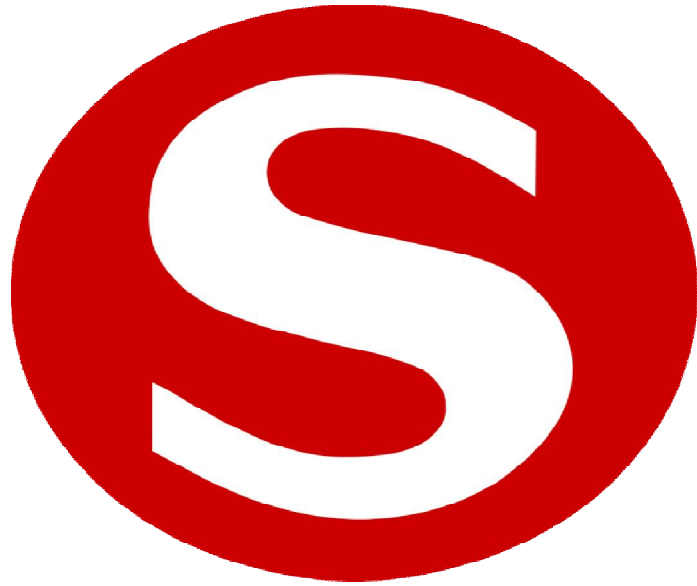


**ELECTRONICS**



**WORLD.in**

**Education  
Training  
Instrument**

# **INSTRUMENTS**

**BASIC ELECTRONICS**

**BREAD BOARD TRAINER**

## BASIC ELECTRONICS

### 1. Conversion of Galvanometer Into a Voltmeter



- Conversion of Galvanometer Into a Voltmeter : Conversion of Galvanometer Into a Voltmeter The board consists of the following built-in parts :
  1. Galvanometer, 65mm rectangular dial having 30-0-30 scale.
  2. 5V D.C. at 50mA, IC regulated Power Supply.
  3. D.C. Voltmeter, 65mm rectangular dial to read 0-5V.
  4. Necessary Shunt & Series Resistances.
  5. Potentiometer and adequate no. of other electronic components.
  6. Mains ON/OFF switch, Fuse and Jewel light.
- The unit is operative on 230V  $\pm 10\%$  at 50Hz A.C. Mains.
- Adequate no. of patch cords stackable from rear both ends 4mm spring loaded plug length  $\frac{1}{2}$  metre.
- Good Quality, reliable terminal/sockets are provided at appropriate places on panel for connections / observation of waveforms.

### 2. Measurement of Inductance & Capacitance :



- Experimental Training Board has been designed specifically for the study of Maxwell's L/C Bridge. Using this bridge the value of unknown capacitor or an unknown inductor can be found. The board is absolutely self contained and requires no other apparatus. Practical experience on this board carries great educative value for Science and Engineering Students.
- Object:  
To study Maxwell's L/C Bridge.
  1. To measure value of unknown capacitance.
  2. To measure value of unknown Inductance.
- Features:  
The board consists of the following built-in parts:
  1.  $\pm 12V$  D.C. at 100mA, IC regulated Power Supply internally connected.
  2. 1 KHz Sine Wave Oscillator.
  3. Audio Amplifier and speaker for null detection.
  4. Five unknown values of capacitors selectable by a band switch.
  5. Three unknown values of inductors selectable by a band switch.
  6. Two decade resistances in 100 ohm steps.
  7. Potentiometer and adequate no. of other electronic components.
  8. Mains ON/OFF switch, Fuse and Jewel light.

### 3. Wien Bridge



- **Wien Bridge : Wien Bridge**  
The board consists of the following built-in parts:
  1.  $\pm 12V$  D.C. at 100mA, IC regulated Power Supply internally connected.
  2. 1 KHz Sine Wave Oscillator.
  3. Audio Amplifier and speaker for null detection.
  4. Three decade resistances, single dial in steps of 100 Ohm, Total 1K each, to form arms of a bridge.
  5. Decade resistance, Two dials of 10 Ohm & 100 Ohm, total 1100 Ohms to form arms of bridge.
  6. Decade Standard Capacitance, selectable by a band switch to form the one arm of the bridge.
  7. Unknown capacitor and adequate no. of other electronic components.
  8. Mains ON/OFF switch, Fuse and Jewel light.

### 4. Opto Electronic Devices Characteristics : Opto Electronic Devices



- **Characteristics Experimental Training Board** has been designed specifically to study the characteristics of Opto Electronic Devices.
- **Features:**  
The board consists of the following built-in parts:
  1. Two 0-10V D.C. at 100mA, continuously variable regulated Power Supplies.
  2. D.C. Milli-ammeter, 65mm rectangular dial to read 0-10mA.
  3. D.C. Micro-ammeter, 65mm rectangular dial, with switch selectable ranges of 50mA, 500mA, 5mA and 50mA.
  4. D.C. Voltmeter, 65mm rectangular dial, with switch selectable ranges of 1V and 10V.
  5. Opto Electronic Devices:
    - 1 Light Emitting Diode (LED)
    - 2 Photo Diode
    - 3 Photo Transistor
    - 4 Light Dependent Resistance (LDR)
    - 5 Photo Voltaic Cell
    - 6 Opto Coupler

## 5. Study of Unijunction Transistor :



- **Object:**
  1. To plot V-I characteristics of a given U.J.T. (Unijunction Transistor).
  2. To use the given U.J.T. as a Relaxation Oscillator.
- **Features:**

The board consists of the following built-in parts

  1. Two 0-30V DC at 50mA, continuously variable regulated Power Supplies
  2. D.C. Voltmeter, 65mm rectangular dial to read 0-30V.
  3. D.C. Ammeter, 65mm rectangular dial to read 0-5mA.
  4. Unijunction Transistor.
  5. Adequate no. of other electronic components
  6. Mains ON/OFF switch, Fuse and Jewel light
- The unit is operative on 230V  $\pm 10\%$  at 50Hz A.C. Mains.
- Adequate no. of patch cords stackable from rear both ends 4mm spring loaded plug length  $\frac{1}{2}$  metre.
- SCathode Ray Oscilloscope 20MHz

## 6. Operational Amplifier Trainer :



- **List of experiments**
  1. Basic operational amplifier circuit
    1. Inverting amplifier
    2. Non-inverting amplifier
    3. Inverting A.C. amplifier
    4. Non-inverting A.C. amplifier
    5. High input impedance inverting amplifier
    6. High input impedance non-inverting amplifier
  - 2. Source Followers
    1. Voltage Follower (Unit gain buffer amplifier)
    2. A.C. Voltage follower
  - 3. Op- Amps As Analogue Computer Elements
    1. Inverting summing amplifier
    2. Non-inverting summing amplifier
    3. Subtractor
    4. Differential amplifier
    5. A.C. differential amplifier
    6. Adder subtractor
    7. Multiplication by a constant
    8. Division by a constant
    9. Integrating amplifier for DC input signals

## 7. Multivibrators (Solid State) :



- **Features:**  
The board consists of the following built-in parts :
  1.  $\pm 9V$  D.C. at 100mA, IC regulated Power Supply.
  2. 0-9V D.C. at 5mA, IC regulated Power Supply.
  3. D.C. Voltmeter, 65mm rectangular dial to read 0-10V.
  4. Pulser for triggering the circuit.
  5. Three NPN transistors.
  6. Adequate no. of other Electronic Components.
  7. Mains ON/OFF switch, Fuse and Jewel light.
- The unit is operative on 230V  $\pm 10\%$  at 50Hz A.C. Mains.
- Adequate no. of patch cords stackable from rear both ends 4mm spring loaded plug length  $\frac{1}{2}$  metre.

## 8. Semiconductor Devices Characteristics :



- **Features:**  
the board consists of the following built-in-parts:
  1. Two, 0-1.5v dc, 0-10v dc and 0-25v dc at 500ma, ic regulated power supplies (switch selectable).
  2. 0-50v d. C. At 100ma, continuously variable regulated power supply.
  3. Two, d. C. Ammeters, 65mm rectangular dial with switch selectable ranges of 50ma, 500ma, 5ma, 50ma and 500ma.
  4. D. C. Voltmeter, 65mm rectangular dial with switch selectable ranges of 1v, 10v and 50v.
  5. Electronic devices (all as mentioned under heading "object").
  6. Adequate no. Of other electronic components.
  7. Mains on/off switch, fuse and jewel light.
- The unit is operative on 230v $\pm 10\%$  at 50hz a. C. Mains.
- Sdequate no. Of patch cords stackable from rear both ends 2mm spring loaded plug length  $\frac{1}{2}$  metre.

## 9. Junction Diode Rectifier & Filter Characteristics :



- Study of junction diode rectifier & filter characteristics.
  1. Study of junction diode rectifier output and ripple content for different resistive loads for :
    - (1) Half wave.
    - (2) Full wave (Centre Tap).
    - (3) Full wave (Bridge).
    - (4) Voltage doubler circuit.
  2. Study of filter and load regulation characteristics for half wave and full wave rectifier having different resistive loads and filters of the type
    - (1) Capacitor filter.
    - (2) Capacitor Filter with capacitor value doubled.
    - (3) Inductor filter.
    - (4) Capacitor input L section filter.
    - (5) Capacitor input p section filter.
- Features:

The board consists of the following built-in parts :

  1. Mains transformer, secondary centre tap 100-0-100V at 100 mA.
  2. DC Milliammeter, 65mm rectangular dial to read 0-100 mA.
  3. DC Voltmeter, 65mm rectangular dial to read 0-300 V.
  4. Four Silicon Junction Diodes.
  5. Filter choke.
  6. Adequate no. of other electronic components.
  7. Mains ON/OFF switch, Fuse and Jewel light.

## 10. MOS-FET Characteristics :



- Object:
  1. To determine experimentally the drain characteristics of a given mosfet.
  2. To study the use of mosfet as an amplifier and to measure its voltage gain in common source configuration. Features:

The board consists of following built-in parts:

    1. 0-15v d. C. At 50ma, continuously variable regulated power supply.
    2. 0-4v d. C. At 10ma, continuously variable regulated power supply.
    3. 0-1v d. C. At 10ma, continuously variable regulated power supply.
    4. D. C. Voltmeter, 65mm rectangular dial with switch selectable ranges of 1v and 15v.
    5. D. C. Milliammeter, 65mm rectangular dial to read 0-30ma.
    6. Metal oxide semiconductor field effect transistor (mosfet).
    7. Adequate no. Of other electronic components.
    8. Mains on/off switch, fuse and jewel light.



## 11.Active Filters :



- **Object:**  
To study characteristics of various active filters.
- **Specifications:**
  1. Low Pass Filter
    - (1) Upper Cut-off frequency : 1 KHz
    - (2) Cut-off slope : 29.5 dB/decade
    - (3) Input impedance : 3.5 K at 1KHz
    - (d) Output impedance : 18 Ohms at 1KHz
  2. High Pass Filter
    - (1) Lower cut-off frequency : 100 Hz
    - (2) Cut-off slope : 26 dB/decade
    - (3) Input impedance : 12 K at 100 Hz
    - (4) Output impedance : 30 Ohms at 100 Hz
  3. Band Pass Filter
    - (1) Upper cut-off frequency : 1 KHz
    - (2) Lower cut-off frequency : 100 Hz
    - (3) Upper cut-off slope : 29.5 dB/decade
    - (4) Lower cut-off frequency : 26 dB/decade
    - (5) Input impedances : 24 K at 100 Hz , 3.5 K at 1 KHz
    - (6) Output impedances : 30 Ohms at 100 Hz, 27 Ohms at 1 KHz

## 12. Semiconductor Diode Characteristics:



- **Object:**
  - To Study and Plot the Forward and Reverse Bias characteristics of (Ge & Si) Semiconductor Diodes.
  - To Determine the Static and Dynamic resistances of Forward Biased p-n junction of the given Diodes.
- **Features:**
  - 0-10V D.C. at 50mA, continuously variable with Coarse & Fine Pots, regulated Power Supply.
  - D.C. Voltmeter, 65mm rectangular dial, with switch selectable ranges of 1V and 10V.
  - D.C. Microammeter, 65mm rectangular dial, with switch selectable ranges of 50 mA and 10mA.
  - Ge and Si Semiconductor Diodes.
  - Adequate no. Of other electronic components.



### 13. DE-Sauty Bridge :



- **Object:**  
To study the working of a de-sauty bridge and to compare the capacitance of two capacitors.
- **Features:**  
The board consists of following built-in parts:
  01. Two decade resistances, each with single dial in steps of 100w total 1kw, to form the two arms of the bridge.
  02. Two decade capacitors, each with single dial in steps of 0. 1mf total 1mf, to form the other two arms of the bridge.
  03. A high impedance head phone, for detecting the null position

### 14. Diac Characteristics:



- **Object:**
  01. To plot V-I Characteristics of a DIAC and study the following :
    1. Breakover voltage, VBO.
    2. Negative resistance region.
    3. VBO symmetry and delta V
  02. To study the applications of a DIAC as :
    1. Saw tooth waveform generator.
    2. Pulse train generator.
- **Features:**  
The board consists of following built-in parts:
  1. 0-50V D.C. at 50mA, regulated Power Supply.
  2. 45V A.C. at 50mA, unregulated Power Supply.
  3. D.C. Voltmeter, 65mm rectangular dial to read 0-50V D.C.
  4. D.C. Ammeter, 65mm rectangular dial with switch selectable ranges of 200mA and 50mA.
  5. DIAC.
  6. Potentiometer and adequate no. of other electronic components.
  7. Mains ON/OFF switch, Fuse and Jewel light.

## 15. Triac Characteristics :



- Object:
  1. To study the gate characteristics of a TRIAC in the following modes :
    - (a) Mode I+ : i.e. T2 positive with respect to T1 and gate positive with respect to T 1
    - (b) Mode I- : i.e. T2 positive with respect to T1 and gate negative with respect to T 1
    - (c) Mode III+ : i.e. T2 negative with respect to T1 and gate positive with respect to T 1
    - (d) Mode III- : i.e. T2 negative with respect to T1 and gate negative with respect to T 1
  2. To study the terminal characteristics of a TRIAC in the following modes :
    - (a) Mode I+ : i.e. T2 positive with respect to T1 and gate positive with respect to T 1
    - (b) Mode III+ : i.e. T2 negative with respect to T1 and gate positive with respect to T 1
  3. To study the following applications of TRIAC :
    - (a) Triac as a static switch (D.C. control).
    - (b) Control of A.C. with A.C. signal.
    - (c) To measure the holding current of IH. Triac.
- FEATURES  
The board consists of following built-in parts:
  01. 0-70V D.C. at 100mA, regulated Power Supply.
  02. 0-3V D.C. at 30 mA, regulated Power Supply.
  03. 55 Volt at 100mA, fixed A.C. Supply.
  04. 7 Volt at 30mA, fixed A.C. Supply.
  05. D.C Ammeter, 65mm rectangular dial with switch selectable ranges of 10mA and 100mA.
  06. D.C Ammeter, 65mm rectangular dial to read of 0-30mA.
  07. D.C. Voltmeter, 65mm rectangular dial with switch selectable ranges of 5V and 100V.
  08. TRIAC.
  09. Three Potentiometers.
  10. Reset switch.
  11. Adequate no. of other electronic components.
  12. Mains ON/OFF switch, Fuse and Jewel light

## 16. Verification of Laws & Network Theorems in DC Circuits Ex :



- Features:
  01. 0-30V D.C. at 100 mA, continuously variable IC Regulated Power Supply
  02. +9V D.C. at 100 mA, IC Regulated Power Supply
  03. +5V D.C. at 100 mA , IC Regulated Power Supply
  04. D.C. Voltmeter, 65mm rectangular dial with switch selectable ranges of 0.5, 1.5, 25 & 50V
  05. D.C. Ammeter, 65mm rectangular dial with switch selectable ranges of 0.05, 0.5, 5, 50 & 100mA
  06. Adequate no. of other electronic components

## 17. Determination of Energy Band Gap In Semiconductor :



- Object:
- To draw the characteristics of a P-N junction diode for reverse saturation current and temperature.
- To determine the energy band gap in a P-N junction diode.
- Features:
- The board consists of the following built-in parts :
  01. 2V D.C. at 10mA, regulated power supply.
  02. Digital microammeter, 3½ digits having range 200mA D.C.
  03. Semiconductor diode.
  04. Thermometer 0-110 °C.
  05. Oven, electrically heated to heat the semiconductor diode.
  06. Mains ON/OFF switch and fuse

## 18. F.E.T. Characteristics :



- Features:

The board consists of the following built-in parts:

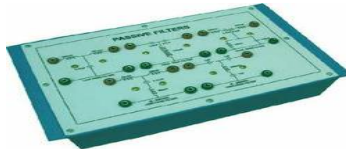
  01. 0 to 20v d. C. At 50ma, continuously variable power supply.
  02. 0 to 12v d. C. At 50ma, continuously variable power supply.
  03. Two d. C. Voltmeters, 65mm rectangular dial to read 0-20v.
  04. D. C. Milliammeter, 65mm rectangular dial to read 0-20ma.
  05. Field effect transistor.
  06. Adequate no. Of other electronic components.
  07. Mains on/off switch, fuse and jewel light.

## 19. Transistor Characteristics :



- Features:
- Two 0-10v d. C. At 200ma, continuously variable power supplies for base emitter & collector emitter junctions.
- Two d. C. Ammeters, 65mm rectangular dial with switch selectable ranges of 200 ma & 10ma.
- Two d. C. Voltmeters, 65mm rectangular dial with switch selectable ranges of 1v and 10v. Two silicon (nnp & pnp) transistors and two germanium (nnp & pnp) transistors.
- Adequate no. Of other electronic components
- Mains on/off switch, fuse and jewel light.

## 20. Passive Filters :



- Object:
- To study different types of passive filters and determine the different constants and cut-off frequency of the following passive filters :
- Low-Pass constant-K filter
- High-Pass constant-K filter
- Band-Pass constant-K filter
- Low-Pass M-Derived filter
- High-Pass M-Derived filter
- Features:
- Different types of Passive Filters
- Adequate no. of other electronic components
- Dimension : W 340 x H 110 x D 210
- Other Apparatus Required:
  - Audio Frequency Generator
  - A.C. Milli-voltmeter

## 21. Anderson Bridge :



- Experimental training board has been designed specifically for the measurement of inductance of a coil by Anderson Bridge. It includes audio amplifier with speaker for null detection (Instead of head phone) and one KHz sine wave oscillator instead of externally used decade audio frequency generator. The board is absolutely self contained and requires no other apparatus.
- Object:
- To measure the inductance of a given Coil by Anderson Bridge method.
- Features:
- Anderson Bridge circuit with arms values
- Potentiometer for varying one arm
- Three different value inductances
- Potentiometer with calibrated dial
- Five capacitors selected by a band switch
- Audio Amplifier with its IC regulated Power Supply
- 07. One KHz Sine Wave Oscillator with its IC regulated Power Supply
- Speaker.

## 22. Series and Parallel Resonance :



- To study the following :
- Series resonance for different values of resistances, capacitances, inductances and plotting of resonance curves.
- Parallel resonance for different values of resistances, capacitances, inductances and plotting of resonance curves.
- Measurement of Q for both series and parallel resonances.
- Measurement of dielectric constant relative permittivity of a liquid.
- Features:
- Three inductances made on ferrite cores, selectable by a switch.
- Three capacitances with low loss factor, selectable by a switch.
- Three resistances, selectable by a switch.
- Other Apparatus Required:
- Decade Audio Frequency Generator
- A.C. Millivoltmeter
- A.F. Millivoltmeter

## 23.RF Oscillators :



- Special Feature:
- -9V DC at 50 MA, IC regulated power supply internally connected
- PNP transistor
- Variable gang condenser
- Adequate no. of other electronic components
- Mains on/off switch, fuse and jewel light
- The unit is operative on 230V  $\pm$ 10% at 50Hz A.C. mains
- Adequate no. of patch cords stack able from rear both ends 4mm spring loaded plug length  $\frac{1}{2}$  meter
- Good quality, reliable terminal/sockets are provided at appropriate places on panel for connections/ observation of waveforms
- Strongly supported by detailed operating instructions, giving details of object, theory, design procedures, report suggestions and book references
- Weight : 3 kg. (approx.)
- Dimension : W 340 x H 110 x D 210
- Absorption wave meter.

## 24.Manufacturing and Exporting of Study of Unijunction Transistor :



- To plot V-I characteristics of a given U.J.T. (Unijunction Transistor).
- To use the given U.J.T. as a Relaxation Oscillator.
- Features:  
The board consists of the following built-in parts
  1. Two 0-30V DC at 50mA, continuously variable regulated Power Supplies
  2. D.C. Voltmeter, 65mm rectangular dial to read 0-30V.
  3. D.C. Ammeter, 65mm rectangular dial to read 0-5mA.
  4. Unijunction Transistor.
  5. Adequate no. of other electronic components
  6. Mains ON/OFF switch, Fuse and Jewel light
- Cathode Ray Oscilloscope 20MHz

## 25. Verification of Ohm's Law Series & Parallel Circuits :



- The board consists of the following built-in parts:
  1. 0-15 V.D.C. at 100 mA, continuously variable regulated Power Supply.
  2. D.C. Voltmeter, 65mm rectangular dial to read 0-15V D.C.
  3. D.C. Milliammeter, 65mm rectangular dial to read 0-50mA D.C.
  4. Adequate no. of other electronic components.
  5. Mains ON/OFF switch, Fuse and Jewel light.
- The unit is operative on 230V  $\pm$ 10% at 50Hz A.C. Mains.
- Adequate no. of patch cords stackable from rear both ends 4mm spring loaded plug length  $\frac{1}{2}$  metre.
- Good Quality, reliable terminal/sockets are provided at appropriate places on panel for connections/observation of waveforms.
- Strongly supported by detailed Operating Instructions, giving details of Object, Theory, Design procedures, Report Suggestions and Book References.
- Weight : 3 Kg. (Approx.)
- Dimension : W 340 x H 110 x D 210

## 26. T and Pie Circuit Trainer :





## **BREAD BOARD TRAINER**

### **1. Power Electronics Lab :**



- DC Power Supply on Board
  - :  $\pm 5V$  at 100mA
  - :  $\pm 12V$  at 150mA
  - :  $\pm 15V$  at 50mA
  - :  $\pm 35V$  at 50Ma
- AC Power Supply on Board : 18V - 0V - 18V at 50mA
- 15V - 0V - 15V at 50mA
- Triggering Circuit on Board : 5 gate signal output
- Frequency range : 40Hz to 900Hz Variable
- Amplitude : 12V
- PWM control of G1,G2,G3 and G4 Duty
- cycle control of "Gate" Signal is 0 to 100%
- Single Phase Rectifier : Firing angle control  $0^\circ$ - $180^\circ$  variables
- Firing Circuit on Board : Four gate signal output with isolation

### **2. Electricity Lab :**



- Specifications:
- Meters: 5 Nos.
- AC Voltmeter : 15V
- DC Voltmeter : 15V
- Galvanometer :  $\pm 250\mu A$
- DC Ampere Meter : 0.6Amp
- DC Ampere Meter : 5A
- Power Supply:
- Power Supplies : 3, 6, 12Vat 3.5A
- Power SupplyAC : 30Vat1A
- Power SupplyDC : 5Vat100mA
- Switch SPDT
- Switch DPDT
- Relay 12VDCOne change over
- Buzzer/Electric Bell
- Transformer Input 6-0-6V and Output 6-0-6V
- Bulb6VThree Nos.
- Breadboard 840Tie Points

### 3. Electricity Trainer :



- **Specification & Features:**

- DC power Supply : 5V. 200 mA
- DC power Supply : 12V. 200 mA
- AC power Supply : 6V, 1A
- Relay : 12V
- Galvanometer : 30 -0 -30 .
- Galvanometer Resistance : 80 Ohm
- Light Bulbs (3 Nos.) : 6V
- Potentiometers (3 Nos.) : 25 Ohm. 1 W 10 K Ohm. 1 W
- Switch : 1 Pole, 2 Way Toggle Type
- Core Types : E, I, U
- Main Supply : 230V AC 50Hz
- Dimension : W 340 x H 110 x D 210

### 4. Logic Gates Circuit Trainer :



- *Logic Gate Circuit Trainer*-are designed to study the functioning of various circuits, are rugged & user friendly, the detailed circuit is printed on the top & the components are mounted inside on a PCB & the required

## 5. Bread Board Trainer :



- Specifications:
- Output D.C. Voltage : Fixed 5V  $\pm$ 1%.
- Output Current : 2 Amp.
- Output D.C. Voltage : Fixed 15V  $\pm$ 1%.
- Output Current : 500 mA.
- Load Regulation :  $\pm$ 1% of the highest specified output voltage.
- Ripple And Noise : less than 5 mV.
- Clock Pulses : 1 Hz and 1 KHz by manual pulser.
- Logic Inputs : 8 switches for High/Low.
- Bread Board : 3 mains strips (Approx. 175mm long). : 5 bus mains strips (Approx. 175mm long).
- For Connections : 1/2 mains strip (Approx. 175mm long).
- Operating Conditions : 0 to 40°C and 95% R.H. at 40°C.
- Input Voltage : 230 V  $\pm$ 10% at 50 Hz A.C. Mains.
- Weight : 3 Kg. (Approx).
- Dimension : W 340 x H 110 x D 210

## 6. Digital Logic Trainer (TTL) Logic Trainer Board :



- OUTPUT D.C. VOLTAGE : Fixed 5V, Variable 0 to  $\pm$ 18 V.
- OUTPUT CURRENT: 1 Amp.
- LOAD REGULATION :  $\pm$ 1% of the highest specified output voltage.(NO LOAD TO FULL LOAD)
- RIPPLE AND NOISE : less than 2 mV.
- VARIABLE CLOCK FREQUENCY : 1 Hz to 1 MHz by three frequency range & multiplier.
- LOGIC INPUTS : 16 switches for High/Low
- OUTPUT INDICATORS : 16, 5 mm bright Red LEDs.
- SEVEN SEGMENT DISPLAY : 4 digit seven segment display with decoder driver.
- DIGITAL VOLTMETER : Digital DC voltmeter range 0 - 20V.
- OPERATING CONDITIONS : 0 to 40°C and 95% R.H. at 40°C.
- BREAD BOARD : Unique solder - less large size, spring loaded breadboard consisting of 2 Terminal Strips with 640 tie points each and 4 Distribution Strips with 100 tie points each, totalling to 1680 tie points.
- INPUT VOLTAGE : 230V  $\pm$ 10% at 50 Hz A.C. Mains.
- ICs PROVIDED : 29 ICs have been provided.

## 7. Digital Electronic Trainer :



- Study and verifications of the law of Boolean algebra and De-Morgan's Theorems.
- Study of important TTL terminologies. Verification of important TTL Circuit parameters.
- Construction and verification of various types of flip - flops using gates and Ic's
- Construction and verification of various types of combinational circuits
- Construction and verification of various types of counters
- Construction and verification of 4 Bit Universal Shift Register :  
1 Parallel Input Parallel Output( Parallel load operation) 7.2 Shift Right Operation (Serial Input serial Output)  
2 Shift Left Shift Register
- Study of 7 - Segment Display And Decoder / Driver.
- Many other experiments are possible using the onboard components and Bread board

## 8. Bread Board Circuit Lab :



1. Bread boards :  
Unique solder-less large size, spring loaded breadboard consisting of two Terminal Strips with 1280 tie points and 4 Distribution Strips with 100 tie points each, totaling to 1680 tie points. (Size:112mm x 170mm approx)
2. IC based DC Reg. :  
(a). +12 V / 500 mA ( fixed and with facility to vary from 0 to +12 V ).
3. Power Supplies :  
:(b). -12 V / 500 mA ( fixed and with facility to vary from 0 to -12 V ).  
:(c). + 5V  $\pm$  0.25V / 500mA ( fixed ).
4. Digital meters :  
:(a) Dual range DC voltmeter ( 20 V / 200V ). ( 3.5 Digit)  
:(b) Dual range DC current meter ( 200 mA / 2A ).
5. Continuity Tester :  
Audio / Visual indication.
6. Clock Generators :  
(a). 0.1Hz, b. 1Hz, c. 100Hz, d. 1KHz. Simultaneous independent fixed TTL ( 5V ) outputs.
7. Manual Pulser :  
One independent buffered bounce less manual pulser ( useful for freezing the action of each stage of the counter after every clock pulse )
8. Patch Cords :  
a. Set of 25 assorted colored single stand hook - up wires.  
b. Set of 15 assorted colored multi - stand wires with 2mm stackable plug termination at one end & hook-up wire termination at the other end.
9. Components provided : IC-7400/1, 7402/1, 7408/1, 7432/1, 7404/1, 7490/1, 7495/1, 7486/1, 7476/2, 7410/2

E-mail : [info@sworld.in](mailto:info@sworld.in) & [zala@sworld.in](mailto:zala@sworld.in)

Customer Care No : 076 0000 3447

## 9. Power Project Board Trainers :



- Features:
- Breadboard : Unique solder-less large size, spring loaded breadboard consisting of 3 Terminal Strips with 1920 tie points and 5 Distribution Strips with 500 tie points , totaling to 2420 tie points.
- Power Supply
- Fixed DC Power Supply : 5 V at 1 Amp.
- Variable DC Power Supply :  $\pm 0$  to 15 V at 500 mA
- Mains On/Off Illuminated Switch
- Accessories : Mains Lead, Operating Manual, Adequate no. of patch cords (Total 26)

## 10. Logic Lab Board Trainers :



- Experimental Coverage:
- Logic gates operation
- To prove De-morgan's theorem with boolean logic equations
- Binary to Gray code conversion
- Gray code to Binary conversion
- Binary to Excess-3 code conversion
- Binary Adder and Subtractor
- Binary Multiplier
- EX-OR gate implementation
- Application of EX-OR gate
- To verify the dual nature of Logic Gates
- Study of Flip-Flops RS, JK,
- Specifications:
- Basic Logic Gate Units : It contains 6 kinds of logic gates, i.e. AND GATE X 6, OR GATE X 6, NAND GATE X 6, NOR GATE X 6, XOR GATE X 3, NOT GATE X 3. Input voltage of HI level  $> 2.25V$  Input voltage of LO level  $< 0.8V$
- DC Power Supply : Equipped with short circuit protection and indicator.
- a. Output voltage  $+5V \pm 5\%$  Max. output current 1 Amp. Line regulation  $< 50mV$  Load regulation  $< 100mV$
- b. Output voltage  $-5V \pm 5\%$  Max. output current 500 mA Line regulation  $< 25mV$  Load regulation  $< 30mV$
- c. Output voltage  $\pm 15V \pm 5\%$  Max. output current 500 mA Line regulation  $< 150mV$  Load regulation  $< 150mV$
- Pulse Generator : 3 kinds of time interval, 1 sec, 0.1 sec, 0.01 sec.
- Output voltage  $+5V$  Debounced Logic Switch : 4 No's HI / LO
- LED Indicator : 8 Bits LED Output Indicator, Max. Input Voltage

## Digital Lab Station Board Trainers :



- Experimental Coverage:
  1. Logic gates operation
  2. To prove De-Morgan theorem With Boolean logic equations
  3. Binary to Gray code conversion
  4. Gray code to Binary conversion
  5. Binary to Excess-3 code conversion
  6. Binary Adder and Subtractor
  7. Binary Multiplier
  8. EX-OR gate implementation
  9. Application of EX-OR gate
  10. Johnson Counter
  11. To verify the dual nature of Logic Gates
  12. Study of Flip-Flops RS, JK, D&T
  13. Multiplexer and Demultiplexer
  14. 4 Bit Binary up and down counter
  15. Study of 8 to 3 Line Encoder
  16. Study of 3 to 8 Line Decoder
  17. Study of Shift Register (SIPO)
  18. CMOS-TTL Interfacing
  19. Study of Crystal oscillator
  20. Study of pulse stretcher circuit
  21. 4 Bit Ring Counter
  22. Modulo 12 Counter By Direct Clearing
  23. Decade counter
  24. Shift Register SISO and PIPO

## 11. Digital Trainer :



1. Breadboard : Solderless Bread board with 1680 inter connected Tie Points
3. Logic Switches : 8 logic level Switches in Dip type .
4. Power Supply : Fixed: +5V at 750 mA
5. Power Sockets : Logic Probe Power Supply Sockets
6. Logic Input : 8 LED buffered logic level indicators
7. Variable Clock : Fine adjustment of clock frequency.  
Clock range selection L: 10 – 40 Hz, H : 1K – 20K Hz.
9. Components Provided : ICs - 4001/1, 7400/3, 7402/1, 7404/1, 7408/1, 7432/1, 7476/2, 7486/1, 74126/1, Resistors 1/4W

E-mail : [info@sworld.in](mailto:info@sworld.in) & [zala@sworld.in](mailto:zala@sworld.in)

Customer Care No : 076 0000 3447

## 12. Digital- Analog Lab Trainers :



- Experimental coverage:analog
- Study of diodes in dc circuits
- Study of light emitting diodes in dc circuits
- Study of half wave rectifier
- Study of full wave rectifier
- Study of zener diode as a voltage regulator
- Study of transistor series voltage regulator
- Study of transistor shunt voltage regulator
- Study of low pass filter
- Study of high pass filter
- Study of band pass filter
- Study of ce configuration of npn transistor
- Study of cb configuration of npn transistor
- study of ce amplifier
- study of monostable multivibrator using transistor
- study of bistable multivibrator using transistor
- study of astable multivibrator using transistor

## 13. Digital Lab Board Trainers :

- Experimental coverage:
- Logic gates operation
- To verify De-morgan<sup>TM</sup>s theorem with boolean logic equations
- Binary to gray code conversion
- Gray code to binary conversion
- Binary to excess-3 code conversion
- Binary adder and subtractor
- Binary multiplier
- EX-OR gate implementation
- Application of EX-OR gate
- Johnson counter
- To verify the dual nature of logic gates
- Study of flip-flops RS, JK, D&T
- Multiplexer and demultiplexer
- 4 bit binary up and down counter
- Study of 8 to 3 line encoder
- Study of 3 to 8 line decoder
- Study of shift register (SIPO)
- CMOS-TTL interfacing
- Study of crystal oscillator
- Study of pulse stretcher circuit



## 14. Digital Logic Trainer / Logic Trainer Board :



based on 74 series has been designed specifically to make the students familiar with the study of TTL ICs and verification of the truth table of logic gates, flip-flops, Gated & Master Slave JK flip-flops, Schmitt Trigger, Expanders, Binary address, Counters, Shift registers, Multiplexer (Encoder), Demultiplexer (Decoder), 8 Bit D/A Converter and 8 Bit A/D Converter etc. Large area of Bread Board is provided on the front panel for ICs. Students can make the circuit easily on the Bread Board with the help of other accessories which are provided on the front panel of Digital Logic Trainer.

- Specifications:
- OUTPUT D.C. VOLTAGE : Fixed 5V and 0 -  $\pm 18V$ .
- OUTPUT CURRENT: 1 Amp.
- LOAD REGULATION :  $\pm 1\%$  of the highest specified output voltage.(NO LOAD TO FULL LOAD)
- RIPPLE AND NOISE : less than 2 mV.
- VARIABLE CLOCK FREQUENCY : 1 Hz to 1 MHz by three frequency range & multiplier.
- LOGIC INPUTS : 16 switches for High/Low
- OUTPUT INDICATORS : 16, 5 mm bright Red LEDs.
- SEVEN SEGMENT DISPLAY: 4 digit seven segment display with decoder driver.
- DIGITAL VOLTMETER : Digital DC voltmeter range 0 - 20V.
- OPERATING CONDITIONS : 0 to 40°C and 95% R.H. at 40°C.
- BREAD BOARD : Unique solder - less large size, spring loaded breadboard consisting of 2 Terminal Strips with 640 tie points each and 4 Distribution Strips with 100 tie points each, totalling to 1680 tie points.
- INPUT VOLTAGE : 230V  $\pm 10\%$  at 50 Hz A.C. Mains.
- ICs PROVIDED : 29 ICs have been provided. Note :Following ICs or equivalent can be provided.