

<b>Digital Electronics laboratory</b>		
<b>Sr. No.</b>	<b>Description Of Item / Specifications</b>	<b>Quantity</b>
1.	<p><u>A master unit carrying useful experiment resources like</u></p> <p>Built in Power Supply  DC. Power Supply : 5V / 1A , ± 12V, 500mA  Variable : 0 - + / -12V 150mA, AC 12 - 0 - 12, 150mA AC  Built in Function Generator  Output Waveform - Sine, Triangle &amp; Square / TTL  Output Frequency - 1 Hz to 200KHz in 6 ranges, with amplitude &amp; frequency control pots. O/P Voltage 20V p-p max.  Clock Generator : 10 MHz TTL clock.  Input Data Switches and output LED status indicators for High/Low indication (15+1) No.  Pulser switches (2 nos.) With four debounced outputs..2no.  Fixed TTL (5V) clocks : 4 Nos. 1KHz, 100Hz, 5Hz, 1Hz  Logic probe to detect High/Low level pulses up to 1MHz, with bi-colour LEDs to indicate status.  2 digit 7 segment display with BCD to 7 segment decoder.  LED BAR graph with 10 LED indicator to display 0-2.5V or 0-4V input.  Onboard DPM is provided with mode selection.  DC volt / current - 200mA/20V .....1no.  Onboard speaker - 8 Ohms, 0.5 Watt (1no.)  Onboard POTS.....1K(1no.) &amp; 1M(1no.)  Built in bread board panel with 1280 tie points and 400 distribution points totalling to 1680 points along with 4mm banana sockets fortapping from the trainer +5V, +12V GND for the circuits to be assembled on bread board using single stand (#22/24)wire should provide.  Computer Interface Adapter Facilitates connecting your trainer to either IEEE 488 or RS232 com port of PC using 25 pin (male) D connector through 25 nos. of banana sockets. Optionally a 16 pin ZIF should be provided in place off 'D' connector.  Modular Experiment Panels should provide in conjunction with above Master Unit</p>	4
2.	<p>DC/AC &amp; Wave Shaping Circuit Experiment Panel :</p> <p>Wave Shaping: Differentiator, Integrator, Clipping, Clamping,  Passive filters LC / RC, LPF/ HPF  DC: Resistance, current and voltage measurements, Power DC circuits, Series, parallel and mixed circuits , Voltage distribution of capacitors in series &amp; parallel, total capacitance of capacitors in series and parallel, charging and discharging of capacitor through resistance &amp; time constant, 2 Port Network Y, Z, ABCD Parameters &amp; Star Delta Network.  AC : AC Voltage &amp; Current Measurements - R-L series, R-C series, R-L-C series circuit (Series Resonance). R - L parallel, R-C parallel, R-L-C parallel(Parallel Resonance), Active, Reactive power &amp; power factor(Vector Diagram), average &amp; RMS Value measurement. The experiment panel should provide with sufficient banana tags &amp; operating</p>	4

	manual.	
3.	Digital Logic Gates Experiment Panel AND, OR, Invertors, NAND, NOR, EX-OR, EX-NOR, Demorgan's theorems, Input / Output characteristics, propagation delay. The experiment panel should provide with sufficient banana tags & operating manual.	4
4.	Flip Flop, Counters & Shift Register Experiment panel : R-S Flip-flop, 'D' flip-flop, 'T' flip-flop, 'J-K' flip-flop, Master- slave J-K flip-flop, Binary Counter, Rotary feed back application of counter, Decade counter, Shift registers: Shift left/Right/Ring counter, Parallel mode, Twisted ring counter. The experiment panel should provide with sufficient banana tags & operating manual.	4
5.	Timer (555) & Frequency (565) application Experiment Panel : Using 555: Timer (1 shot/Monostable), Free running (Astable), Bistable. Applications of 555: Saw tooth generation, long duration timer, tachometer, missing pulse detector. Using PLL (IC565), VCO, Phase detector, Determination of Lock freq., Capture freq., & freq. Multiplier / Synthesizer, FM demodulation (Using PLL). The experiment panel should provide with sufficient banana tags & operating manual.	4
6.	Analog Multiplexer / Demultiplexer & ADC, DAC Expt. Panel (P26) : (Provided with 40 banana tags.) : 8 Channel Analog Multiplexer, 1 of 8 Analog Demultiplexer, A to D Converter (3 bit), D to A Converter (4 bit) -weight & binary & R-2R . The experiment panel should provide with sufficient banana tags & operating manual.	4
7.	Study of Logic Gates & Applications Expt. Panel : Logic Gates, & input output characteristics Boolean Algebra Theorems, Demorgan's Theorems, Logical equations, Digital code lock, R-S flip-flop using NOR gates, Multivibrators - Astable, Monostable & Bistable multivibrator etc., 4 bit synchronous counter, Synchronous non binary counter/Decade counter /MOD 10 counter . The experiment panel should provide with sufficient banana tags & operating manual.	4

8.	ADC & DAC Circuits Experiment Panel : 8 bit ADC, 0-5V I/P:- Dual slope ADC, Tracking ADC, SAR ADC, RAMP ADC, Bipolar ADC using level translator, Delta Sigma ADC , 8 bit DAC:- O/P Range 0 5V & +/-5V. The experiment panel should provide with sufficient banana tags & operating manual.	4
9.	Multiplexer , Decoder & Encoder Trainer with built in power supply : Multiplexer , Decoder /Demultiplexer , BCD to seven segment decoder driver , Tristable logic , Encoder . The experiment panel should provide with sufficient banana tags & operating manual.	4
10.	Digital IC panel : It should covers mention IC (7400,7404, 7408, 7432, 7486, 7476, 7490, 7476, 7495 or 7402) IC should be provided on sockets & pins to be brought out on 4mm banana ports for all.	4
<b>Basic Electronics Laboratory</b>		
1.	<p><u>A master unit carrying useful experiment resources like</u></p> <p>Built in Power Supply DC Supply:5V / 1A. &amp; <math>\pm 12V</math>, 500mA. 0 to 15V DC (Variable), 100 mA (Isolated), 0 to 30V DC (Variable), 100 mA (Isolated), HighVolt DC -15V to 220 V, 100mA. AC Supply:12-0-12V AC,150 mA. Short circuit protected.</p> <p>Built in Function Generator O/p Waveform :Sine, Triangle &amp; TTL O Output Frequency : 1 Hz to 1MHz in 6 ranges, with amplitude &amp; frequency control pots. O/P Voltage 20Vp-p max. (Sin/TRG) Modulation I/P AM : - I/P voltage + 5V (100%modulation) O/P - For 0V (min), + 5V (max.) - 5V (Phase reversal of O/P) FM : I/P voltage <math>\pm 400mV</math>( + 50% modulation) Clock Generator : 10 MHz TTL clock. Data Switches (10 No.) &amp; bi-colour LED status indicators 10X2 Nos, for High/Low indication. Pulser switches (2 Nos.) with four debounced outputs - 2No. Optional BNC to 2 channel banana adapter - 2No. Logic probe to detect High/Low level pulses upto1MHz, with bi-colour LEDs to indicate status. 2 / 4 digit 7 segment display with BCD to 7 segment decoder. Built in bread board panel with 1280 tie points and 400 distribution points totalling to 1680 points along with 4mm banana sockets fortapping from the trainer +5V, +12V GND for the circuits to be assembled on bread board using single stand (#22/24)wire should provide. Onboard digital panel should provide with mode/range selection. (A) DC volt : 2V/200V - 1No. (B) DC current : 2mA/200mA - 1No. (C) DC Volts/Current : 20V/200mA - 1No.</p>	4

	Onboard moving iron meters should provide for (A) AC Current: 1 Amp. - 1No. (B) AC Voltage : 15V - 1No. Onboard speaker: 8 Ohms, 0.5 Watt -1No. Onboard POTS : 1K - 1No. 1M - 1No. Experiment Panels should provide in conjunction with above Master Unit	
2.	<b>Semiconductor &amp; Power Semiconductor Devices Experiment Panel</b> : Silicon diode, Semiconductor Testing using Multimeter, Germanium diode, zener diode, LED, diac, bipolar transistor (NPN, PNP), Field Effect Transistor (FET), MOSFET, IGBT, UJT, Silicon Controlled Rectifier (SCR), Triac, Optocoupler, Band gap energy Calculations, Thermistor, V-I Characteristics on CRO of SCR, Triac, Transistor as a Switch & MOSFET as a Switch. The experiment panel should provide with sufficient banana tags & operating manual.	4
3.	<b>Transistor h-parameters &amp; CB/CC/CE amplifiers experiment panel</b> : Thermal stability (Transistor bias stability), Determination of h-parameters, Common base, common collector, common emitter, cascode amplifier, bootstrapping & transistor switching. The experiment panel should provide with sufficient banana tags & operating manual.	4
4.	<b>Operational Amplifier Circuit Experiment panel</b> : Inverting amplifier, Non-inverting amplifier, Summing amplifier, Difference amplifier, Integrater circuit, Differentiator circuit, Precession rectifier: Half wave & full wave, Voltage to current converter, Current to voltage converter, Op-amplifier characteristics, Instrumentation amplifier, Schmitt trigger, Comparator, Sign Changer, Offset Null, Peak detector, Clipping circuit, Clamping circuits (DC restorer), Waveform Generator. The experiment panel should provide with sufficient banana tags & operating manual.	4
5.	<b>Advance Operational Amplifier with built in power supply</b> : Lowpass Filter , High Pass Filter , Bandpass Filter , Notch Filter , Wein Bridge Oscillator , Phase Shift Osc. , sample & Hold Circuit , Log Amplifier , Antilog amplifier , Voltage to frequency converter , Freq. to voltage converter , square Rooter. The experiment panel should provide with sufficient banana tags & operating manual.	4
6.	Bread-Board with power supply	2
<b>Test &amp; Measuring Units</b>		
1.	<b>DIGITAL MULTIMETER</b> ( Hand Held) 3 ½ digit Multimeter DCV -1000Volts , ACV-1000 Volts , DCA/ACA -10 Amp. Resistance : 10 MOhm Diode & Continuity check facilities With all standard accessories & operating manual should provide.	4