GOVERNMENT COLLEGE OF ENGINEERING
Jamunalia, Old Town, Keonjhar-758 002

No. 1577 Dated 19-09-2025

TENDER CALL NOTICE

Sealed tenders are invited form reputed original manufacturers/ authorized distributors up to the date mentioned in the tenders for supply of equipment through speed post for **Department of Electrical Engineering**. The date of opening the tender is mentioned in the respective tender document, which will be opened in the office of the Principal, Government College of Engineering, Keonjhar in the presence of bidders and/or their nominees. The tender bid documents with details of terms and conditions are to be downloaded from the College Website: **www.gcekjr.ac.in**

The authority reserves the right to reject/cancel the tenders in whole or in part without assigning any reason thereof. The authority will not be responsible for any postal delay.

Sd/-
Principal

18/9/2025

Bid Ref No. 1577 Date: 19-09-2025

BIDDING DOCUMENTS AND INSTRUCTION TO SUPPLY EQUIPMENTS
FOR
DEPARTMENT OF ELECTRICAL ENGINEERING

GOVERNMENT COLLEGE OF ENGINEERING, KEONJHAR

Jamunalia,Old Town,Keonjhar– 758002

18/9/2025

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INVITATION FOR BIDS

Principal, Government College of Engineering, Keonjhar invites sealed bids from eligible bidders for supply of machineries/equipment to Department of Electrical Engineering.

Interested eligible Bidders may obtain detail information and list of items with technical specifications from **the website of the College** **www.gcekjr.ac.in**

Particulars about submission of bidding document are as follows:

(a) Price of bidding document : **Rs.2000/-(Service Tax is included)** (non-refundable)

(b) First date of availability of Bidding Document in the website: 19-09-2025

(c) Last date and time for submission of bids: 15-10-2025

(d) Time and date of opening of bids :17-10-2025

(e) Place of opening of bids: **Principal Office, Government College of Engineering Jamunalia, Old Town, Keonjhar-758002**

(f) Address for communication: **Principal Government College of Engineering Jamunalia, Old Town, Keonjhar -758002**

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Sd/
Principal

Sr. Jr. Assistant
18/9/2025

1. Eligibility of Tenderer and General Instructions:

1.1 Eligibility:

Those who fulfill the following criteria are eligible to participate in the tender.

a) The tenderer must be a reputed Original Manufacturer and/or the Authorized agent/ dealer of a reputed manufacturer. Manufacturers must provide all documents relating to their Manufacturing Capabilities.

b) If the tenderer is an Authorized Dealer/Agent of a reputed manufacturer, necessary certificate to this effect from his manufacturer must be enclosed

c) The tenderer must be registered with Sale Tax Department.

d) Annual turn-over of the tenderer must be more than **Rs. 1crores** in last three years. As a letter of support, the bidder should submit audited balance sheet of last three financial years.

e) The tenderer must have cleared Sales Tax and Income Tax payment up to date. Attested copies of Sales Tax Clearance Certificate or non-assessment certificate from the concerned Sales Tax Authority valid up to date and attested copy of Income Tax Clearance Certificate or non-assessment certificate, as the case may be, from the competent authority, up to date, GST and PAN Number must be enclosed along with the Tender documents.

f) The tenderer must have the willingness for providing comprehensive maintenance support of the Machine supplied by him for at least two years after expiry of the warranty period.

g) The tenderer must provide evidence of purchase order and successful execution of supply of orders with installation and successful after sales support in reputed organizations like NITs/IITs/IIESTs/IISERs/NISER/IISc/Central Research Laboratories/ Government Engineering Colleges of Odisha.

h) All after sales support must be provided directly by the manufacturer only.

i) The manufacturer should be preferably ISO: 9001-2008.

j) The manufacturer should have preferably its own NABL (National Accreditation Board for Testing and Calibration Laboratories) accredited laboratory or equipments supplied should have certification from any NABL accredited laboratory in respect of quality and performance.

k) The manufacturer should be preferably registered with ESI.

l) The manufacturer should have preferably its own R&D section registered with Government of India.

1.2 General Instructions:

The selection for procurement of equipment will be based on quality and performance along with cost. In this context decision of technical committee is final based on documentary evidence or actual physical verification.

a) Submission of more than one bid by a particular tenderer under different names is strictly prohibited. In case it is discovered later on that, this condition is violated, all the tenders submitted by such tenderer/s would be rejected or contract cancelled.

b) The tenderer should mention in the tender paper, the location of its service center nearest to Keonjhar.

c) All offers should be in English and the price quoted for each item should be firm.

d) Warranty period, Delivery period and After-Sale-Service conditions, etc. are also to be clearly indicated.

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e) The rates and the conditions of the offer will remain valid for three months from the date of opening of the tender and no change or alteration of the rate will be acceptable on any account.
f) Submitted tender forms with overwriting or erased or illegible specifications and rates will be rejected.
g) Request from tenderer in respect of additions, alterations, modifications, corrections, etc. of either terms & conditions or rate after opening of the bid may not be considered. However, negotiation may be made before finalization.
h) Tenderers shall carefully examine the bid documents and fully inform themselves of all the conditions, which may in any way affect the work of the cost thereof.
i) Should a tenderer find discrepancies or omissions from the specification or other documents and any doubt as to their meaning, he should at once notify the purchaser and obtain clarification in writing.
j) This, however, does not entitle the tenderer to ask for time beyond the due date fixed for receipt of tenders.
k) The tenderer must also specify minimum time and maximum time to repair/replace in the event of a failure and penalty thereof.
l) Verbal clarification and/or information given by the purchaser or its employees or representatives shall not be binding on the purchaser.
m) Submission of sealed bid will carry with the implication that the tenderer agrees to abide by the conditions laid down in the detailed particulars of the bid notice.
n) Conditional offers and offers qualified by vague and indefinite expression, as 'subject to immediate acceptance' 'subject to prior sale', etc. will not be considered.
o) While tenders are under consideration, tenderers and their representatives or other interested parties are advised to refrain from contacting by any means, to the purchaser's personnel or representatives on matter relating to the tenders under study.
p) The purchaser, if necessary, will obtain clarification on tenders by requesting such information from any or all the tenderers either in writing or through personal contact as may be necessary.
q) The tenderer will not be permitted to change the substance of his offer after the tenders have been opened.
r) In the event of non-compliance with this provision, the tenderer is liable to be disqualified.

1.3 Procedure for Submission of Tenders:

The Tenderers must submit their bids as required in two parts in separate sealed covers prominently super scribed as Part-I "Technical Bid" and Part-II "Financial Bid" and also indicating on each of the covers the "Tender call Notice Number & Date" and due date and time of submission as mentioned in Tender Call Notice.

Part-I (Technical Bid)

Excepting the price schedule, all other documents as mentioned in para 1.1 i.e details of technical specifications, printed information Catalogue for each instrument, Copy of Firm Registration Certificate from the competent authorities, Sale Tax clearance, Income Tax Clearance, PAN Card copy, GST, list of clients, evidence of successful execution with photograph, etc. along with tender document duly signed by the authorized person in each page shall be covered in Part-I (Technical Bid).

Part-II (Financial Bid)

All indications of price shall be given in Part-II (Financial Bid).

a) Both sealed covers Part-I **"Technical Bid"** and Part-II "Financial Bid" should be placed in a third cover along with requisite **EMD & cost of Tender documents** (separately in the form of DD drawn in favour of **Principal, Government College of Engineering, Keonjhar** at any Nationalized Bank payable at Keonjhar) , others requisite supporting documents etc. and sealed. The sealed cover containing tender documents as per procedure indicated above should be sent to the Office of the Principal, GCE, Keonjhar by Registered Post/Speed Post addressing to the Principal, Government College of Engineering, Jamunalia, Old Town, Keonjhar-758002**within the due date and time as stipulated in Tender. The sealed envelope must show the name of the tenderer and his address and should be super scribed as "*Tender for supply of Equipment for Electrical Engineering Department*" on the top of the envelope**.

b) All the documents submitted must be in the papers showing signature of the tenderer and printed office name of the tenderer on official seal.

c) All the documents must be submitted in a sequential manner with separator/flags to help in quick scanning of the topics. Wherever possible, data in tabular form should be given.

2. Requirements by Tenderer before Supply:

2.1 Rating Plate, Name Plate and Labels:

Each of the equipment is to have permanently attached to it, a rating plate of non-corrosive material in a conspicuous position, upon which the total specifications along with the manufacturer's name, address, etc. are to be engraved.

2.2 Packaging:

All the equipments are to be suitably protected, covered in water -proof packing and crated to prevent damage or deterioration during transit and storage till the time of installation. The supplier shall be responsible for any loss or damage caused during transportation, handling or storage till their successful installation.

2.3. Inspection:

a) All materials / equipment shall be inspected and tested for completeness, proper assembly, operation, cleanliness and state of physical condition and performance as per quoted specification.

b) The test shall be conducted, reported and certifications to be provided by the tenderer.

c) The tenderer shall provide all test and measuring equipment/tools required for inspection / testing.

d) The cost of all such tests shall be borne by the Tenderer.

e) GCE reserves the right to reject any equipment if it does not comply with the specifications during site testing, installation and commissioning stage.

f) Inspection & testing would be conducted, jointly, at various stages as applicable during unpacking, installation and commissioning of respective equipment / components at the manufacturing site.

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2.4. Environmental Condition:

All the equipment supplied shall be rugged and should operate without any deviation in quality, or degradation of equipment performance. All the specification/parameters shall be guaranteed over the following environmental conditions:

* Storage Temperature : 0 to 50^0 C
* Operating Temperature : 0 to 50^0 C
* Humidity : 95% RH (non-condensing)

All the equipments are intended to operate under 220 V/ 440V, 50 Hz power supply.

3. Requirements by Tender after Supply:

3.1 Supply:

a) The material would be delivered by the supplier at GCE, Jamunalia, Old Town, Keonjhar – 758002, Odisha.

b) The items should be supplied directly from the manufacturing terminal having passed all tests successfully with Certifications as required.

c) The equipment should conform to the latest relevant National/International standards and shall be completed in all respect.

d) Any component, fitting etc. which may not have been specifically mentioned in the specifications but which are usual and necessary for the equipment, shall be supplied by the tenderer at no extra cost.

e) In case, articles are found damaged in transit or found short at the time of delivery the full cost of the same will be deducted from the bill of the supplier in case the supplier does not replace the stock within a week from the date of the complaint.

f) The articles ordered must be supplied in one lot within 4 (four) weeks of placing of the order.

g) In case of delay in delivery or successful installation, a penalty of 1% (one per cent) per week shall be levied.

h) GCE reserves the right to procure the materials from alternative sources at the risk and cost of the successful tenderer giving 15 days' notice.

i) Any increase in tax and duties after expiry of delivery period will be borne by the supplier.

j) In case the items supplied by the supplier are found not up to the specification shall be rejected.

k) The supplier will be intimated to take back the stocks at his own cost within three days from the date of rejection and to replace the same within 7 days, failing which the EMD will be invoked in addition to taking legal actions.

l) Imported consignment, if any, should be destined to GCE, Jamunalia, Old Town, Keonjhar – 758002, Odisha, India through Bhubaneswar Air Port.

m) The suppliers shall be responsible for releasing the consignments from the carriers/transporters.

n) The equipment shall be delivered and installed at site at the cost of the tenderer.

o) All taxes, levies, surcharges including the customs clearance and handling freight and insurance should be paid and handled by the tenderer.

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3.2 Installation and Commissioning:

Installation and Commissioning shall include the following:

a) Installation and Testing of the Equipment, Machineries etc. must be conducted by the tenderer at GCE.

b) It will be the responsibility of the tenderer to provide all necessary spares and consumables, which may be required during installation and commissioning, at no extra cost to purchaser.

c) The tenderer is to bring their own testing and measuring instruments required for installation, testing, commissioning, which can be taken back after completion.

d) Installation must complete within 15 days after delivery on site.

e) During installation and commissioning the complete intended experiments is to be conducted with results must be within accepted level of accuracy.

f) The raw materials and samples required for conducting experiments during installation is to be supplied by the tenderer free of cost.

3.3 Documentation:

a) Detailed technical manuals, handbooks, drawings, Warranty card and Factory Quality Assurance checklist, test results and any other certifications mentioned in the technical specifications shall be supplied along with the consignment.

b) Supplied manuals/handbooks must cover detailed technical specifications and installation, operation, maintenance and System Safety procedures.

c) For Experimental setups details of theory, procedure and methods of taking measurements etc. should be provided in the form of hand books for each experiment.

d) The receipts for GST paid, if any, for the supplied materials should also be submitted.

3.4 Trial Operation and Performance Guarantee Test:

a) After successful completion of Installation and Commissioning of the equipment, a 7-day continuous trial operation putting those on optimum use shall be conducted by the tenderer at site, during which the performance of the equipment shall be demonstrated for trouble-free continuous operation, meeting the specified standards and proper training shall be imparted to two persons of the purchaser.

b) During trial operation, tenderer shall do all necessary adjustments required to ensure the performance as per the acceptable level.

c) In case, guaranteed performance is not established, the tenderer shall be given opportunity to rectify/replace the equipment/components, and restart the 7 days continuous trial operation, at the risk and cost of the tenderer.

3.5 On-Site Warranty:

a) The entire materials may be used continuously. The reliability and safety of the total installed system and trouble-free operation are, therefore, of prime importance. The supplied devices/equipment and components shall be covered under **Two-years or more** comprehensive on-site warranty from the date of issue of successful completion of Performance Guarantee Report.

b) During the period of warranty, it shall be the responsibility of the tenderer to provide all essential spares and consumables, which may be required for maintenance and trouble-free operation of the devices / components at the tenderer's cost.

c) Software, if any, has to be tested with at least one-year warranty for trouble free operation.

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3.6 Comprehensive Maintenance Contract:

a) The tenderer shall be under the obligation of entering into a Comprehensive Maintenance Contract (CMC) with GCE for a minimum period of two years, renewable if felt necessary, on mutually acceptable rates, terms and conditions. CMC shall start after the completion of Warranty.
b) The scope of CMC shall cover maintenance and supply/replacement of materials and components, for smooth and reliable operation of the systems without trouble.
c) Accordingly, the tenderer has to offer rates for the CMC structure per equipment along with the price for the Systems and other associated Equipment supplied.

3.7 After Sales Service:

a) During the warranty period and subsequently, after signing of Agreement for CMC the tenderer shall attend to the problems reported by the users of GCE on a priority basis.

b) For any problem reported the tenderer shall attend and rectify the problem within 7 (seven) days or provide a standby system of the similar configuration.
c) The report on any problem will be informed through phone or fax number of which shall be given by the tenderer.
d) The branch office of the concerned manufacturing firm will be fully responsible to provide maintenance service, in case of any negligence, in providing the service by the tenderer.
e) On failure to comply with those instructions, the Bank Guarantee provided for the warranty period shall be invoked.

4. Financial Terms:

4.1 EMD

a) The tenderer has to submit a Demand Draft / Banker's Cheque / Pay order of Rs.50,000/ - **in favour of Principal, Government College of Engineering, Keonjhar** payable at Keonjhar in any Nationalized Bank towards EMD.

b) There will be no interest paid to the tenderer towards EMD money.

c) In no case, the EMD Money in cash or other forms will be accepted at the time of opening of the bid.

d) No request for adjustment of claims, if any, will be accepted.

e) The EMD of unsuccessful tenderers will be refunded as soon as possible after the tenders are finalized.

4.2 Performance Security Deposit

In case of successful Bidder EMD will be kept as Performance Security Deposit and will be refunded after expiry of stipulated warranty periods from the completion date of installation and commissioning on satisfactory performance of the equipment.

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4.3 PRICES:

Price quoted should be **FOR Government College of Engineering, Keonjhar only. Tax components as applicable should be mentioned clearly in the financial bid.**

a) Price should be quoted for unit item.

b) Purchase order will be placed as a single lot for each type of item or for all the items together, as the case may be.

c) In case of items of import, the tenderer should take full responsibility for customs clearance, handling, tax payment, etc. and specify the charge for the same in the price bid.

4.4 Sales Tax Concession:

Central Sales Tax Concession is to be availed on production of the required certificates applicable to Educational Institution.

4.5 Discount:

a) Our Institute is a pioneer Institution in the field of Teaching and Research in Engineering and allied disciplines and do not run with profit motive.

b) As such we are availing price discount for purchase of equipment/instruments.

c) The rate of discount or any other Institutional benefit arising out of Govt. Policy etc., on each item may also be indicated in the bid specifically.

4.6 Payments:

a) In case of imported items, payment will be made by opening LC in the name of the manufacturer subject to the condition that a Bank Guaranty for an equal amount will be submitted by the selected tenderer to GCE for the period of completion of installation and commissioning.

b) In case of purchase in Indian Rupees, payment of 90 percent of the ordered value will be made after successful installation and commissioning of the equipment subject to submission of satisfactory performance report by the concerned Head of Department. The rest 10 percent of the payment will be made after one year of successful installation of the equipment.

4.7 Penalty:

If the delivery, installation and commissioning is not carried out in time as specified in other part of the tender document, the tenderer/manufacturer will be charged @ 1 % (one per cent) per week of the total value of the concerned machine / equipment.

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4.8 Rate Contract with DGS&D or any other Government Organisation:

In case the tenderer has entered into a Rate Contract with DGS & D or any other Government Organization such as EPM, rate contract preference, number & copy of rate contract have to be submitted along with tender.

5. Instruction to the Tenderer:

a) Some of the minimum specifications specified may be redundant, obsolete or incompatible and in these cases, quote the particulars of correct specification of latest trend and technology.
b) Higher specifications instead of minimum specifications are allowed if a minimum specification is not available, obsolete or incompatible.
c) Otherwise, model with higher specification should be in addition to the model with minimum specifications.
d) Specify brand name and full model name and number for each offer.
e) Include the printed catalogue and pricelist if any for each of the equipment quoted.
f) Specify the list of Accessories required along with each of the equipment.
g) Quote the additional price of the accessories; only those, which are fully compatible with the quoted model, should be furnished.
h) Specify the list of Accessories to be given free of cost, along with the equipment as "**Free Accessories**"; these should be fully compatible with the quoted models.

5.1 Solving Disputes:

a) GCE, the tenderer and the manufacturer shall make all efforts to resolve amicably by direct informal negotiation on any disagreement or dispute arising between them under or in connection with this contract.
b) All disputes arising out of the contract shall be referred to courts under the jurisdiction of the Keonjhar court only.
c) **The above terms and conditions except those otherwise agreed upon, shall form a part of the Purchase Order.**
d) Sign on each page of this tender document and Return it along with the offer enclosing this part together with the Technical Offer.
e) The GCE authority has all rights to accept / reject any tender without assigning any reasons thereof.

6. Technical Specifications:

Following are the minimum specifications of the equipment.
a) The minimum specifications are indicative and not exhaustive.
b) The models with higher specifications may be quoted.
c) The quoted materials should be of latest trend and technology.
d) Each equipment should be complete in itself without needing any extra requirements except the requirement of general test and measuring instruments.

Sr Sarangi 18/12/2025

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Basic Electronics Lab

Warranty 2 Years

Sl. No.	Name of the Experiment	Specification	Qt.	Full specification
01	Input Output characteristics of NPN and PNP transistor.	**Input side:** DC voltage regulated (0-5V) On board voltmeter (0-2V) On board ammeter (0-250μA) **Output side:** DC voltage regulated (0-10V) On board voltmeter (0-20V) On board ammeter (0-20mA) NPN transistor (CL100) PNP transistor (CK100)	02	**Transistor Characteristics Module** **SCOPE OF LEARNING:** • Study and Construction of Various Analog Electronics Lab Experiment **TECHNICAL SPECIFICATIONS:** **Digital Meters:** • Ammeter 2Ma/200mA DC. • Voltmeter/ Ammeter 20V/20mA • Voltmeter 2V/200V DC. **Power Supplies:** • Operated on Mains power 230V, 50Hz ±10% • DC Power Supplies IC Regulated 0-15V, 500mA • DC Power Supplies IC Regulated 0-30V, 500mA • DC Power Supplies Fixed ±12V, 500mA • DC Power Supplies Fixed ±5V, 500mA • AC Power Supplies Isolated 15-0-15V, 500mA • AC Power Supplies Isolated 9-0-9V, 500mA **Function Generator and Oscillators:** • 0-100KHz Function Generator (Sine, Square, Triangle) • 0-10KHz Function Generator (Sine, Square, Triangle) **Components are mounted on the panels are:** • Variable Resistor (1K, 10K, 100K) • Buzzer as Continuity Tester • Low Frequency Speaker. • SPDT Switched • 2 Nos. Bread Board provided with module box **SALIENT FEATURES:** • Front panel built with high class insulated Printed Circuit Board sheet with well printed circuits and symbols. • Fuse for Short Circuit protection • Instruction manual. • Connections are brought out through 2mm Brass Pins. • Patch Cords 2mm.

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				• The trainer is housed in ABS Plastic cabinet. • Size of the trainer set 12"x10" **Included Module:** **NPN Transistor CE Mode** • NPN transistor (CL100) on board on the panel of the module • Provision to attach Voltmeter and Ammeter as symbol of V and I should be mentioned on the modular panel. • Transistor characteristics CE Mode diagram should be mentioned on the panel. • Panel size 173x126mm • Panel should be housed in High Quality plastic cabinet, and module should be fit on the main trainer unit. **NPN Transistor CB Mode** • NPN transistor (CL100) on board on the panel of the module • Provision to attach Voltmeter and Ammeter as symbol of V and I should be mentioned on the modular panel. • Transistor characteristics CB Mode diagram should be mentioned on the panel. • Panel size 173x126mm Panel should be housed in High Quality plastic cabinet, and module should be fit on the main trainer unit. **PNP Transistor CE Mode** • PNP transistor (CL100) on board on the panel of the module • Provision to attach Voltmeter and Ammeter as symbol of V and I should be mentioned on the modular panel. • Transistor characteristics CE Mode diagram should be mentioned on the panel. • Panel size 173x126mm Panel should be housed in High Quality plastic cabinet, and module should be fit on the main trainer unit. **PNP Transistor CB Mode** • PNP transistor (CL100) on board on the panel of the module • Provision to attach Voltmeter and Ammeter as symbol of V and I should be mentioned on the modular panel.

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				• Transistor characteristics CB Mode diagram should be mentioned on the panel. • Panel size 173x126mm Panel should be housed in High Quality plastic cabinet, and module should be fit on the main trainer unit. **Module Required With Trainer:** 1. 48 kS/s, 14-bit, 8-ch Multifunction USB Module 2. Supports USB 2.0 3. Portable 4. Bus-powered 5. 8 x analog input channels 6. 14-bit resolution AI 7. Sampling rate up to 48 kS/s 8-ch DI/8-ch DO, 2-ch AO and one 32-bit counter
02	Study of characteristics of JFET	Voltage Regulator for **Vds (0-10 v)** Voltage Regulator **Vgs (0 ±10)** On board ammeter in mA Range	2nos	**JFET Characteristics Module** **TECHNICAL SPECIFICATIONS:** **Digital Meters:** • Ammeter 2Ma/200mA DC. • Voltmeter/ Ammeter 20V/20mA • Voltmeter 2V/200V DC. **Power Supplies:** • Operated on Mains power 230V, 50Hz ±10% • DC Power Supplies IC Regulated 0-15V, 500mA • DC Power Supplies IC Regulated 0-30V, 500mA • DC Power Supplies Fixed ±12V, 500mA • DC Power Supplies Fixed ±5V, 500mA • AC Power Supplies Isolated 15-0-15V, 500mA • AC Power Supplies Isolated 9-0-9V, 500mA **Function Generator and Oscillators:** • 0-100KHz Function Generator (Sine, Square, Triangle) • 0-10KHz Function Generator (Sine, Square, Triangle) **Components are mounted on the panels are:** • Variable Resistor (1K, 10K, 100K) • Buzzer as Continuity Tester • Low Frequency Speaker. • SPDT Switched • 2 Nos. Bread Board provided with module box **SALIENT FEATURES:**

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				• Front panel built with high class insulated Printed Circuit Board sheet with well printed circuits and symbols. • Fuse for Short Circuit protection • Instruction manual. • Connections are brought out through 2mm Brass Pins. • Patch Cords 2mm. • The trainer is housed in ABS Plastic cabinet. • Size of the trainer set 12"x10" **Included Module:** **JFET Characteristics** • JFET transistor (BF256) on board on the panel of the module • Provision to attach Voltmeter and Ammeter as symbol of V and I should be mentioned on the modular panel. • JFET characteristics diagram should be mentioned on the panel. • Panel size 173x126mm • Panel should be housed in High Quality plastic cabinet, and module should be fit on the main trainer unit. **Module Required with Trainer:** 1. 48 kS/s, 14-bit, 8-ch Multifunction USB Module 2. Supports USB 2.0 3. Portable 4. Bus-powered 5. 8 x analog input channels 6. 14-bit resolution AI 7. Sampling rate up to 48 kS/s 8. 8-ch DI/8-ch DO, 2-ch AO and one 32-bit counter
03	Transfer characteristics and drain characteristics of MOSFET	Transfer characteristics and drain characteristics of MOSFET	01 No.	**<u>MOSFET Characteristics Module</u>** **<u>Digital Meters:</u>** • Ammeter 2Ma/200mA DC. • Voltmeter/ Ammeter 20V/20mA • Voltmeter 2V/200V DC. **<u>Power Supplies:</u>** • Operated on Mains power 230V, 50Hz ±10% • DC Power Supplies IC Regulated 0-15V, 500mA • DC Power Supplies IC Regulated 0-30V, 500mA • DC Power Supplies Fixed ±12V, 500mA

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				• DC Power Supplies Fixed ±5V, 500mA • AC Power Supplies Isolated 15-0-15V, 500mA • AC Power Supplies Isolated 9-0-9V, 500mA **Function Generator and Oscillators:** • 0-100KHz Function Generator (Sine, Square, Triangle) • 0-10KHz Function Generator (Sine, Square, Triangle) **Components are mounted on the panels are:** • Variable Resistor (1K, 10K, 100K) • Buzzer as Continuity Tester • Low Frequency Speaker. • SPDT Switched • 2 Nos. Bread Board provided with module box **SALIENT FEATURES:** • Front panel built with high class insulated Printed Circuit Board sheet with well printed circuits and symbols. • Fuse for Short Circuit protection • Instruction manual. • Connections are brought out through 2mm Brass Pins. • Patch Cords 2mm. • The trainer is housed in ABS Plastic cabinet. • Size of the trainer set 12"x10" **Included Module:** **MSOFET CHARACTERISTICS MODULE** • MOSFET (IRF540) on board on the panel of the module • Provision to attach Voltmeter and Ammeter as symbol of V and I should be mentioned on the modular panel. • MOSFET diagram should be mentioned on the panel. • Panel size 173x126mm • Panel should be housed in High Quality plastic cabinet, and module should be fit on the main trainer unit. **Module Required with Trainer:** 1. 48 kS/s, 14-bit, 8-ch Multifunction USB Module 2. Supports USB 2.0

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				3. Portable 4. Bus-powered 5. 8 x analog input channels 6. 14-bit resolution AI 7. Sampling rate up to 48 kS/s 8. 8-ch DI/8-ch DO, 2-ch AO and one 32-bit counter
04	OP-AMP: Inverting and Non-Inverting Configuration. Record of Waveforms.	OP-AMP: Inverting and Non-Inverting Configuration. Record of Waveforms.	01 No.	**Technical Specifications:** **Power Supplies:** • DC Power Supply IC Regulated ±12V DC, 150mA (Fixed). • DC Power Supply IC Regulated ±15V DC, 150mA (Fixed). • DC Power Supply IC Regulated ±5V DC, 150mA (Fixed). • DC Power Supply IC Regulated 1.5V-10V DC, 150mA (Negative). • DC Power Supply IC Regulated 1.5V-10V DC, 150mA (Positive). • Operated on Mains power 230V, 50Hz ±10% **Function Generator:** • Sine, Square and Triangle 0-100KHz, 0-20Vpp **Components are mounted on the panels are:** • LM741 Operational Amplifiers: 3 Nos. • LM324 Dual Op-Amp • 20Pin Zif Socket • One Bread Board. • Resistors SMD • Capacitors • Zener, Led, Transistor, Mosfet and Diodes • Variable Resistor 1K,10K,100K,1M **SALIENT FEATURES:** • Front panel built with high class insulated Printed Circuit Board sheet with well printed circuits and symbols. • Fuse for Short Circuit protection • Instruction manual. • Connections are brought out through 4mm Brass Sockets. • Patch Cords 4mm. • The trainer is housed in ABS Plastic cabinet. • Size of the trainer set 12"x10" **Main Features:**

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				• 25MHz bandwidth, and 100MSa/s sample rate • 2/ 4 channels + 5K record length • Friendly UI : FFT, or X-Y, and waveform 2 views displayed on the same screen • Multi-trigger option : edge, video, slope, pulse, and alternate • USB isolation - less signal inference, more PC protection • USB bus powering • Ultra-thin body design, easy portability **Specifications: -** Bandwidth: 25MHz Sample Rate (Real time) :100MS/s Horizontal Scale(S/div) : 5ns/div~100s/div, step by 1~2.5~5 Rise time (at input, typical) :=17.5ns Display :3.5" color TFT display (320×240 pixels) Channels: Single Input impedance: 1MO±2% in parallel with 20pF±3pF Record length: Max. 6000 points on each channel Interpolation :(sin x)/x Probe attenuation factor :1X,10X,100X,1000X Input coupling: DC, AC, GND DC accuracy (Average) : Average>16: ±(3% reading+0.05div) Vertical Sensitivity (A/D) :5mV/div~5V/div (at input) Vertical resolution :8 bit Max. Input Voltage : 400V (PK-PK) (DC + AC PK-PK, 1MO input impedance, Probe attenuation 10:1) Trigger Type: Edge, Video Trigger Mode: Auto, Normal, Single Trigger level:±6 divisions from screen center Acquisition modes: Sample, Peak Detect and Average DC gain accuracy: ±3% Waveform math: Unavailable Waveform storage :4 waveforms Communication interface: USB Power supply :100V-240V AC, 50/60Hz Li-ion battery :7.4V, 6 hours operation **Accessories Included:**

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				1 x VDS1022, 1 x CD ROM, 1 x Quick Start Guide, 2 x Oscilloscope probe, 1 x Probe tool, 1 x soft carry bag 1 x Power adapter, 1 x USB Cable, 1 x Silicone Case protectors, 1 x Power cable **Optional Accessories: PC**
05	Half Wave and Full Wave Rectifier without Capacitor filter. Record of Waveforms, Measurement of Average and RMS value.	Half Wave and Full Wave Rectifier without Capacitor filter. Record of Waveforms, Measurement of Average and RMS value.	01 No.	**Digital Meters:** • Ammeter 2Ma/200mA DC. • Voltmeter/ Ammeter 20V/20mA • Voltmeter 2V/200V DC. **Power Supplies:** • Operated on Mains power 230V, 50Hz ±10% • DC Power Supplies IC Regulated 0-15V, 500mA • DC Power Supplies IC Regulated 0-30V, 500mA • DC Power Supplies Fixed ±12V, 500mA • DC Power Supplies Fixed ±5V, 500mA • AC Power Supplies Isolated 15-0-15V, 500mA • AC Power Supplies Isolated 9-0-9V, 500mA **Function Generator and Oscillators:** • 0-100KHz Function Generator (Sine, Square, Triangle) • 0-10KHz Function Generator (Sine, Square, Triangle) **Components are mounted on the panels are:** • Variable Resistor (1K, 10K, 100K) • Buzzer as Continuity Tester • Low Frequency Speaker. • SPDT Switched • 2 Nos. Bread Board provided with module box **SALIENT FEATURES:** • Front panel built with high class insulated Printed Circuit Board sheet with well printed circuits and symbols. • Fuse for Short Circuit protection • Instruction manual. • Connections are brought out through 2mm Brass Pins. • Patch Cords 2mm.

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				• The trainer is housed in ABS Plastic cabinet. • Size of the trainer set 12"x10" **Included Module:** **Rectifier MODULE** • 1N4007 on board on the panel of the module • Provision to attach Voltmeter and Ammeter as symbol of V and I should be mentioned on the modular panel. • Rectifier diagram should be mentioned on the panel. • Panel size 173x126mm • Panel should be housed in High Quality plastic cabinet, and module should be fit on the main trainer unit. **Main Features:** • 25MHz bandwidth, and 100MSa/s sample rate • 2/ 4 channels + 5K record length • Friendly UI : FFT, or X-Y, and waveform 2 views displayed on the same screen • Multi-trigger option : edge, video, slope, pulse, and alternate • USB isolation - less signal inference, more PC protection • USB bus powering • Ultra-thin body design, easy portability **Specifications** Bandwidth: 25MHz Sample Rate (Real time): 100MS/s Horizontal Scale(S/div) : 5ns/div~100s/div,step by 1~2.5~5 Rise time (at input, typical) : =17.5ns Display: 3.5" color TFT display (320×240 pixels) Channels: Single Input impedance: 1MO±2% in parallel with 20pF±3pF Record length: Max. 6000 points on each channel Interpolation: (sin x)/x Probe attenuation factor: 1X,10X,100X,1000X Input coupling: DC, AC, GND

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				DC accuracy(Average) : Average>16:±(3% reading+0.05div) for ?V Vertical Sensitivity (A/D): 5mV/div~5V/div (at input) Vertical resolution: 8 bits Max. Input Voltage: 400V (PK-PK) (DC + AC PK-PK, 1MO input impedance, Probe attenuation 10:1) Trigger Type: Edge, Video Trigger Mode: Auto, Normal, Single Trigger level: ±6 divisions from screen center Acquisition modes: Sample, Peak Detect and Average DC gain accuracy: ±3% Waveform math: Unavailable Waveform storage: 4 waveforms Communication interface: USB Power supply: 100V-240V AC, 50/60Hz Li-ion battery: 7.4V, 6 hours operation **Accessories Included:** 1 x VDS1022! 1 x CD ROM 1 x Quick Start Guide 2 x Oscilloscope probe 1 x Probe tool 1 x soft carry bag 1 x Power adapter 1 x USB Cable 1 x Silicone Case protectors 1 x Power cable **Optional Accessories: PC**
06	Universal GATE testing	On board 10-NAND gate (IC 7400) On board 10-NOR gate (IC 7402) Input LED and Output LED Input +5V GND Clock switch Clock Output Output switch	2nos	**Power Supplies:** • DC Power Supply IC Regulated ±5V, ±12V @ 500mA. • DC Power Supply IC Regulated 0 to 30V and 0-15V @ 250mA (1 Each) • AC Power Supply 9-0-0 VAC,12-0-12VAC • Operated On Mains Power 230v, 50hz ±10% **Graphical LCD:** • Graphical LCD to show the menu of experiment and gate level diagram for selected Experiments **Meters:** Volt/Current/Frequency Measurement: • Measurement display on 16X2 LCD ;

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				• 2 Voltage inputs /2 current inputs & One frequency input • Voltage measurement Range +12V to -12V ; • Current Measurement Range 0 to 500mA • Frequency measurement Range DC to 100KHz ; (All with respect to Ground) **Solder-less, breadboard (Easy to Remove)** • Logic Inputs & Outputs 16 Bit • Trainer Contains 3 Bit BCD To 7 Segment Indicators with Inputs A, B, C, D Inputs 3Nos. • Logic Low Frequency Mono Pulsar with Rising and Falling Edge. 2Nos. • Frequency Generator 1Hz to 100 KHz (Variable Frequency and Amplitude) • 2 Variable Resistors are given on Board. • One Low Frequency Speaker. • Buzzer as Continuity Tester. • 2Nos. 3Pin Toggle on Board. **SALIENT FEATURES:** • Front Panel Built with High Class Insulated Printed Circuit Board Sheet with Well Printed Circuits and Symbols. • Fuse For Short Circuit Protection • Instruction Manual. • Connections are brought out through 2mm Brass Sockets. • Patch Cords 2mm with Bread Board Pin (25Nos). • The trainer is housed in ABS Plastic cabinet. • Size of the trainer set 14"x10" **Included Module:** Universal GATE testing • On board 10-NOR gate (IC 7402) • Provision to attach Power Supply should be mentioned on the modular panel. • IC diagram should be mentioned on the panel. • Panel size 173x126mm • Panel should be housed in High Quality plastic cabinet, and module

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				should be fit on the main trainer unit. Universal GATE testing • On board 10-NAND gate (IC 7400) • Provision to attach Power Supply should be mentioned on the modular panel. • IC diagram should be mentioned on the panel. • Panel size 173x126mm Panel should be housed in High Quality plastic cabinet, and module should be fit on the main trainer unit.

BASIC ELECTRICAL ENGINEERING (Warranty: Standard 2-year warranty of all the items)

Sl. No.	Name of the Experiment	Specification	Qt.	Full specification
01	Portable Watt Meter		01	Range: 2.5/5A, 150/300/600V (LPF type, P.F.=0.2)
02	Portable Watt Meter		01	Range: 2.5/5A, 150/300/600V (UPF type, P.F.=1)
03	Rheostats		02	500Ω,2Amp (Single Tube)
04	Rheostats		02	260Ω,1.4Amp (Single Tube)
05	Rheostats		02	100Ω,5Amp (Single Tube)
06	Rheostats		02	750Ω,1.2Amp (Single Tube)
07	Demonstration of cut sections of Machine	DC Machine-Commutator-Brush arrangement Induction Machine (Squirrel Cage Rotor) Synchronous Machine (field winding-Slip ring arrangement) Single Phase Induction Machine	01 01 01 01	DC Shunt Machine, 2HP, 8A, 220V DC, 1500 RPM, SPDP, foot Mounted type. 2HP, 3phase, 1440rpm, 415 V, 50 HZ, SPDP, foot Mounted type (6 – Terminals type) Synchronous Machine, 2HP, 3phase, 1500rpm, 415 V, 50 HZ, SPDP, foot Mounted type. 1-phase Capacitor Start Capacitor Run Machine (CSCR), 1 HP, 5A, 230 V, single phase foot mounted type.

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Electrical Machine-I Lab

Warranty: Standard 2-year warranty of all the items

Sl no.		Specification	Quantity
1	et Voltmeter	0-600 V MI Type	5
	Voltmeter	0-600 V MC Type	5
	Voltmeter	0-300 V MI Type	3
	Voltmeter	0-300 V MC Type	3
	Ammeter	0-2 A MI Type	3
	Ammeter	0-5 A MI Type	3
	Ammeter	0-5-10 A MI Type	3
	Ammeter	0-15 A MI Type	3
	Ammeter	0-2 A MC Type	3
	Ammeter	0-5 A MC Type	3
	Ammeter	0-5-10 A MC Type	3
	Ammeter	0-15 A MC Type	3
	Rheostat	45 Ω, 5 A	2
	Rheostat	1200 Ω, 0.8 A	2
	Rheostat	400 Ω, 1.7 A	2
	Rheostat	200 Ω, 1.5 A	2
	Rheostat	100 Ω, 5 A	2
	Rheostat	200 Ω, 5 A	2
	3-Phase Wattmeter Dynamometer Type	500 V, 10 A, LPF	2
	3-Phase Wattmeter Dynamometer Type	500 V, 10 A, UPF	2
	3-Phase Wattmeter Dynamometer Type	500 V, 5 A, LPF	2
	3-Phase Wattmeter Dynamometer Type	500 V, 5 A, UPF	2
	1 Phase PF Meter	300 V, 5 A	2
	1 Phase Centre Tapped PF Meter	300 V, 5 A	2
	3 Phase PF Meter	500 V, 10 A	2
	3 Phase Center Tapped PF Meter	500 V, 10 A	2
	3 Phase PF Meter	500 V, 5 A	2
	3 Phase Center Tapped PF Meter	500 V, 5 A	2
	Auto Transformer	3 Phase 440 V, 15 A	2
	Auto Transformer	1 Phase 440 V, 10 A	2
	3 Phase Resistive Load	5 KW	1
	1 Phase Inductive Load	3 KVA,5A Fine	1

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	3 Phase Inductive Load	5 KVA, 5A fine	1
	3-Phase Wattmeter Induction Type	500 V, 10 A, LPF	2
	3-Phase Wattmeter Induction Type	500 V, 10 A, UPF	2
	3-Phase Wattmeter Induction Type	500 V, 5 A, LPF	2
	3-Phase Wattmeter Induction Type	500 V, 5 A, UPF	2
	Multimeter	Digital	15
2.	Load characteristics of DC series motor	DC Series Motor,3HP,12A,220V DC,1500 RPM, SPDP, foot Mounted type, Frame Size-132	01
		2-Point Starter for the above Motor, Pony Brake Arrangements for the above consisting of Brake Drum, Belt and Dial type spring Balances etc.	01
		Control Panel for performing experiment on DC Shunt Motor consisting of 2 pole MCB, special Nylon based terminals, indication lamp assembled and wired in on a hylem sheet and fitted to MS angle frame	01
		Portable DC voltmeter (0-300V)	01
		Portable DC ammeter (0-10-20A)	

ELECRICAL CIRCUIT ANALYSIS LAB

Sl. No.	Name of The Experiments/Kit	Specification	Quantity
1	Frequency responses of band pass and band elimination filters.	Experimental Trainer Board that contains: - **Built in Power Supply,** DC Regulated power Supply: +5V DC & +12V DC.AC Supply: 12-0-12VAC.Short circuit Protected. **Built in Function Generator,** O/p Waveform: Sine, Triangle & TTL O/Ps. Output Frequency: 1 Hz to 1MHz, with amplitude & frequency control pots. Onboard potentiometers: 1K - 1No. 1M - 1No. Adjustable resistors (1 kΩ – 100 kΩ), capacitors (10 nF – 100 μF), and inductors (10 μH – 100 mH). **Standard Accessories:** Power Chord, Patch Chords & Instruction Manual **The experimental kit must be robust and simple in connection.**	1pc
2	Determination of two port network parameters (hybrid and transmission parameters).	Experimental Trainer Board that contains: - **Built in Power Supply** DC Regulated power Supply: +5V DC & +12V DC.Onboard potentiometers: 1K - 1No. 1M - 1No.Adjustable resistors (1 kΩ – 100 kΩ), capacitors (10 nF – 100 μF), and inductors (10 μH – 100 mH). **Standard Accessories:** Power Chord, Patch Chords & Instruction Manual, Multimeter. **The experimental kit must be robust and simple in connection.**	1pc
3	Study of series and parallel connected magnetically coupled circuits **Experiments Supported by the Trainer Kit:** (i)Study of Mutual Inductance (ii)Series Connected Magnetically Coupled Circuits (iii)Parallel Connected Magnetically Coupled Circuits (iv)Transformer Coupling: (v)**Phase Relationship in Magnetically Coupled Circuits:**	Experimental Trainer Board that contains: - **Transformer:** Primary: 0-220V-230V, Secondary: 12-0-12VAC. Short circuit Protected. **Coil with taps (Tap 1, Tap 2 &Com)** **Electromagnetic Relay:** DC %V, DPDT 1A-100V AC **Standard Accessories** Power Chord, Patch Chords & Instruction Manual, Multimeter **The experimental kit must be robust and simple in connection.**	1pc

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ANALOG AND DIGITAL ELCRCTRONICS LAB

Sl. No.	Name of the Experiment	Quantity	Specification
01	Design and simulate voltage divider biasing circuits using BJT-CE configuration and compare the results. **Objectives** i.The dc currents and voltages can be measured. ii.The resistances and by using potentiometer can be varied. iii. The AC analysis can be performed and the voltage gain using CRO/DSO can be studied. iv. The input impedance and output impedance can be calculated. v. The resistances, dc voltages and currents between test points can be measured with the help of multimeter.	01 no	**Built in Power Supply** Experimental Trainer Board that contains: Built in Power Supply, DC Regulated power Supply: +5V DC & +12V DC. AC Supply: 12-0- 12VAC. Short circuit Protected. Built in Function Generator O/p Waveform: Sine, Square, Triangle & TTL O/Ps. Output Frequency: 1 Hz to 1MHz, with amplitude & frequency control pots. Onboard potentiometers: 1K - 1No. 1M - 1No. Standard Accessories Power Chord, Patch Chords & Instruction Manual **The experimental kit must be robust and simple in connection.**
02	Design and simulate of voltage divider biasing circuits using JFFET-CS configuration. **Objectives** i. The dc currents and voltages can be measured. ii.The resistances and by using potentiometer can be varied. iii. The AC analysis can be performed and the voltage gain using CRO/DSO can be studied. iv. The input impedance and output impedance can be calculated. v. The resistances, dc voltages and currents between test points can be measured with the help of multimeter.	01 no.	**Built in Power Supply DC Supply** : DC Regulated power Supply: +5V DC & +12V DC. AC Supply: 12-0- 12VAC. Short circuit Protected. **Built in Function Generator** Built in Function Generator O/p Waveform: Sine, Square, Triangle & TTL O/Ps Output Frequency: 1 Hz to 1MHz, with amplitude & frequency control pots. Onboard potentiometers: 1K - 1No. 1M - 1No. Standard Accessories Power Chord, Patch Chords & Instruction Manual-color LEDs to indicate status. **The experimental kit must be robust and simple in connection.**
03	Design and simulate of self-biasing circuits of MOSFET. Objectives i. The dc currents and voltages can be measured. ii. The resistances and by using potentiometer can be varied. iii. The AC analysis can be performed and voltage gain using CRO/DSO can be studied. iv. The input impedance and output impedance can be calculated. v. The resistances, dc voltages and currents between test points can be measured with the help of multimeter.	1no.	**Built in Power Supply** Experimental Trainer Board that contains: - Built in Power Supply DC Regulated power Supply: +5V DC & +12V DC. AC Supply: 12-0- 12VAC. Short circuit Protected. Built in Function Generator O/p Waveform: Sine, Square, Triangle & TTL O/Ps Output Frequency: 1 Hz to 1MHz, with amplitude & frequency control pots. Onboard potentiometers: 1K - 1No. 1M - 1No. Standard Accessories Power Chord, Patch

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			Chords & Instruction Manual **The experimental kit must be robust and simple in connection.**
04.	Determine the frequency response of BJT CE amplifier: low frequency, Mid-frequency and high frequency response. Objectives i. The Maximum Gain in dB of BJT CE-amplifier circuit can be studied. ii. 3 dB Lower cut-off frequency and Upper cut-off frequency in Hz of BJT CE-amplifier circuit can be measured. iii. 3 dB Bandwidth in Hz of BJT CE-amplifier circuit can be measured. iv. The input and output voltage waveform in CRO/DSO can be plotted.	1no.	**Built in Power Supply DC Supply** Experimental Trainer Board that contains: - Built in Power Supply DC Regulated power Supply: +5V DC & +12V DC. AC Supply: 12-0- 12VAC. Short circuit Protected. Built in Function Generator, O/p Waveform: Sine, Square, Triangle & TTL O/Ps Output Frequency: 1 Hz to 1MHz with amplitude & frequency control pots. Standard Accessories Power Chord, Patch Chords & Instruction Manual **The experimental kit must be robust and simple in connection.**
05.	Determine the frequency response of BJT emitter follower (CC amplifier) circuit. Objectives i. The Maximum Gain in dB of BJT emitter follower (CC-amplifier) circuit can be studied. ii. 3 dB Lower cut-off frequency and Upper cut-off frequency in Hz of BJT emitter follower (CC-amplifier) circuit can be measured. iii. 3 dB Bandwidth in Hz of BJT emitter follower (CC-amplifier) circuit can be measured. iv. The input and output voltage waveform in CRO/DSO can be plotted.	1no.	**Built in Power Supply DC Supply** Experimental Trainer Board that contains: - Built in Power Supply DC Regulated power Supply: +5V DC & +12V DC. AC Supply: 12-0- 12VAC. Short circuit Protected. Built in Function Generator, O/p Waveform: Sine, Square, Triangle & TTL O/Ps Output Frequency: 1 Hz to 1MHz with amplitude & frequency control pots. Standard Accessories Power Chord, Patch Chords & Instruction Manual **The experimental kit must be robust and simple in connection.**
06.	Determine the frequency response of JFET CS amplifier circuit. Objectives i. The Maximum Gain in dB of JFET CS amplifier circuit can be studied. ii. 3 dB Lower cut-off frequency and Upper cut-off frequency in Hz of JFET CS amplifier circuit can be measured. iii. 3 dB Bandwidth in Hz of JFET CS amplifier circuit can be measured. iv. The input and output voltage waveform in CRO/DSO can be plotted.	1no.	Experimental Trainer Board that contains: Built in Power Supply DC Regulated power Supply: +5V DC & +12V DC. AC Supply: 12-0- 12VAC. Short circuit Protected. Built in Function Generator O/p Waveform: Sine, Square, Triangle & TTL O/Ps Output Frequency: 1 Hz to 1MHz, with amplitude & frequency control pots. Standard Accessories Power Chord, Patch Chords & Instruction Manual **The experimental kit must be robust and simple in connection.**
07.	Determine the frequency response of MOSFET CS- amplifier circuit. Objectives i. The Maximum Gain in dB of MOSFET CS amplifier circuit can be studied. ii. 3 dB Lower cut-off frequency and Upper	1no.	**Built in Power Supply DC Supply** Experimental Trainer Board that contains: - Built in Power Supply DC Regulated power Supply: +5V DC & +12V DC. AC Supply: 12-0- 12VAC. Short circuit Protected.

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	cut-off frequency in Hz of MOSFET CS amplifier circuit can be measured. iii. 3 dB Bandwidth in Hz of MOSFET CS amplifier circuit can be measured. iv. The input and output voltage waveform in CRO/DSO can be plotted.		Built in Function Generator, O/p Waveform: Sine, Square, Triangle & TTL O/Ps Output Frequency: 1 Hz to 1MHz with amplitude & frequency control pots. Standard Accessories Power Chord, Patch Chords & Instruction Manual **The experimental kit must be robust and simple in connection.**
08.	Universal Bread Board Objectives i. A Complete System to study and implement logic gates, combinational circuits, sequential circuits, clock pulse generator, memory Unit etc. ii. All the logic gates, combinational circuits (Adder, subtractor, code converter, 7 segment display, MUX, DEMUX, Parallel adder, Multiplier), sequential circuits (Flip-flop, Shift Registers, Counters), clock pulse generator can be implemented on a single board. iii. All the logic gates, combinational and sequential circuits such as adders, subtractors, comparators, binary multiplier, code converter, BCD to seven segment display, MUX, DEMUX, decoders, encoders, Flip-flops, Counters, Shift registers can be designed, assembled and tested on the universal bread board.	10nos.	Detailed technical specification: Experimental Trainer Board that contains:-Tie points on bread, board: 2000 nos. or more (solder less), High quality breadboard, Inbuilt fixed power, supply, Inbuilt variable power supply. Inbuilt function Generator. O/P, Waveform: Sine, Triangle, Square and TTL O/Ps, O/P Frequency: 1Hz to 10 MHz, Onboard transformer. Onboard Timer (clock Generator) 1Hz – 10MHz, Onboard Logic Probes. Type: Four state (High, Low, Pulse, High-z) 16- Bit Data switches. Onboard Pulse Generator. Solder less Breadboard can be used for testing 14/16 pin digital IC`s of 54 & 74 series. Onboard Manual clock Both positive & negative edge triggered clock pulse Generator & sequence circuits. 16-bit LED display. Logic probes. Standard Accessories Power Chord, Patch Chords & Instruction Manual **The experimental kit must be robust and simple in connection.**

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Electrical Measurement & Instrumentation Laboratory

Warranty: Standard 2 year warranty of all the items

Sl. No.	Name of the Equipment	Qt.	Specification
01	**i. Wheatstone Bridge**	01 no.	**Features:** • Range of Measurement : 5Ω - 100KΩ • Accuracy (Min to Max.): ±0.2 ±5Ω • Tolerance : ±5% • Built-in power supply • Resistance Box- To vary resistance in steps of 100Ω **Experiments:** Measurement of unknown resistance
	ii. Maxwell Inductance Bridge	01 no.	**Features**: • Audio amplifier with speaker to detect the bridge balancing conditions (optional) • Measurement Range :10mH - 200mH • Tolerance : ±5% • Built-in power supply • Inductance Box (Min - 100μH to Max – 100mH) **Experiments:** Measurement of unknown inductance
	iii. De-sauty's Bridge	01 no.	**Features**: • Measurement Range: 0.02μF to 0.9μF • Sensitivity : ±0.03μF • Audio amplifier with miniature speaker to detect the balance condition of the bridge (Optional) • Capacitance Box : Range 100pf to 11.11μfd in steps **Experiments:** Measurement of unknown capacitance
	iv. Kelvin's Double Bridge	01 no.	**Features**: • Range of Measurement : 0.1Ω - 0.82Ω • Tolerance : ±5% • Built-in power supply **Experiments:** Measurement of unknown resistance
	v. Schering Bridge	01 no.	**Features**: • Measurement Range : 0.01μF to 2μF • Sensitivity : ±0.1μF • Tolerance : ±5% • Audio amplifier with miniature

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			speaker to detect the balance condition of the bridge (Optional) **Experiments:** Measurement of unknown capacitance
	vi. Hay's Bridge	01 no.	**Features**: • Audio amplifier with speaker to detect the bridge balancing conditions (optional) • Measurement Range: 5mH - 500mH • Sensitivity : ±5mH • Built-in power supply **Experiments:** Measurement of unknown inductance
	vii. Anderson Bridge	01 no.	**Features**: • Audio amplifier with speaker to detect the bridge balancing conditions (optional) • Measurement Range : 25mH - 500mH • Sensitivity : ±2mH • Built-in power supply **Experiments:** Measurement of unknown inductance
02	**LVDT characteristics trainer** **Objective: M**easurement of linear displacement using LVDT	01 no.	**Features**: • LVDT sensor with Micrometer (Range: 0-25mm) • Signal Conditioner for LVDT • Displacement calibrated Range for +10mm • Output voltage: 0-5V • Built in Power Supply • digital indicator to display the Displacement **Experiments:** displacement-voltage characteristics of the LVDT
03	**J-type thermocouple characteristics trainer** **Objective:** Study of temperature voltage characteristics of J type thermocouple	01 no.	**Features**: • `J' type Thermocouple as a temperature sensor • sensor for cold junction compensation • Signal conditioner f or `J' type thermocouple output: 0-5V • Built in Instrumentation power supply • digital indicator to display the temperature. • Water bath as heat source • Thermometer provided to monitor the temperature **Experiments:** temperature-voltage characteristics of J-type thermocouple

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04	**Strain gauge characteristics trainer** **Objective:** To measure strain developed in a cantilever beam using strain gauge	01 no.	**Features:** • Cantilever beam of maximum weight up to 1Kg • A pan with slotted weights to vary the strain • Built in power supply • Digital display for displaying the strain • Offset and gain variable provision **Experiments:** Strain - Voltage characteristics

POWER ELECTRONICS LAB

Warranty: Standard 2-year warranty of all the items

SL. NO.	Name of the Item	Specification	Qty.
1	To measure the latching and holding current of a SCR	SCR characteristics study unit: - V–I characteristics study trainer and to find out holding and latching current of SCR. One potentiometer to vary VGK from 1.5V to 15V @100mA. One potentiometer to vary VAK from 3.5V to 35V @500mA. Consists of 2 SCRs with heatsink, RatingofSCR's-12A/600V&16A/1200V, one no. 25Watts Variable load Resistance. This unit is enclosed in a powder coated Ms box with Screen Printed Front panel PVC striker.	1
2	Rheostat	Rheostat:100Ω,5A(Single Tube)	1
3	Inductor	Loading Inductor 1(Ø) –150mH/5A	1
		3-Phase step type Loading Inductor,415V, 50Hz, 0-2-4-6-8-10A AC (Step Variable)	1
4	Tachometer	Digital Contact type	3
5	Multimeter	Digital type	4
6	Isolation Transformer	Isolation Transformer 1(Ø) 1 KVA,5A, 0-230V / 0-30-60-115-200-230V	2
		Isolation Transformer 3(Ø) 2 KVA,5A, 0-230-415V / 15-150-230V	1

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