained.
34. Illustrated manuals, working instructions, trainers, software and hardware, erection / wiring details of the ordered equipments must be supplied in suitable damp proof cover.

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PERFORMA FOR TECHNICAL – BID

Format of Application (printed on the letterhead of the tenderer)

Sub: Supply of Supply of Laboratory Equipments Government Co-Ed Polytechnic Raipur

1. Name of the Firm :
2. Complete Postal Address :

 FAX No :..... Telephone No:..... Email:.....
3. Details of Tender Fee:
4. Earnest Money Deposit details:
5. Are you a manufacturer/distributor/dealer/supplier? If so attach the authority letter(s) in support of your claim.
6. Year of starting of the Firm with Registration Number & Date
7. PAN (Attach copy)
8. TIN/CST No. (Attach copies)
9. Income tax return for the last three financial years and certificate for turnover (Attach copies)
10. Number of Important Engineering Institutions served as supplier of lab equipments (Attach at least one copy of the latest Purchase Order handled by your firm with copy of the Certificate of successful completion of supply on time from the institute concerned, use additional sheets if required.

DECLARATIONS:

- (i) I/We (names of partners/Proprietors) do hereby declare that the entries made in this application form are true to the best of our knowledge and believe.
- (ii) Mr..... whose Signature is given below, is an authorized representative of this firm.
- (iii) I/We also undertake the responsibility to communicate all subsequent changes in the constitution or working of firm, affecting the accuracy of the facts, stated above.

Date:

Authorised Signatory and Seal of the Firm

Technical Bid

S.No	Name of Item along with Make	Specifications given in the Tenders	Technical Specifications which the bidder wants to supply as per Catalogue/ Brochure	Remarks

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NOTE: Attach Technical Catalogue / Brochure of the product in original for above quoted Items.

UNDERTAKING BY THE TENDERER
(To be signed and returned along with the tender)

I / We (Full Name) ,
Address..... , have read the tender rules for the supply of various stores as per tender notice **No.GPR/Equip/Tender-1/2016-17** to the Principal Government Co-Ed Polytechnic, Raipur (C.G.) and I / We, fully accept the bidding rules / terms,& condition supplied with the bidding documents.

Date:

Signature and Seal:

(Name & Full Address of the Firm)

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ANNEXURE-II

PERFORMA FOR COMMERCIAL BID (printed on the letterhead of the tenderer)

The offer should be submitted in the following format only:

Sl. No.	Name of Item along with Make	Specifications given in the Tenders	Technical Specifications which the bidder wants to supply as per Catalogue/ Brochure	Price of Equipment	Cost of equipment Inclusive all	Remarks

NOTE : All the above quoted items rate should be in confirmation with the tender conditions.

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Annexure III

Technical Specifications

(1) Applied Mechanics Lab

S.No.	Name of Equipment/Item	Specifications
1	Set up for verification of: (a) Law of triangle of forces (b) Law of parallelogram of forces (c) Law of polygon of forces	Complete set up consisting of wooden board, provided with two wall brackets and adjustable frictionless aluminum pulleys, strings, slotted weights of iron nickered, each set containing nine weight and one hanger of 50 gms
2	Jib Crane Apparatus for Verification of Lami's Theorem	Consisting of a tubular compression balance provided about an axis & fitted to the base. The tie chain has an adjustable angle bracket and fitted with a 10 Kg extension balance. Complete on wooden base with 1.2 meter Jib with weights
3	Setups for determining mechanical advantage, velocity ratio and efficiency of:	
	(a) Single Purchase Crab winch	Fitted with heavy cast iron wall brackets. The grooved wheel is of 25 cm diameter and gears are machine cut. Supplied with Weights
	(b) Simple screw	Small size, experimental model, an aluminum turned pulley of about 10 cm dia is fitted on a screw jack fitted on a 12 cm dia metallic circular base with an adjustable pulley and a linear vertical scale. Supplied with Weights
	(c) Differential wheel & axle	All metal wheel of 30 cm diameter. The axle having diameter of 15 & 7.5 cm respectively giving a ratio of 1:2:4. Arrangement to fix the apparatus on wall. Complete with snatch pulley block, cord and hooks with weights
	(d) Differential Pulley Block	Triple Pulley of Aluminum cast in one piece with diameter 38, 50 & 62 mm in metal frame and hook, weights

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4	Setup for determining coefficient of friction on horizontal plane.	Comprising of a 75x15 cm Wooden surface. Complete set with Pulley, Sliding three wooden carriages with different bottom surface (wooden, glass and iron), Weight Hanger and Weights
5	Setup for determining coefficient of friction on inclined plane.	Made of wooden board with a glass top hinged on an iron base to which a sector with graduated arc and vertical scale attached. The plane may be clamped at any angle up to 60 degree; a 5 cm frictionless pulley attached to the end by means of a clamp adjustable to any necessary position, One set of three wooden carriages with different bottom surface (wooden, glass and iron) with weights
6	Setup for verification of law of moments	Complete set up Good quality
7	Weight Boxes	(i) Set Comprising of One Hanger & Four Slotted Weights Chrome Plated (20 gm x 5 = 100 gm) (ii) Set Comprising of One Hanger & Four Slotted Weights Chrome Plated (50 gm x 5 = 250 gm) (iii) Weight Boxes - Set Comprising of One Hanger & Four Slotted Weights Chrome Plated (100 gm x 5 = 500 gm) (iv) Weight Boxes - Set Comprising of One Hanger & Four Slotted Weights Chrome Plated (250 gm x 5 = 1000 gm)

2. Physics Lab

S.No.	Name of Equipment	Specifications
1	Simple Pendulum set up	Consists of a brass bob of 1" diameter suspended by flexible and weightless stitching thread. The 2nd end of thread is tied to the rigid support. Supplied with heavy metallic base along with rod & special clamp.
2	Searl's Apparatus for Modulus of Elasticity	Good quality complete set up
3	Surface tension setup for Capillary Rise method	This apparatus comprises of a) A metal frame, on which set of capillary tubes of different internal diameters & length are clamped with the help of small metal brackets. The 9mm. rod is also attached to metal plate, so that complete clamp can be held in any stand for determining the surface

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		<p>tension of liquid by capillary rise method. It should have a cast aluminium table with adjustable stand.</p> <p>b) Travelling Microscope Base : Iron Scale : Stainless Steel Vertical Scale Main Scale : 0-150mm Vernier Scale : 0-1mm Least Count : 0.01mm</p> <p>Horizontal Scale Main Scale : 0-180mm Vernier Scale : 0-1mm Least Count : 0.01mm Eyepiece : 10x</p>
4	Poiseuille's set up for coefficient of viscosity	<p>Comprising of a capillary tube of fine bore fitted on a wooden board. The Two ends joined by a rubber tubing which is joined to two upright L-shaped glass tubes forming the manometer with scale. With the help of a pinch cork, a steady flow of water is maintained. Complete with a three limbed constant level tank of brass, one stand with rubber tube and glass parts of corning glass.</p>
5	Prism	38 mm
6	Optical Bench for focal length of convex/concave lenses	<p>Optics Bench Length : 1 m Light Source : 150 W, Incandescent light source Converging and Diverging lens Focal length : 100mm, 150mm each Diameter : 50mm each Concave and Convex mirror Focal length : 100mm, 150mm each Diameter : 50mm each Plane Mirror Dimensions (mm) : W 100 x D 75 x H 2 D-Shape lens Dimensions (mm) : W 100 x D 50 x H 20 Mirror Stand, Lens Stand, Ray Table, Viewing Screen Two Optical Pins</p>
15	Optical Bench for focal length of combination of lenses	<p>Optics bench Length : 1m Light source Output : 40W Mains Supply : 230V \pm10%, 50Hz</p>

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		Convex Lens Type : Double Convex Focal Length : 150mm Diameter : 50mm Nodal Slide Assembly Circular scale : 0-360° Linear scale : 70-0-70mm
16	Joules Calorimeter	Power Supply Input : 230V AC 10%, 50Hz Out put : 0-10V / 0-1.5A Calorimeter Material : Copper Container Volume : 140 ml Heater Coil Material : Nichrome Resistance : 5Ω Thermometer Least count : 1°C Maximum range : 110°C
17	Bar Magnets	Set of 2, Size 50 mm
18	Magnetic Needle	Size 18 mm
19	Drawing Board	Size 16"x23"

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(3) Measuring Instruments for Workshop

S.No.	Name of Equipment	Specifications
1	Micrometer Outside	up to 0 to 75 MM Least count 0.01 MM
2	Micrometer Inside	up to 25 To 150 MM Least count 0.01 MM
3	Depth Guage Micrometer	0 To 150 MM Least count 0.01 MM
4	Vernier Caliper	200 MM Least Count 0.01 MM
5	Vernier Bevel Protractor	150 MM Blade
6	Screw Pitch Guage	Good Quality
7	Vernier Height Guage ,	150 MM
8	Surface Plate	600 x 600 MM Cast Iron

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(4) Electrical Engineering & Electronics Labs		
SNo.	EQUIPMENT	SPECIFICATION
1	Norton's &Thevenin's Theorem Trainer Kit	<ul style="list-style-type: none"> • Variable power supply 12 V@ 500 mA • On panel resistor network with load resistor • Operation Manual
2	Ohms Law Trainer Kit	<ul style="list-style-type: none"> • Variable power supply 12 V@ 500 mA • On panel circuit diagram with three resistors • Two digital panel meters • Required numbers of patch cords and operating manual
3	RLC Bridge Trainer Kit	1. Measure the unknown RLC <ul style="list-style-type: none"> • Power Supply $\pm 15V$ • 1KHz sine wave generator 2. Measuring Range: <ul style="list-style-type: none"> • R : 10 to 10K • C : 0.1nf to 10 mfd • L : 100 mH to 350 mH • Operation Manual
4	Super Position Theorem Kit	One LED indicator to indicate Power input. On Board circuits -Millmans Theorem -Superposition Theorem -Max Power Transfer Theorem -Reciprocity Theorem Variable DC power supply : 0 to +15 V Variable DC power supply : 0 to +30 V All interconnections are made using 2 mm banana Patch cords. Bare board Tested Glass Epoxy PCB is used.

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		Set of 2 mm Patch cords for interconnections Operation Manual
5	Kelvin Double Bridge Kit	<ul style="list-style-type: none"> • Four arms with one unknown arm to connect the unknown resistance. • Two range selection arms provided to select the nearest range of unknown value. • Range of Measurement : 0.1Ω – 0.92Ω. • One digital Galvanometer provided to indicate the Balance conditions. • Technical Reference Manual. • Required patch Chords are provided • Input Voltage:15V dC • Output Current:1 Amps • Output Voltage:5V • Patch cards • 1A power supply adaptor • Operation Manual
6	Kirchhoff's current & voltage Law Trainer Kit	<ul style="list-style-type: none"> • Instrument comprises of Two DC IC Regulated Power Supplies 0-12V/150mA. • Two MR65 Square/Digital meters for voltage & current measurement. • Components are mounted behind the panel with printed circuit diagram. • Connections are brought with 4mm banana sockets. • Instrument Fitted in Highly Shockproof Plastics Box. • 4mm patch cords are provided with the trainer for interconnections. • Student work book will be provided with the trainer kit,

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		<ul style="list-style-type: none"> • Instrument Dimensions: 10''x8'' • Power Cords 230v, 50Hz • Operation Manual
7	Maximum Power Transfer Theorem Kit	<p>One LED indicator to indicate Power input. On Board circuits -Millmans Theorem -Superposition Theorem -Max Power Transfer Theorem -Reciprocity Theorem Variable DC power supply : 0 to +15 V Variable DC power supply : 0 to +30 V All interconnections are made using 2 mm banana Patch cords. Bare board Tested Glass Epoxy PCB is used. Set of 2 mm Patch cords for interconnections. Operation Manual</p>
8	Function generator (Sign, square, triangular, pulse)	<ul style="list-style-type: none"> • Frequency range: 1 Hz to 100 KHz in multiple steps • Functions: Sine, Square, Triangle • Separate TTL compatible output • Output amplitude: 0 to 10 V in steps • Impedance: 50 Ohm approx. • Accuracy: +/- 3% • Operation Manual
9	RLC Circuit - Electrical Based	<ul style="list-style-type: none"> • Built in Resistance, Choke and Condenser • Built in Voltmeter and Ammeter • Provision to see the waveform in Oscilloscope <p>Operation Manual</p>

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10	Lamp Load	<ul style="list-style-type: none"> • SINGLE PHASE with measuring Ammeter, Voltmeter and Selector Switch • Range 2KW - 8A
11	Portable digital multimeter	Accuracy DC Voltage 200mV/2V/20V/200V $\pm(0.5\% +3)$ 600V $\pm(0.8\% +5)$ AC Voltage 200V/600V $\pm(1.2\% +10)$ DC Current 20 μ A/200 μ A/2mA/20mA/200mA $\pm(1.0\% +3)$ 10A $\pm(3.0\% +10)$ Resistance 200 Ω /2K Ω /20K Ω /200K Ω $\pm(0.8\% +2)$ 2M Ω $\pm(1.0\% +5)$ Feature Display 2000 counts, 3 ∞ digit LCD, Operation Manual
12	Megger (insulation tester)	Digital Insulation Tester Auto range, 3999 Counts, 250V, 500V, 1000V DC, 40GOhm With Backlight & Overload Protection, with Tmer, Operation Manual
13	Energy meter (analog single phase)	Energy meter Single Phase Energy Meter Multi function, 10A
14	Portable type (analog) wattmeter	<ul style="list-style-type: none"> • Three phase three element four wire LPF model • 600 volt, 2.5A/5A or 5A/10A
15	Portable type Voltmeter	<ul style="list-style-type: none"> • Triple Range 75/150/300V • Accuracy 2% or Better
16	DC Motor Study kit	<ul style="list-style-type: none"> • DC Machine With Loading Arrangement • Type : DC Shunt Rating : 1 HP , RPM : 1500 (No Load) • CONTROL PANEL made of Powder Coated Metal body with complete safety features like MCB etc • Meters used Voltmeter (MC) : 300 V, Ammeter (MC) : 1 A, Ammeter (MC) : 5/10 A • Tachometer : 20,000 RPM • BUILT IN DC SUPPLY • Speed Control of DC Shunt Motor by Field Current and Armature Voltage Control • Load Characteristics of DC Shunt Motor

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		<ul style="list-style-type: none"> • Study of self excited DC Shunt Motor Operation Manual
17	2HP Induction Motor with Loading Arrangement	<ul style="list-style-type: none"> • AC Squirrel Cage Induction Motor, 2 HP, 415 Volts AC, Three Phase, 1440 RPM, 50 Hz, TEFC, Insulation class 'B', frame 112 size, Horizontal foot mounted, Educational type Bakelite insulated banana terminals 30 Amp. With colour code provided on terminal base. Six terminals are brought out on terminal box. • CONTROL DESK: All accessories connected with internal wiring ferrules. <p>INSTRUMENT PANEL BOARD CONSISTING OF METERS & ACCESSORIES :</p> <ol style="list-style-type: none"> 1. Voltmeter MI Type selector switch OFF / RY / YB / BR 2. Ammeter MI 3. Suitable ISI Mark DOL Starter 3 Phase 4. TP-MCB 16A, 415V ISI Marked mounted on panel board 5. Indicating lamp for incoming, outgoing 12 mm LED Type 6. HRC Fuses 16A, 440V, Bakelite Type Base with top <p>Operation Manual</p>
18	Wattmeter 150-300/5-10A	<ul style="list-style-type: none"> • Element Dynamometer Type for 3-phase 3 wires Balance & Unbalance Load • Class 1.5%
19	Wattmeter 150-300-600/10-20A	<ul style="list-style-type: none"> • Element Dynamometer Type for 3-phase 3 wires Balance & Unbalance Load. Class 1.5% • Measuring Range :- 0.5 (lead) – 1.0 (unity) – 0.5 (lag) Ranges of P. F. Meter : Current range :- 5 Amp Voltage Range :- 110V or 440 Volts

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20	STAR Connection Trainer kit	<ul style="list-style-type: none"> • Built in Built in Lamp Load with Star Configuration • External Variac - single Phase /10A • Built in Four Pole MCB
21	Different type of resistance, inductances and capacitors, Ammeter, Voltmeter, Ohmmeter, DC Power supply, Rheostats, Solenoid, Galvanometer	Different ratings/ranges
22	DELTA Connection Trainer kit	<ul style="list-style-type: none"> • Built in Lamp Load with Delta Configuration • External Variac - single Phase /10A • Built in Four Pole MCB
23	Clipper & Clamper trainer kit	<ul style="list-style-type: none"> • Power Supply $\pm 15V$ • Clipper Circuit Using 741 OP-Amp • Clamper Circuit Using 741 OP-Amp • Wood Box (Closed Type) • +ve and –ve clipping • +ve and –ve clamping • Input : 230V, AC Operation manual
24	Astable & Monostable Multivibrator kit	<ul style="list-style-type: none"> • Using IC 555 • Single pulse Switch 5V • Input 230VAC / 50Hz • DC 5V Operation Manual
25	Integrator & Differentiator kit	<ul style="list-style-type: none"> • Power supply : $\pm 15V$, +5V • Inbuilt Variable Square wave generator • Independent circuit for integrator and differentiator • Input : 230V Operation Manual

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26	Zener diode voltage regulator	<ul style="list-style-type: none"> • For study of regulated power supply based on zener diode • regulated power supply • Operation manua
27	Controlled Bridge Rectifier	<ul style="list-style-type: none"> • 1Phase Isolation Transformer • Primary 230V • Secondary (15 – 0 – 15)V • SCR • Filter Circuit
28	Half Wave , Full Wave Rectifier & bridge rectifier	<p>Capacitor Bank consisting of Two Capacitors of 220μf each. Center Tapped Transformer Secondary providing 12V-0-12V. One LED indicator to indicate Power input.</p> <p>On-board Circuits</p> <ul style="list-style-type: none"> - Half wave Rectifier, - Full wave Rectifier, - Bridge Rectifier - Filter Circuit <p>All interconnections are made using 2 mm banana Patch cords. Bare board Tested Glass Epoxy PCB is used. Set of 2 mm Patch cords for interconnections. Operation Manual</p>
29	RC Phase Shift Oscillator	<ul style="list-style-type: none"> • Power Supply +15V • RC Phase Shift Network • Feed Back Amplifier Circuit Using BC 108 • Operation Manual
30	Flip Flop Trainer Kit	<ul style="list-style-type: none"> • Power supply : 5V/1A • 2 Nos. of Logic input switches with indicator • Sine wave generator • Mono pulse using 74121

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		<ul style="list-style-type: none"> • 6Nos. of output status indicator • Input : 230V, AC Operation Manual
31	Multiplexer & Demultiplexer Trainer Kit	<ul style="list-style-type: none"> • Power supply : $\pm 5V$ • Using CMOS 4051 • 8 analog inputs & outputs • Input Signal generator (Sine, Square and Triangle) • Address input manually and Clock generator • Input : 230V, AC Operation Manual
32	Colpitts and Hartley Oscillator	Fixed DC supply of +5V/500mA One LED indicator to indicate Power input On-board Circuits <ul style="list-style-type: none"> - Hartley Oscillator circuit - Colpitt's Oscillator circuit - Blocking Oscillator circuit - Clapp Oscillator circuit All interconnections are made using 2 mm banana Patch cords. All ICS are mounted on IC Sockets. Bare board Tested Glass Epoxy PCB is used. Attractive injection molded Wooden enclosures of Light weight Australian Pine wood . Set of 2 mm Patch cords for interconnections. Operation Manual
33	RC Coupled Amplifier	<ul style="list-style-type: none"> • DC supply 12V @ 500mA • On panel circuit diagram of RC coupled amplifier • Required numbers of patch cords and operating manual Operation Manual

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34	Function Generator	<ul style="list-style-type: none">• Frequency range: 1 Hz to 100 KHz in multiple steps• Functions: Sine, Square, Triangle• Separate TTL compatible output• Output amplitude: 0 to 10 V in steps• Impedance: 50 Ohm approx.• Accuracy: +/- 3%• Operation Manual
35	Characteristics of PN Junction Diode With Meters	<ul style="list-style-type: none">• Built-in power supply DC +5 V @ 500 mA• Variable DC supply 0 to 15 V @ 500 mA• On panel diodes IN 4007, OA79 & BY127• Two dual range digital panel meters• Required numbers of patch cords and operating manual Operation Manual
14	Demorgans Theorem Kit	Built in DC Power Supplies, Pulse Generator, Pulser Switches, Data Switches, Logic Probe, Digital Display, TTL/CMOS Mode Selector, and LED Display Operation Manual
15	Logic Gates trainer Kit	Built-in power supply DC +5 V @ 500 mA, Two input AND, OR & NOT gates using diodes & transistors Operation Manual

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Mechanical Engineering

Fluid Mechanics Lab

S.No.	Name of Equipment	Specifications
1	U-Tube Manometer,	Glass tube 50 mm, Complete set up for demonstration of pressure measurement, wall or stand mounted
2	Differential Manometer	Glass tube 50 mm, Complete set up for demonstration of pressure measurement, wall or stand mounted
3	Venturimeter setup for measurement of discharge	Manometer Fluid : Mercury (Hg) Sudden Enlargement : From 15mm to 25mm Sudden Contraction: From 25mm to 15mm. Bend: ½" Elbow: ½" Ball valve: ½" Gate valve: ½" Water Circulation: FHP Pump, Crompton makes. Flow Measurement: Using Measuring Tank with Piezometer, Capacity 25 Ltrs. Pressure Drop Measurement: Differential Manometer Sump Tank: Capacity 50 Ltrs. Stop Watch: Electronic. Control Panel Comprises of Standard make On/Off Switch, Mains Indicator, etc.
4	Orificemeter setup for measurement of discharge	Manometer Fluid : Mercury (Hg) Sudden Enlargement : From 15mm to 25mm Sudden Contraction: From 25mm to 15mm. Bend: ½" Elbow: ½" Ball valve: ½" Gate valve: ½" Water Circulation: FHP Pump, Crompton makes.

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		<p>Flow Measurement: Using Measuring Tank with Piezometer, Capacity 25 Ltrs. Pressure Drop Measurement: Differential Manometer Sump Tank: Capacity 50 Ltrs., made of Stainless steel Stop Watch: Electronic. Control Panel Comprises of Standard make On/Off Switch, Mains Indicator, etc.</p>
5	Setup for Bernoulli's Theorem	<p>Test Section : Material Acrylic(One Piece) Piezometer Tubes : Material P.U. Tubes (9 Nos.) Water Circulation : FHP Pump, Crompton/Sharp make Flow Measurement : Using Measuring Tank with Piezometer, Capacity 25 Ltrs. Sump Tank : Capacity 70 Ltrs. Inlet Tank : Capacity 20 Ltrs. Stop Watch : Electronic Control Panel comprises of Standard make on/off Switch Mains Indicator Etc. Tanks should be made of Stainless steel.</p>
6	Setup for Friction losses through Pipes	<p>Manometer Fluid : Mercury (Hg) Bend: ½" Elbow: ½" Ball valve: ½" Gate valve: ½" Water Circulation: FHP Pump, Crompton makes Flow Measurement: Using Measuring Tank with Piezometer, Capacity 25 Ltrs Pressure Drop Measurement: Differential Manometer, Sump Tank: Capacity 50 Ltrs made of stainless steel, Stop Watch: Electronic</p>
7	Setup for losses due to enlargement & contraction in pipes	<p>Manometer Fluid : Mercury (Hg) Sudden Enlargement: From 15 mm to 25 mm Sudden Contraction: From 25 mm to 15 mm Bend: ½" Elbow: ½" Ball valve: ½" Gate valve: ½"</p>

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		Water Circulation: FHP Pump, Crompton makes Flow Measurement: Using Measuring Tank with Piezometer, Capacity 25 Ltrs Pressure Drop Measurement: Differential Manometer Sump Tank: Capacity 50 Ltrs Stop Watch: Electronic
8	Setup for discharge through Open Channel	Channel Test Section: Size 600 x 250 x 180 mm Notches : Material Brass Rectangular Notch 45° V Notch 60° V Notch Pointer Gauge: With Vernier scale Water Circulation: FHP Pump Crompton makes Flow Measurement: Using Measuring Tank with Piezometer, Capacity 25 Ltrs Sump Tank: Capacity 50 Ltrs, made of stainless steel Stop Watch: Electronic
9	Working Models of:	
10	(a) Reciprocating Pump	Cut-sectional Model of Actual pump suitably sectioned to demonstrate the working of Pump. Mounted on Wooden Base
11	(b) Centrifugal Pump	Cut-sectional Model of Actual pump suitably sectioned to demonstrate the working of Pump. Mounted on Wooden Base
12	(c) Submersible Pump	Cut-sectional Model of Actual pump suitably sectioned to demonstrate the working of Pump. Mounted on Wooden Base

Note: Combined set up including venturimeter & orificemeter for measurement of discharge can also be offered.

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Thermal Engineering Lab

<u>S.No.</u>	Name of Equipment	Specifications
1	Cut section Models:	
	i. Lancashire boiler	Good quality self – contained sectional model for demonstration purpose complete with deadweight safety vante, manhole, mudhole. Chock valve high steam a low water safety valve, steam and water gauges, regulating draught doors, dampers with counter weights and chimney.
	ii. Babcock and Wilcox boiler	The model is fitted with stop valve, safety valve, water gauge, steam gauge. Manhole, mudhole, regulating draught door, damper with counter weight and chimney. Seating and brick work shown
	iii. Petrol Engine – 2 & 4 stroke	Made from actual engine, Cut – section model showing internal constructional details, demonstrating the working of various parts and accessories, provided with flywheel and mounted on sturdy stand, manually driven, multicoloured for ease of demonstration
	iv. Diesel Engine – 2 & 4 stroke	Made from actual engine Cut – section model showing internal constructional details, demonstrating the working of various parts and accessories, provided with flywheel and mounted on sturdy stand, manually driven, multicoloured for ease of demonstration
	v. Fuel Pump	Made from actual Fuel Pump, Suitable Cut-sectioned and Multicoloured for ease of demonstration. Mounted on Sturdy Base
	vi. Fuel Injector	Made from actual Fuel Injector, Suitable Cut-sectioned for ease of demonstration. Mounted on Sturdy Base
2	Two stage reciprocating compressor test rig	Compressor : Double Stage, Double Cylinder.Capacity 6.9 CFM max. Working Pressure : Max. 7 kg/cm ² Motor : 2 HP Crompton/Standard make, Swinging Field type Spring Balance : 10 kg, Dial type Flow Measurement : Orificemeter with Manometer Temperature Measurement : RTD PT-100 type sensor (4 nos.) Air Tank : Capacity 150 Ltrs. with safety valve, shut off valve, Pressure Gauge : Bourdon Type. RPM measurement : RPM Indicator with Proximity sensor.

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		MCB : For overload protection
3	Separating & throttling calorimeter	Complete self – contained set up for determining dryness fraction of steam, set up consist of a separating and throttling calorimeter, a steam generator

Automobile Engineering Lab

SNo.	Items	Specifications
	Working Models of:	
	(i) Water Cooling System	made out of original used parts, suitably sectioned to demonstrate the internal construction details like radiator, fan blade, water pump and hose showing the minute information, and working of the same, the model will be suitably painted and mounted on a navopan wooden base
	(ii) Air Cooling System	made out of original used parts, suitably sectioned and arranged to demonstrate the internal construction details showing the, condenser, radiator, its pipe lining, blower/fan assembly etc., the model will be suitably painted and mounted on a sturdy base.
	(iii) Ignition System	demonstration working unit made out of original used parts such as switches, ignition coil, Distributor, spark plugs and a battery for power source, with necessary wiring connections. By switching on the switch and by giving rotation to the Distributor, Sequential Sparks in the spark plugs can be demonstrated.
	(iv) Lighting System	demonstration working unit made out of original used parts such as switches, Lights, Indicators and a battery for power source, with necessary wiring connections. By switching on the switch Lighting System can be demonstrated.
	(v) Electrical System	demonstration working unit made out of original used parts such as switches, Lights, Indicators etc and a battery for power source, with necessary wiring connections.
	(vi) Differential Gear	suitably sectioned model to show the action of Differential gear box and

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		Brake drums in Rear axle. A Crank handle is provided to demonstrate the model. The whole model is mounted on a sturdy base.
	(vii) Braking system – Mechanical, Pneumatic, Hydraulic	made out of Original parts, Suitably sectioned to demonstrate the working of brakes, the entire system will be mounted on a sturdy base
	Toolkit	Complete toolkit containing various size spanners, screw drivers, pliers etc.

Lab Requirement for Civil Engineering

Surveying Lab

S.N.	Name of Equipment	Specifications
1	Metric chain	Measuring Chain of galvanized mild steel wire 4mm in diameter. The ends of the chain are provided with brass handles. Suitable Brass Tallies as per specifications. Each chain should be provided with 10 nos of M.S.Arrows of 4 mm diameter bar and 40 cm. Link Size : 200 mm, Length : 20 m
2	Engineer's Chain	Measuring Chain of galvanized mild steel wire 4mm in diameter. The ends of the chain are provided with brass handles. Suitable Brass Tallies as per specifications. Each chain should be provided with 10 nos of M.S.Arrows of 4 mm diameter bar and 40 cm. Link Size : 1 Ft, Length : 100 Ft
3	Cloth Tapes	Cloth or Linen Tape with metallic strings for durability. Hard Acrylic case, Length 30m
4	Steel Tapes	Steel tape of 13 mm width, Hard acrylic case, Length 30m
5	Invar Tapes	Made of alloy of steel and nickel, 6mm wide . Length 30m
6	Arrows	M.S.Arrows of 4 mm diameter bar and 40 cm.
7	Ranging Rods	Made of steel conduit pipe 31mm dia. fitted with iron shoe, duly enamel painted. Length : 2m
8	Offset Rods	Made of Steel Square Conduit pipe, duly enameled painted Red & white. Fitted with strong solid iron shoe at the bottom. Length : 2m
9	Plumb bob	Made of Brass , 38 mm
10	Line Ranger	Prism Type 15mm Dia

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11	Open cross staff	Size 4", Open Type having four vanes at right angles, Complete in wooden box with metallic pole.
12	French cross staff	Made of Brass Octagonal Tube with Teakwood Pole 1.5m Long
13	Optical square	Circular type, made of brass, fitted with double reflecting mirror right and left to 90 degree, complete in box
14	Prismatic Compass	Fitted with quality agate stone. Provided with an Aluminum floating circle graduated to read 30 minutes (0.5 degree). An automatic lifter along with reflecting mirror is fitted on the sight vane. Packed in PVC case. Supplied with Aluminum (Metallic) Tripod Stand in a canvas cover. Size : 150 mm
15	Surveyor's compass	Made of Brass, Size 100mm dia. with metal circle graduated to full degree with two bubbles and with bar needle fitted with real agate stone to give high accuracy & precision bearing reading, Supplied in PVC case. Supplied with Aluminum (Metallic) Stand in canvas cover.
16	Plane Table with Accessories	Drawing Board 75cmX60cmX2cm made of seasoned pine wood/fire wood and braced with teak wood battens fitted with brass screws and washers in slots complete with metallic disc of 160 mm dia at base and confirming to BIS2539:1963; accessories comprising of magnetic trough compass confirming to BIS-1764:1961, spirit level 15 cm long, plumb bob , 28cm long brass U-fork, alidade 45 cm long made of brass, one sided beveled edged wooden stand with metallic head and shoes
17	Dumpy Level	Size 300mm (12"), Internal focussing, Erect-Image. The stadia diaphragm is provided with two vertical lines to make the staff straight and accurately divided into 1:100. fitted with Compass having floating ring to read 30 min. with sliding prism, fitted with 45 sec. Accuracy bubble on the top of the telescope and sensitive cross bubble is fitted for quick setting the instrument. The instrument is Made of Complete Brass and Gunmetal. The eye piece is of a helical focussing type and is very convenient for the instrument in focussing the diaphragm and is free from backlash. Supplied along with all standard accessories in a highly polished wooden box. Supplied with Aluminum (Metallic) Telescopic Tripod Stand in carrying canvas cover.
18	Auto level	Length : 215mm Magnification : 24x Objective Aperture : 32mm Resolving Power : 4 Sec Field of View : 1 Deg 25 Min Minimum focus : 0.2 m Image : Erect

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		Stadia Constant : 0 Stadia ratio : 100 Accuracy : 2.0 mm Compensator: Magnetic Damping System
19	Solid Staff	Made of Wood, 25mm Thick, Width 75mm, 5 mm Division, Iron Shoe at Bottom, Length : 3m
20	Folding Staff	Made of Aluminum, Length 4 m in two folds, Width 75mm, Thickness 18mm
21	Telescopic Staff	Made of Fully Aluminium body, telescopic type in Three sections, accurately printed divisions numerical in RED and BLACK on WHITE ground graduations and push button automatic locking system with detachable circular bubble at the back. Supplied in canvas cover, Length : 4 m in four folds
22	Target Staff	Attachment to be fixed in Telescopic Staff, Least count 1 mm
23	Vernier Theodolite	Telescope: Length 150 to 210mm Magnification 25 to 30X Resolving Power 1.3mm Minimum focusing distance 1.5m Stadia Multiplying Constant-100 Additive Constant-0(zero) Image-Erect Accuracy-5mm/Km Sensitivity of vertical circle-200seconds/2mm Horizontal circle-100 to115mm Graduation-20minutes Vernier-20sec Vertical Circle -100 to 115mm Graduation-20 minutes Vernier -20sec With optical plummet, with telescope level and plate level supplied with all standard accessories as per BIS 2988-1965 including Tripod stand & Box
24	Electronic Theodolite	Angle measurements (Hz, V) Precision 2" Display resolution 1" or 5" Display units DEG (360° 00' 00"), GON (400), MIL (6400), V / % Telescope Magnification 30x

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		<p>Objective aperture 45 mm (1.7 in) Minimum focusing distance 1.35 m (4.43 ft) Stadia multiplication factor/constant 100/0 Compensator System Automatic vertical compensator, User set On/Off Working Range $\pm 3'$ Operation Display Double side large character back-lit LCD Keys 6 one touch button functions Laser plummet Type Visible laser point Accuracy 1.5 mm at 1.5 m instrument height Environmental conditions Operating temperature $-20^{\circ}\text{C} \sim +50^{\circ}\text{C}$ Protection to dust and water dust and water resistant</p>
25	Total Station	<p>Angle measurements Accuracy 2" Display resolution 0.1" Method Absolute, continuous, diametrical Compensation Quadruple axis Distance measurements Prism : 3,500 m / 2 mm + 2 ppm Long range : 10,000 m / 5 mm + 2 ppm Typ. meas. time : 1 s Reflectorless : 1,000 m / 2 mm + 2 ppm Interface Keyboard : Full alphanumeric (Identical Dual Display) Display : 3.5" Quarter-VGA colour touchscreen (320 x 240 pixel), 10 lines x 30characters, self heating, illuminated Data recording Internal memory : 50,000 pts Interface : USB, serial & external power</p>

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		Removable memory : USB memory stick Bluetooth : Device Class 1 Power supply Internal battery : Removable Li-Ion 4.4 Ah / 7.4 V Operating time : 36 h (continuous angle), 9 hours (continuous distance) Plummet Type Laser point, adjustable brightness Accuracy 1.5 mm at 1.5 m instrument height Operating system Windows® Embedded CE
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Material Testing Lab

S.N.	Name of Equipment	Specifications
1	I.S. Sieves Coarse grain analysis	Dia 30 cm Brass frame with perforated round or square holes as per IS mesh No. 4.75 mm, 5.60 mm, 6.3 mm, 8 mm, 10 mm, 11.2 mm, 12.5 mm, 16 mm, 20 mm, 22.4 mm, 25 mm, 31.5 mm, 40 mm, 50 mm, 63 mm, 80 mm, 100 mm with Lid and Cover
2	Fine grain analysis	Dia 20 cm Brass frame with perforated round or square holes as per IS mesh No. 4.75 mm, 2.38 mm, 1.18 mm, 75 mic, 150 mic, 300 mic, 600 mic with Lid and Cover
3	Sieve Shaker	Carries upto 7 sieves of 150mm or 200mm diameter, driven by a ¼ H.P. Motor through a reduction gear immersed in oil. The sieve table does not rotate but is inclined from the vertical axis and the direction on inclination changes progressively in clockwise direction. If the stop pin below the table is removed, the shaker can have a rotary motion. In addition to this gyratory motion of the table, there is an upward and downward movement ensuring that each square cm of the sieve is utilized. A pair of rods and a holder are supplied. The holder can be fixed on the top of the upper most sieve, and thus the sieve set is firmly held. Suitable for operation from 230 V, 50 Hz Single Phase A.C. Supply.
4	Bulk Density Test Apparatus	consists of a Calibrated Cylindrical Measures of sheet iron with handles. Capacities available 3 litres, 5 litres, 7 litres, 15 litres & 30 litres . Complete with One Tamping Rod 16mm dia x 600mm long both ends rounded

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5	Workability Test Apparatus “Slump Cone”	consists of one slump cone with handles and foot pieces. The slump cone has internal dimension 20 cm dia at base 10 cm top dia and 30 cm height foot pieces can be fixed to the clamps on the base plate. One graduated steel rod 16mm dia x 600mm long Rounded at both ends and graduated in mm is also supplied.
6	Vicat’s Apparatus	consists of a metallic frame bearing a freely movable and with a cap at top, one vicat mould and glass base plate and one set of needles one each initial needle, final needle and consistency plunger

Soil Mechanics Lab

S.N.	Name of Equipment	Specifications
1	Pycnometer	Comprises a 1 kg. glass jar with brass cone. Locking ring and rubber seal.
2	Density Bottle	<ul style="list-style-type: none"> • 50 ml density bottle with capillary vent leak proof stopper and As per IS: 2720 part –I suitable for determination of specific gravity of fine soils. • 100 ml density bottle with capillary vent leak proof stopper and As per IS: 2720 part –I suitable for determination of specific gravity of fine soils.
3	Core Cutter Apparatus	A cylindrical cutter is used to extract a sample of the soil with the help of a dolly and rammer. From the weight, density and the moisture, and dry density of the soil is ready calculated. It consists one each of: cylindrical core cutter made of steel, 127.3mm. Long and 100mm internal diameter. Steel dolly, 25mm high with a lip to enable it to be located on top of the core cutter, rammer with detachable steel rod
4	I.S. Sieves	Brass frame with perforated round or square holes as per IS mesh No. 4.75 mm, 2.38 mm, 1.18 mm, 75 mic, 150 mic, 300 mic, 600 mic with Lid and Cover
5	Soil Hydrometer	Clear transparent glass having uniform clarity throughout the upper end on which density scale is engraved. The scale range is 0.995 to 1.030 0 density (gms./cc) at 27°C smallest division on the scale is 0.0005.
6	Liquid limit Test Apparatus	consists of a brass cup held on an adjustable bracket. The cup can be adjusted for a fall of 1 cm and can be raised and dropped on a rubber base of standard hardness by cam action. Complete with one Casagrande grooving tool, one ASTM grooving tool and a height gauge block.
7	Plastic Limit Test Apparatus	consists of one each : Glass plate 20cm x 15cm having round ends, Brass or stainless steel rod 3mm dia x 150mm long, Flexible spatula 15 cm, Set of 6 moisture containers, Porcelain basin 150mm dia, Plastic wash bottle 500ml

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8	Shrinkage Limit Test Apparatus with all accessories	Set consists of one each - Porcelain evaporating dish, Shrinkage dish, Glass cup, Perspex plate with three metal prongs, Flexible spatula 100mm, Glass cylinder, 25ml x 1ml, supplied without mercury
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Highway Engg. Lab/ Transportation Lab

S.N.	Name of Equipment	Spercifications
1	IS Sieves Coarse grain analysis 30 cm dia	Brass frame with perforated round or square holes as per IS mesh No. 4.75 mm, 5.60 mm, 6.3 mm, 8 mm, 10 mm, 11.2 mm, 12.5 mm, 16 mm, 20 mm, 22.4 mm, 25 mm, 31.5 mm, 40 mm, 50 mm, 63 mm, 80 mm, 100 mm with Lid and Cover
2	Fine grain analysis 20 cm dia	Brass frame with perforated round or square holes as per IS mesh No. 4.75 mm, 2.38 mm, 1.18 mm, 75 mic, 150 mic, 300 mic, 600 mic with Lid and Cover
3	Specific Gravity Test Apparatus	Complete Set comprising a. Electronic balance, capacity 5 kg. Least Count 0.1gm, provision is made in this balance to suspend density basket under material pan. This balance is mounted on an angle iron frame stand. b. Density basket. c. Air tight container to suspend density basket. d. GI Tray of area not less than 650 cm sq. e. Absorbent cloths 75cm x 45cm.
4	Flakiness and Elongation India Apparatus	Consists of a frame with a sliding panel. The Panel has slots of Different Standard Lengths and Widths accurately Cut.
5	Flash and fire point Test Apparatus	The apparatus consists of: a. Cleveland Flash Cup, brass, with an Insulated Handle b. Gas Test-Jet Assembly, correctly positioned and pivoted from a Cast Cup Platform which is fixed to a Heating Bath. c. Energy Regulator, to regulate the rate of rise in temperature, 220 V, 50Hz, Single Phase, AC Supply
6	Softening point Test for Bitumen/Tar	The apparatus consists of steel bracket with a sliding plate support. That support has two holes of 10mm dia on which a ring and ball guide can be kept. A central hole on this plate is for inserting thermometer. Supplied with a

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		glass beaker approximate 600ml, high and a hand stirrer and 2 Nos. 9.5mm dia steel balls.
7	Viscosity test Apparatus for Bitumen/Tar	Standard Tar Viscometer, Electrical Heating with Immersion Heating Elements and Dimmerstat for controlling the temperature. Suitable for operation on 220 V, 50 Hz, single phase, AC supply. Complete with 10 mm cup and valve