Gautam Buddha University

Yamuna Expressway, Greater Noida, Gautam Budh Nagar-201308 (UP)

SCHOOL OF ENGINEERING

TENDER FOR PHYSICS LABORATORY EQUIPMENTS

Tender	**Supply, installation, commissioning and trial operations of the instruments/equipment for Engineering Physics Laboratory**
Document Sale from:	**31st May 2010 from 09:00 a.m.**
Document Sale to:	**09th June 2010 upto 01:00 p.m**
Bid Submission Date:	**09th June 2010 upto 03:00 p.m.**
Technical Bid Opening Date:	**09th June 2010 at 03:30 p.m.**
Earnest Money:	Rs.52,210/- (Rupees Fifty Two Thousand Two Hundred & Ten Only)
Completion Period:	Four to six weeks from date of purchase order
Bid System	Two Bid System : 1) Technical Bid and 2) Financial Bid
Technical Bid Shall Contain	i. Technical specifications of each equipment ii. All documents in support commercial terms & conditions and eligibility criteria.
Financial Bid	The Financial Bid shall contain rate schedule only. The price shall be in words as well as in numeric numbers.

GENERAL TERMS AND CONDITIONS

1. Detailed information about equipments, specifications are available in tender document or downloaded from the University website www.gbu.ac.in.
2. Offer should be submitted in two parts, in two separate envelops; 1**) Technical Bid** and **2) Financial Bid**. These two envelops shall be sealed in a common cover and addressed/sent to **"Registrar, Gautam Buddha University, Gautam Budh Nagar -201308 (U.P**) mentioning "**Tender against Tender Notification dt. 30-05-2010, Name of supply: Physics Laboratory Equipments**" so as to reach us on or before last day of submission.
3. The Technical Bid and Financial Bid should be duly filled up (preferably type written) and should clearly mention the features offered by the bidder against each specification.
4. The **Technical Bid** shall contain all documents in support of offered equipment specifications, commercial terms & conditions and eligibility criteria.
5. The **"Financial Bid"** shall contain rate schedule only. The price shall be in words and numeric numbers both.
6. **Eligibility Criteria**: All the participating suppliers/firms or principal manufacturer-should meet the following qualifying criteria. The firm should be a registered supplier for such supplies, with at least 10 years existence. Following documents are required to be submitted with Technical Bid, to qualify eligibility criteria:
    (a) Sales Tax/VAT registration certificate.
    (b) PAN and TIN number should be mentioned.
    (c) The firm should have 5 years of experience of supplying & installation for similar laboratory equipments to preferably IIT's, NIT's, Central Universities or Institute of National repute. The Supplier should submit the certificate/proof to justify the experience.
    (d) Firm should have completed minimum three similar supply and installation assignments of worth more than Rs. 30.0 lakh each, in last three years.
    (e) The firm should have minimum average annual turn-over of Rs. 200 Lakhs for previous five financial years. Audited balance sheet for previous five financial years should be submitted.
    (f) Authorized dealer certificate from Original Equipment Manufacturer.
    (g) Names of branch offices & service centers after sales arrangements.
    (h) Full technical specifications for all the equipment shall be submitted along with the Technical bid. Offers without proper technical specifications will be rejected.
    (i) Earnest Money Deposit (EMD) **as Rs.52,210/- (Rupees Fifty Two Thousand Two Hundred & Ten Only)** is required to be submitted in the form of DD/Banker's Cheque drawn in favour of "Finance Officer, Gautam Buddha University" payable at "Greater Noida" along with the Technical Bid. If supply is not made within the prescribed period EMD would be forfeited.

(j) Authorized signatory should sign on all pages. Bids without authorized signature will be rejected.
(k) Commercial terms and conditions.
(l) Bidders Profile Performa (Format enclosed).

7. Offer should be sent in a sealed envelope, submitted either in person or by post on which name and address of the supplier/firm shall be written. Tenders received through mails or FAX will not be considered.
8. The tenders will be opened on scheduled date and time in the presence of the vendors present with authorization letter from the respective companies/firms. Suppliers intending to attend the tender opening should intimate in advance.
9. **THE RATES QUTOED SHOULD BE F.O.R. Gautam Buddha University (Gautam Budh Nagar, UP)** inclusive of all charges e.g. packing, forwarding local taxes, railway freight, transit insurance, for outside firms and free delivery at University stores in the case of local firms. Where there is no mention regarding delivery period in the quotations or where the items are offered ex-stock, the firms will be required to supply goods within one month's time.
10. The equipment should have USEPA/International/National validation certificates, wherever applicable.
11. The cost of the tender is Rs.1000/- inclusive of taxes (Nonrefundable) and it shall be paid in the form of DD/Banker's Cheque drawn in favour of "Finance Officer, Gautam Buddha University" payable at "Greater Noida". In case the tender documents are downloaded from the website, the cost shall be paid at the time of submission of the tender.
12. The tenderer must be either sole manufacturer of the instruments /equipment or the authorized agent/representative of the manufacturer. In the case of agent/representative, certified copy of the agency/authorization issued by the manufacturer should be enclosed with the tender.
13. The EMD of the successful tenderer will be refunded one month after completion of the supply and installation of the equipment to the satisfaction of the Gautam Buddha University. The EMD of the unsuccessful tenderers will be returned to the concerned immediately after finalization of the tenders.
14. Tenders should preferably be given only for those articles which are available ex-stock. Other items should be quoted separately giving the delivery period. Rates of imported goods be quoted excluding custom duty, as this University is exempted from payment of custom duty (by letter of Deptt. of Science & Technology, Min. of Sc. & Tech., GOI, Delhi).
15. Detailed specifications and "Make" of each item should be clearly given supported by the illustrated pamphlets wherever possible. Quotations without specifying the make and other particulars may be rejected. The payment will be made after the goods have

been received, opened, checked and found to be in order up to our entire satisfaction. The accessories included in the equipment should also be clearly mentioned.

16. Losses or damage in transit will be in to the account of the Supplier. The supplier may, if he so desires, get the goods insured and include such charges in the tendered rate.

17. Offered rates should be valid at least for two months from the last date of receipt of tenders.

18. All legal proceedings, if necessity arises to the University may be any of the parties (University or Contractor/Supplier) shall have to be lodged in the courts situated at Gautam Budh Nagar and not elsewhere.

19. (a) The Penalty Clause is as under :-

    Should the tenderer fail to deliver the goods within the period specified in the tender form, the Competent Authority may, at his discretion, allow an extension in time subject to recovery from the tenderer as agreed liquidated damages, and not by way of penalty, a sum equal to the percentage of the value of tender amount which the tenderer has failed to supply for period of delay as stated below :-

i.	Delay up to one week	1%
ii.	Delay exceeding one week but not exceeding two weeks	2%
iii.	Delay exceeding two weeks but not exceeding one month	5%
iv.	Delay exceeding one month	5% for each month and part there of subject to maximum 10%

    (b) In case of failure to supply the goods within the prescribed time and in accordance with the specifications give in the Quotations, the University shall be free to cancel the order.

20. Successful bidder will have to furnish Performance Security @ 10 % of the equipment cost, in the form of Bank's Guarantee from any Nationalize Bank or F.D.R. The security shall be refunded after a period of one year from the date of satisfactory installation or expiry of warranty period, whichever more.

21. The price quoted should be in Indian Rupees. 100% payment will be made only after installation and commissioning. No advance payment will be made.

22. No revision of price bid will be allowed once the price bids are opened.

23. No increase in price will be allowed after our purchase order(s) are placed.

24. The warranty period should be clearly mentioned .The maintenance charges (AMC), if applicable, under different schemes after the expiry of the warranty should also be mentioned in a separate sheet.
25. A warranty certificate against all the manufacturing defects covering for a period of minimum one year from the date of installation shall be given at the time of supply of the equipment. Any additional period towards warrantee will be given weightage in evaluation of the bids.
26. Inspection certificates of the instruments/ equipment inspected by the qualified engineer of the manufacturer and packed in accordance with the terms and conditions of this order must be enclosed.
27. During the warranty period or later whenever the firm is called upon to attend to the rectification of the defects/faults in the consignments, the firm shall attend to the repair work within a period of a week. They should render timely back up service whenever called upon. **A certificate to the effect should be attached to the tender.**
28. A certificate to the effect that instruments/equipment supplied is fully operational and no additional accessory or space is required to make the instruments/equipment run should be issued alongwith the delivery challans/invoice. GBU reserves the right to refuse payment in the event of not furnishing this certificate at the time of supply.
29. Complete user, technical and service documentation and spare parts catalogue are to be provided along with the supply of the item.
30. Failure to comply with all the terms and conditions mentioned herein would result in the tender being summarily rejected.
31. Vendors are informed that once the companies are shortlisted based on the eligibility criteria and technical specification, only then the financial bids of the firms that meet the eligibility criteria, technical specification / requirements would be opened.
32. Conditional tenders will not be accepted.
33. GBU reserves the right to modify or alter the specifications after short listing of tenders.
34. GBU reserves the right to change the order quantity or split the orders among multiple vendors without assigning any reason (s) whatsoever.
34. GBU reserves the right to reject any or all the tenders without assigning any reasons whatsoever.

Registrar
Gautam Buddha University

ACCEPTANCE

We accept the above terms and conditions and shall comply with them strictly.

SIGNATURE OF THE AUTHORISED SIGNATORY : _____

NAME OF THE SUPPLIER : _____

ADDRESS : _____

_____

"BIDDER'S PROFILE PROFORMA"

(write or print or type in block letters and please answer all the questions)

1. Name of the firm: ……
1. Date of incorporation:……..
2. Name of the company – Government/Public Ltd/Private Ltd/Partnership/ Proprietorship: ……..
3. Specify the number of years in this line of activity by the company:……..
4. Sales Tax/VAT registration No. (please attach certificate) : ……
5. Experience (in year) of supplying & installation for similar laboratory equipments to IITs, NIT's or Central Universities or any Academic Institute of National Repute (please attached certificate) : ……..
6. Turnover in the last three years (Figures should be in Indian Rupees in Lakhs; please attach the certified copies of balance sheet):(if the figures for 09-10 are not available then they may furnish balance sheet of year 06-07)

2007-08	2008-09	2009-10

7. Provide the postal address, telephone & fax numbers, and email address of the nearest service center : ……
   ……
8. What would be the delivery period from the date of the placement of an official purchase order : ……..
9. Enclose the list of customers to whom you have supplied /serviced during the last 3 years ending 31/03/2010 with full postal address and name of the contact person with phone, FAX numbers, and E-mail-id, billing amount etc. Certificate regarding satisfactory performance from the minimum three end users should be furnished.
10. Are you the manufacturer / authorized dealer / distributor/ reseller for the product quoted (please attached relevant certificate): ……..
11. Was there any elapse or delay in supplying the goods ordered or any service related issue during the warranty period for the products supplied by your firm to different Institutes/Universities during last three years? If yes, provide details.
12. Deviations in specifications, if any? Yes/No
13. Whether technical specification are attached with Technical Bid or not. Yes/No

(SIGNATURE OF THE AUTHORISED SIGNATORY)

FINANCIAL BID FOR PHYSICS LABORATORY EQUIPMENTS

S. No.	Equipment	Qty.	Unit Price (Rs.)	Total Amount	
				In Rs.	Rs. In words
1	**Supply and Installation of *Measurement of Basic Constants: Length, Weight and Time***				
	Vernier calipers	1			
	Micrometer	1			
	Spherometer	1			
	Iron column for weight	1			
	Copper wire, d = 1.0 mm, l = 10 m	1			
	Aluminium foil, set of 4 sheets	1			
	Glass plate, 100 x 85 x appr. 1 mm	2			
	Watch glass, dia. 80 mm	1			
	Watch glass, dia. 100 mm	1			
	Watch glass, dia. 125 mm	1			
	Glass tube, straight, l=80 mm, 10/pkg.	1			
	Glass tube, dia 24/21 mm, l=120 mm	1			
	Total cost of one set				
	Total cost for two sets				
2	**Supply and Installation of *Coupled Pendulum*, (without and with interface version), PHYWE make setup or equivalent**				
	Pendulum with recorder connection	2			
	Helical spring, 3 N/m	1			
	Power supply 12V/2A	1			
	Cobra 3 BASIC-UNIT, USB interface	1			
	Software Cobra 3 Universal recorder	1			

	Power supply 0...12 V DC / 6 V, 12 V AC	1			
	Bench clamp -PASS-	2			
	Rod with hook	1			
	Support rod -PASS-, square, L = 630mm	2			
	Right angle clamp -PASS-	2			
	Measuring tape, L = 2 m	1			
	Connecting cord, 1000 mm, red	4			
	Connecting cord, 1000 mm, blue	4			
	Slotted weight, 10 g, black	5			
	Weight holder for slotted weights	1			
	Electrol. Capacitor 10micro F/35 V, G1	2			
	Total cost of one set				
	Total cost for two sets				
3	**Supply and Installation of *Newton's 2nd Law / Demonstration Track*, (without and with interface version), PHYWE make complete setup or equivalent**				
	Timer 4-4 with USB-interface	1			
	Light barrier, compact	4			
	Portable Balance, OHAUS CS 2000 - AC adapter included	1			
	Holder for light barrier	4			
	End holder for demonstration track	2			
	Starter system for demonstration track	1			
	Magnet with plug for starter system	1			
	Cart, low friction sapphire bearings	1			

	Pulley for demonstration track	1			
	Weight holder 1 g	1			
	Shutter plate for low friction cart, width: 100 mm	1			
	Demonstration Track, Aluminium, Length: 1.5 m	1			
	Holder for pulley	1			
	Pulley, movable, dia.40 mm, with hook	1			
	Slotted weight, 1 g, natural colour	20			
	Cobra3 BASIC-UNIT, USB interface	1			
	Power supply 12V/2A	1			
	Software Cobra 3 translation/ rotation	1			
	Connecting plug, 2pcs pack	1			
	Alligator clips, insulated, black, 10 pcs. pack	1			
	Tube with plug	2			
	Plasticine, 10 sticks	1			
	Silk thread, 200 m	1			
	Needle with plug	2			
	Weight for low friction cart, 400 g	1			
	Hook with plug	1			
	Slotted weight, 50 g, black	4			
	Slotted weight, 10 g, black	8			
	Connecting cord, 1000 mm, red	4			
	Connecting cord, 1000 mm, blue	4			
	Connecting cord, 1000 mm, yellow	4			

	Connecting cord, 2000 mm, yellow	1			
	Connecting cord, 2000 mm, black	1			
	Connecting cord, 1000 mm, black	1			
	Total unit cost				
4	**Supply and Installation *of Current Balance / Force Acting on a Current-carrying Conductor*, PHYWE make setup or equivalent**				
	Ammeter 1/5 A DC	2			
	Balance LGN 310, on rod	1			
	Pole pieces, rectangular, 1 pair	1			
	Wire loop, l 12.5 mm, n 1	1			
	Wire loop, l 25 mm, n 1	1			
	Wire loop, l 50 mm, n 2	1			
	Wire loop, l 50 mm, n 1	1			
	Iron core, U-shaped, laminated	1			
	Base for iron cores	2			
	Coil, 900 turns	2			
	Metal strip, with plugs	2			
	Distributor	1			
	On/off switch	1			
	Power supply, 0-16 VDC, 0-6 A	2			
	Connecting cord, 100 mm, red	1			
	Connecting cord, 250 mm, red	2			
	Connecting cord, 250 mm, blue	2			
	Connecting cord, 500 mm, red	2			

	Connecting cord, 500 mm, blue	1			
	Connecting cord, 1000 mm, red	1			
	Connecting cord, 1000 mm, blue	1			
	Tripod base -PASS-	2			
	Support rod -PASS-, square, L = 1000 mm	1			
	Right angle clamp -PASS-	1			
	Total cost of one set				
	Total cost for two sets				
5	**Supply and Installation *of Magnetic Field of Paired Coils in a Helmholtz arrangement*, PHYWE make components or equivalent**				
	Digital multimeter 2010	1			
	Teslameter, digital	1			
	Hall probe, axial	1			
	Meter scale, demo. l=1000mm	2			
	G-clamp	3			
	Barrel base - PASS-	1			
	Support rod - PASS-,square, L = 250mm	1			
	Right angle clamp -PASS-	1			
	Connecting cord, 1000 mm, blue	2			
	Connecting cord, 1000 mm, red	2			
	Helmholtz coils, one pair	1			
	Power supply, 0-16 VDC, 0-6 A	1			
	Total cost of one set				
	Total cost of two sets				

6	**Supply and Installation of *Measuring the Velocity of Light -New version*, PHYWE make setup or equivalent**				
	Light velocity measuring app.	1			
	25 MHz Digital storage oscilloscope with colour display,	1			
	Total cost for one set				
7	**Supply and Installation of *Dispersion and Resolving Power of a Prism*, Complete setup, PHYWE make components or equivalent**				
	Lamp holder, for spectral lamps	1			
	Spectral lamp Hg 100, base	2			
	Power supply for spectral lamps	1			
	Prism, 60 degrees, height 30 mm, crown	1			
	Hollow prism	1			
	Bench clamp -PASS-	1			
	Spectrometer/goniom. with vernier	1			
	Vernier calipers	1			
	Barrel base -PASS-	1			
	Right angle clamp -PASS-	1			
	Support rod -PASS-,square, L = 250 mm	1			
	Stand tube	1			
	Wash bottle, plastic, 250 ml	1			
	Total cost for one set				
8	**Supply and Installation of *Wavelength of Mercury Spectral Lines Using a Grating*, Complete setup**				
	Lamp holder for spectral lamps	1			

	Spectral lamp Hg 100, base	2			
	Power supply for spectral lamps	1			
	Bench clamp -PASS-	1			
	Diffraction grating, 600 lines/mm	1			
	Diffraction grating, 4 lines/mm	1			
	Diffraction grating, 8 lines/mm	1			
	Diffraction grating,10 lines/mm	1			
	Diffraction grating,50 lines/mm	1			
	Spectrometer/goniometre with vernier	1			
	Vernier calipers	1			
	Barrel base -PASS-	1			
	Right angle clamp -PASS-	1			
	Support rod -PASS-,square, L = 250mm	1			
	Stand tube	1			
	Total cost for one set				
9	**Supply and Installation of *Interference of Light (Fresnel Biprism)***				
	Fresnel biprism	1			
	Prism table with holder	1			
	Lens, mounted, f +20 mm	1			
	Lens, mounted, f +300 mm, achrom.	1			
	Laser, He-Ne, 1.0 mW, 230 V AC	1			
	Swinging arm	1			
	Slide mount for optical bench, h = 30 mm	2			

	Slide mount for optical profile bench, h80mm	2			
	Optical profile-bench, L = 1000mm	1			
	Base f. opt. profile-bench, adjust.	2			
	Measuring tape, l = 2 m	1			
	Lens holder	2			
	Total cost for one set				
10	**Supply and Installation of *Diffraction at a Slit and Heisenberg's Uncertainty Principle***				
	Laser, He-Ne, about 1.0 mW, 230 V AC	1			
	Diaphragm, 3 single slits	1			
	Diaphragm holder	1			
	Si-Photodetector with Amplifier	1			
	Digital multimeter	1			
	Control Unit for Si-Photodetector	1			
	Adapter, BNC-plug/socket 4 mm.	2			
	Optical profile-bench, L = 1500mm	1			
	Base for optical profile-bench adjustable	2			
	Slide mount for optical bench, h = 30 mm	3			
	Connecting cord, 500 mm, red	1			
	Connecting cord, 500 mm, blue	1			
	Sliding device, horizontal	1			
	Total cost for one set				
11	**Supply and Installation of *Malus' Law experiment***				
	Laser, He-Ne, 1.0 mW, 230 V AC	1			

	Polarising filter, on stem	1			
	Photoelement for optical base plate	1			
	Digital multimeter	1			
	Optical profile bench l = 60 cm	1			
	Base for optical profile-bench adjustable	2			
	Slide mount for optical bench, h = 30 mm	3			
	Total cost for one set				
12	**Supply and Installation of *" Planck's Quantum of Action" from Photoelectric Effect (diffraction grating)*, PHYWE make equipments or equivalent**				
	Photocell for h-determination, with housing	1			
	Diffraction grating, 600 lines/mm	1			
	Colour filter, 580 nm	1			
	Colour filter, 525 nm	1			
	Diaphragm holder, attachable	2			
	Lens, mounted, f +100 mm	1			
	Mercury high pressure lamp 80W	2			
	Power supply for spectral lamps	1			
	Lamp holder E 27, on stem	1			
	Universal measuring amplifier	1			
	Digital multimeter	1			
	Turning knuckle for optical profile bench	1			
	Connecting cord, 250 mm, red	1			
	Connecting cord, 250 mm, blue	1			

	Screened cable, BNC, L = 250 mm	1			
	Lens holder	2			
	Optical profile bench L = 60 cm	2			
	Base for optical profile-bench adjustable	3			
	Slit, adjustable	1			
	Slide mount for optical profile-bench, height 80mm	4			
	Total cost for one set				
13	**Supply and Installation of *Electron Diffraction***				
	Electron diffraction tube and mounting	1			
	High voltage supply unit,0-10kV	1			
	High-value resistor, 10 MOhm	1			
	Connecting cord, 30 kV, 500 mm	1			
	Power supply, 0...600 VDC	1			
	Vernier caliper, plastic	1			
	Connecting cord, 250 mm, red	2			
	Connecting cord, 250 mm, blue	2			
	Connecting cord, 750 mm, red	2			
	Connecting cord, 750 mm, yellow	1			
	Connecting cord, 750 mm, blue	1			
	Connecting cord, 750 mm, black	2			
	Total cost for one set				
14	**Supply and Installation of *Band Gap of Germanium* (without and with interface version), PHYWE make or equivalent**				

	Hall effect module	1			
	Intrinsic Germanium carrier board	1			
	Digital multimeter 2010	2			
	Power supply 0...12 V DC / 6 V, 12 V AC	1			
	Cobra3 BASIC-UNIT, USB	1			
	Power supply 12V/2A	1			
	Software Cobra3-hall effect	1			
	Support rod -PASS-,square, L = 250mm	1			
	Right angle clamp -PASS-	1			
	Connecting cord, 250 mm, red	1			
	Connecting cord, 500 mm, blue	1			
	Connecting cord, 500 mm, black	2			
	Data cable, plug/socket, 9 pole	1			
	Tripod base -PASS-	1			
	Total cost for one set				
15	**Supply and Installation of *Hall Effect in n and p-germanium* (without and with interface version), PHYWE make or equivalent**				
	Hall effect module	1			
	Cobra3 BASIC-UNIT, USB	1			
	Power supply 12V/2A	1			
	Measuring module, Tesla	1			
	Software Cobra3-hall effect	1			
	Hall effect, p-germanium, carrier board	1			
	Hall effect, n- germanium, carrier board	1			

	Coil, 600 turns	2			
	Iron core, U-shaped, laminated	1			
	Pole pieces, plane, 30x30x48mm, 2	1			
	Hall probe	1			
	Power supply 0-12 V DC/6 V, 12 V AC	1			
	Tripod base -PASS-	1			
	Support rod PASS, square, L = 250mm	1			
	Right angle clamp -PASS-	1			
	Connecting cord, 500 mm, red	2			
	Connecting cord, 500 mm, blue	1			
	Connecting cord, 750 mm, black	2			
	Data cable, plug/socket, 9 pole	1			
	Total cost for one set				
16	**Supply and Installation of *Characteristic Curves of a Solar Cell*, PHYWE make components or equivalent**				
	Solar battery, 4 cells, 2.5x5 cm	1			
	Thermopile, Moll type	1			
	Universal measuring amplifier	1			
	Ceramic lamp socket E27 with reflector, switch, safety plug	1			
	Filament lamp, 220V/120W, with reflector	1			
	Hot/cold air blower, 1700 W	1			
	Meter scale, demo. L=1000mm	1			
	G-clamp	2			

	Digital multimeter 2010	2			
	Plate holder	1			
	Tripod base –PASS-	2			
	Barrel base –PASS-	2			
	Support rod–PASS, square, L = 250 mm	1			
	Right angle clamp –PASS-	2			
	Universal clamp	1			
	Glass pane, 150x100x4mm	1			
	Lab thermometer, -10. .+ 100 C	1			
	Connecting cord, 500 mm, red	3			
	Connecting cord, 500 mm, blue	2			
	Rheostat, 330 Ohm , 1.0A	1			
	Total cost for one set				
Grand Total					

Total cost of the offer is Rs._____ in words (Rupees _____ _____. I abide by all the terms & conditions of the tender.

SIGNATURE OF THE AUTHORISED SIGNATORY : _____

NAME OF THE SUPPLIER : _____

ADDRESS : _____

_____

List of experiments for 1st year Physics lab (PHY111)

Experimental setup	Quantity
1. Measurement of basic constants: length, weight and time	2
2. Coupled pendulum (interfaced with software)	2
3. Newton's 2nd law / demonstration track (interfaced with software)	1
4. Current balance / force acting on a current-carrying conductor	2
5. Magnetic field of paired coils in a Helmholtz arrangement	2
6. Measuring the velocity of light - new version	1
7. Dispersion and resolving power of a prism	1
8. Wavelength of mercury spectral lines using grating	
9. Interference of light (Fresnel Biprism)	1
10. Diffraction at a slit and Heisenberg's uncertainty principle	1
11. Malus's Law (Polarisation)	1
12. Phtoelectric effect	1
13. To study electron diffraction and verify de Broglie equation	1
14. Band gap of germanium (interfaced with software)	1
15. Hall effect in p and n-germanium (interfaced with software)	1
16. Characteristic curves of a solar cell	1

TECHNICAL SPECIFICATIONS

1) **Measurement of basic constants: length, weight and time**

The complete setup with following items-

Vernier calipers, Micrometer, Spherometer, slotted weight (10 g, 50 g, silver bronze), weight holders and other requisite accessories.

2. Coupled pendula *(interfaced with software,* ***PHYWE*** *make or equivalent)*

The complete setup with following items-

Pendulum with recording connection (Pend. mass = 1 kg, Pend. Rod mass =100 g, length = 1 m, Output 4 mm sockets for connecting a PC interface or a 2 channel yt-recorder), Interface system (PHYWE make Cobra3 BASIC-UNIT or equivalent) and other associated accessories (like rod with hook, weight holder for slotted weights, electrol-capacitor , bench clamp , support rod, right angle clamp and connecting cords etc).

3: To demonstrate Newton's 2nd law (demonstration track) *with and without interfaced with software,* ***PHYWE*** *make setup or equivalent*

The complete setup with following items-

Timers, Light barrier, Power supply (12V/2A), Demonstration Track, Interface system (PHYWE make Cobra3 BASIC-UNIT or equivalent), Portable Balance, and other associated accessories (like slotted weight, weight holders, starter system for demonstration track, magnet with plug for starter system, tube with plug, needle with plug, hook with plug, cart, shutter plate for low friction cart, pulley, holder for pulley and connecting cords).

4).Current balance / force acting on a current-carrying conductor

*(****PHYWE*** *make setup or equivalent)*

The complete setup with following items- Ammeter 1/5 A DC (2 ranges 0 - 1 A DC, 0-5 A DC), Balance LGN 310 (PHYWE make or equivalent), Pole pieces, Wire loops, Iron core (U-shaped, laminated), Coil, Bridge rectifier(30V AC/1A DC), Power supply (0-16 V, 0-6 A), Connecting cords and other associated accessories.

5. Magnetic field of paired coils in a Helmholtz arrangement

*(**PHYWE** make components or equivalent)*

The complete setup with following items-

Helmholtz coils, Hall probe, Teslameter, Power supply (0-16 V, 0-6 A), Digital Multimeter, and other associated accessories.

6. Measuring the velocity of light *(**PHYWE** make setup or equivalent)*

The complete setup with following items-

Light velocity measuring apparatus with Retroreflector, Power supply (12V/2A) and other requisite accessories for complete experiment.

7. Dispersion and resolving power of a prism and a grating

*(**PHYWE** make components or equivalent)*

The complete setup with following items-

Spectrometer/goniometer with telescope, Spectral lamp Hg, (with Lamp holder and Power supply), magnifying glasses, glass prism, hollow prism , Diffraction gratings of different line width (Size about 50 mm×50 mm), vernier calipers and other associated accessories.

9. Interference of light **(Fresnel biprism)**

*(**PHYWE** make components or equivalent)*

The complete setup with following items-

Laser (He-Ne, 1.0 mW, 230 V AC), Fresnel biprism (40 x 30 x 4 mm), Prism table with holder, associated lenses and required accessories.

10. Diffraction at a slit and Heisenberg's uncertainty principle

The complete setup with following items-

Laser (He-Ne, 1.0 mW, 230 V AC), Si-Photodetector (with amplifier and control unit), Digital multimeter and other accessories like diaphragm holder and connecting cords etc.

11. Malus' law

The complete setup with following items-

Laser (He-Ne, 1.0 mW, 230 V AC) with power supply, Optical profile bench (60 cm long), Digital multimeter, Wave plate, Polarizer/Analyzer, Photo detector and other associated accessories.

12. Photoelectric effect

The complete setup with following items-

Light source (Mercury high pressure lamp (80W) with power supply or equivalent), Diffraction gratings, amplifier (for of AC and DC voltages), Digital multimeter (range as required), colour filters (set of 5, 400-650 nm), optical bench and other associated accessories.

13). Electron diffraction

The complete setup with following items-

Electron diffraction tube, High voltage supply unit (0-10kV), Power supply (0-600 VDC), High-value resistor (about 10 MOhm),Vernier caliper (plastic), Connecting cords and other associated accessories.

14). Band gap of germanium

(Interfaced with software, **PHYWE** make or equivalent)

Integrated and computer interfaced (Cobra3 with hall effect module , PHYWE make) experimental system with Intrinsic Ge carrier board, Heatable (about 200 ^{0}C) carrier board with non-doped Ge and thermocouple, Power supply (0-12 V DC / 6 V, 12 V AC) and other accessories like connecting cords and data cables etc.

15). Hall effect in p and n-germanium

(Interfaced with software, **PHYWE** make or equivalent)

The complete setup with following items-

Hall effect module (PHYWE make), p- *germanium*, carrier board, n- *germanium*, carrier board, Cobra3 BASIC-UNIT (with power supply and interface software), Iron core (U-shaped, laminated), Hall probe, power supply (0-12 V DC / 6 V, 12 V AC) and other accessories.

16). Characteristic curves of a solar cell

*(**PHYWE** make components or equivalent)*

The complete setup with following items-

Solar batteries, Thermopile, Universal measuring amplifier (for amplification of AC and DC), Filament lamp, Digital multimeter, Rheostat, Hot/cold air blower and other accessories like ceramic lamp socket, lab thermometer, tripod base, right angle clamp, scale, G-clamp, supporting rod etc.