Indian Institute of Engineering Science & Technology, Shibpur
Howrah – 711103

Tender Notice

Advt. No. JA/D(AA)/16/07
Date : 29.01.2016

Sealed tenders are invited from reputed vendors for supply of laboratory equipments for Dept. of Electronics & Telecomm. Engg. Details are available at **www.iiests.ac.in**. Last time and date of submission of bid is upto **3 PM on 12.02.2016**

(**P. K. Paul**)
Dean, Administrative Affairs

Downloadable

INDIAN INSTITUTE OF ENGINEERING SCIENCE & TECHNOLOGY, SHIBPUR

(Under Ministry of Human Resource Development, Government of India)
(Formerly, Bengal Engineering & Science University, Shibpur)
P.O. Botanic Garden, Howrah – 711 103, West Bengal, India

BIDDING DOCUMENT

Ref.: Advt. No. JA/D(AA)/16/07,

Published in

"The Times of India", "Anandabazar Patrika", "Dainik Jagran"

dated 30.01.2016

For the Supply of

Laboratory Equipments, Software, Computers

for the Dept. of Electronics & Telecommunication Engineering

ELECTRONICS & TELECOMMUNICATION ENGINEERING DEPARTMENT
INDIAN INSTITUTE OF ENGINEERING SCIENCE AND TECHNOLOGY, SHIBPUR
Howrah-711103

Note: Please go through the terms and conditions carefully and sign each page with seal and date

TERMS & CONDITIONS
AND
IMPORTANT INSTRUCTIONS FOR BIDDERRS

1) The list of Laboratory Equipments, Softwares, Computers with technical specifications are given in Annexure-I. The serial number and tender no. of the Equipment must be mentioned in the quotation.
2) Bidders are to submit the tenders in Sealed Cover subscribing "Laboratory Equipments, Softwares, Computers" to the Office of E & T.C.E. Department**,** IIEST Shibpur
3) Bidders are to submit this tender document in original after accepting and signing the Terms and Conditions.
4) The **technical bid** will consist of all technical details along with commercial terms and conditions; whereas the **financial bid** will indicate item-wise price for the items mentioned in the technical bid. The technical bid and the financial bid should be sealed by the bidder in separate cover duly superscribed. Both these two sealed bids are to be put in a bigger cover which should also be sealed and duly superscribed. At first, the technical bids shall be opened and evaluated. Then, financial bids of only the technically acceptable offers shall be opened and evaluated for finalizing the ranks of the bidders.
5) Earnest Money Deposit (EMD) in the form of a Demand Draft/Pay Order in favor of **"The Registrar, IIEST, Shibpur"** payable at Kolkata must accompany the tender (exemption may be allowed on production of proper government certificate). Vendor bidding more than one item may submit a consolidated EMD.
6) **Last date of receipt of tenders is on Friday, 12.02.2016 at 3 P.M.** Tenders received late will not be accepted under any circumstances. **Technical bids** will be opened on Friday, **12.02.2016 at 4.00 P.M**. before the bidders in the Office of ETCE Dept, IIEST. **Financial bids** will be opened on Friday, **19.02.2016 at 3.00 P.M.** before the bidders in the Office of ETCE Dept, IIEST.
7) Tender is to kept valid for acceptance for 3 months with effect from the closing date without any modifications in its terms and conditions. Failure to comply with the same will result in forfeiture of Earnest Money Deposit.
8) Bidders shall furnish with the tender:- Copy of the Latest Income Tax, Sales Tax, Professional Tax, Clearance Certificates and copy of valid Trade Licence, VAT and PAN.
9) Indian Institute of Engineering Science and Technology, Shibpur shall have the right to accept/reject all or any of the tenders without assigning any reason whatsoever.
10) Successful Bidders on receiving purchase order will have to deposit @2% of the ordered value to be kept as Security Deposit (SD) during Warranty/Guaranty period.
11) Materials & Accessories supplied should be as per specifications. This will be finally approved by appropriate authority of Indian Institute of Engineering Science and Technology, Shibpur
12) The price quoted should be inclusive of all taxes, duties and levies, installation, demonstration and door delivery to the department of ETCE, IIEST Shibpur. Inclusion of Tax/Levy at a later stage will not be accepted. (Break up of the Tax/Levy should be given separately).
13) No advance will be made against any order.

14) If the supply is not completed within the stipulated period as indicated in the Tender/Work Order, a Liquidated Damage@ ½% per week will be imposed subject to maximum of 5% of the value of work order.

15) If necessary installation, commissioning and demonstration/Training is not completed within 15 days after the delivery, necessary action as per rules of the Institute will be taken.

16) Bills and challans in Triplicate along with a copy of the order should be presented for payment within 15 days of supply/commissioning of work. The order No. is to be noted on both Challan and Bill.

17) Payment will be made by A/c. payee cheque. No cash payment will be made under any circumstances. All payments are subject to statutory deductions as and when applicable.

18) E.M.D. will be refunded for unsuccessful bidder after the completion of evaluation process. For successful bidder E.M.D. will be refunded after completion of supply & Commissioning of equipments, softwares, and computers. No interest is payable on EMD or security deposit.

19) Product catalogue must be available in the website and the website address where product catalogue is available should be mentioned. Hard copy of product catalogue must be attached with the tender documents.

I/We accept the above terms and conditions.

Signature of Bidder/Supplier
with date & seal

Department of Electronics and Telecommunication Engineering
Indian Institute of Engineering Science and Technology, Shibpur

Annexure-I

List of Laboratory Equipments / Softwares / Computers with Technical Specifications

Sl. No.	Tender No.	Item Name with Minimum Technical Specifications	Quantity	EMD (Rs.)
01	ETC/1	**Analog Oscilloscope 30MHz with frequency measurement & auto time base** i. Bandwidth - 30MHz ii. Channel & Trace - 2 channel iii. Vertical sensitivity - 1mV/div. to 5V/div (should have separate control knob for each channel) iv. Horizontal sensitivity - 0.2uS to 0.5S/div in 20 steps in 1-2-5 sequence (without magnification) v. Sweep magnification - x10 vi. General facility - 5 digit direct frequency measurement, Auto Time base, vii. LCD display for Volt/Div, Time/div & frequency. viii. Microcontroller Switching ix. Accessory - 2 x 1:1/1:10 switchable probes, mains chord, manual.	20	9000/-
02	ETC/2	**DDS Function Generator** i. DDS Technique and FPGA Chip Design ii. Output Waveform: Sine, Square, Triangle, TTL iii. Frequency Range:0.1Hz~3MHz iv. Frequency Accuracy : ± 20ppm v. Frequency Stability : ± 20ppm vi. Max. Frequency Resolution : 100mHz vii. Sine Wave Distortion: -55dBc,0.1Hz~200kHz viii. DC Offset: -5V. to +5V. ix. Duty Cycle control: 25% to 75% (below 1MHz in Square wave) x. Display: 6 digit LED display for voltage and frequency	10	2500/-
03	ETC/3	**60MHz 2 channel Digital Storage Oscilloscope** i. Bandwidth 60MHz ii. No. of channel 2 iii. Sampling Rate - real time 1GS/s max. iv. Record Length 10K points per channel (minimum) v. Display 5.7" TFT Color LCD Display vi. Vertical sensitivity 2mV – 10V/cm (separate control knob for both the channel) vii. Horizontal sensitivity 5nS/div to 50S/div. viii. Vertical Resolution 8 bit ix. Features Add/Subtract/Multiply, Autoset, FFT, FFTrms, Zoom FFT Save & Recall Upto 10 setups and 10 sets of waveform can be saved & recalled. x. Automatic Measurement 20 types xi. Cursor Measurement ΔV, ΔT. 1/ΔT. xii. Acquisition Modes Sample, Peak Detect, Average xiii. Peak Detect 10nS, xiv. Communication Interface USB, Host & Device xv. Mains input 100 – 240V.AC 1 ph. 50Hz Accessories 2x1:1/1:10 switchable probes, software, USB cable	10	1300/-
04	ETC/4	**70MHz 4 channel Digital Storage Oscilloscope** i. Bandwidth 70MHz ii. No. of channel 4 iii. Sampling Rate - real time 1GS/s max. iv. Record Length 1M.points per channel (minimum) v. Display 7" TFT Color LCD Display vi. Vertical sensitivity 1mV – 5V/cm (separate control knob for all 4 channels) vii. Horizontal sensitivity 5nS/div to 50S/div.	04	4500/-

<table>
<tr><td></td><td></td><td>viii. Vertical Resolution 8 bit
Features Add/Subtract/Divn./Multiply, Autoset, FFT, FFTrms,
ix. Save & Recall Upto 10 setups and 10 sets of waveform can be saved & recalled.
x. Automatic Measurement 24 types
xi. Cursor Measurement ΔV, ΔT. 1/ΔT.
xii. Acquisition Modes Sample, Peak Detect, Average
xiii. Peak Detect 10nS,
xiv. Communication Interface USB, Host & Device
Mains input 100 – 240V.AC 1 ph. 50Hz
Accessories 2x1:1/1:10 switchable probes, software, USB cable</td><td></td><td></td></tr>
<tr><td>05</td><td>ETC/ 5</td><td><u>Function Generator with Power Supply</u>
i. Operating Modes: Sine, Square, Triangle, DC, Free Running, internal sweep or external frequency modulation, with or without DC offset, TTL/Trigger Output.
ii. Frequency Range: 0.3Hz to 3MHz
iii. Output Voltage: 10 Vpp into 50 Ω, Max. 20Vp-p (OC)
iv. Sine Wave Distortion: 0.3Hz - 100kHz: Max.0.5%;0.1MHz – 0.3MHz: Max. 1.5%, 0.3MHz – 3MHz: Max. 3%;
v. In-built Frequency counter with frequency range 10Hz to 15MHz
vi. In-built DC Power Supply with Output Voltage 2 X 15V, 1A adjustable from 2 to 15V; +5V, 1A adjustable from 4.5V to 5.5V, Ripple ≤ 10mVrms, Regulation ± 1%
vii. Display: 4 digit for Function Generator & 5 digit for Frequency Counter; 0.5”, 7 Segment LED Display, 3 digit Switchable simultaneous display of voltage and current</td><td>10</td><td>2000/-</td></tr>
<tr><td>06</td><td>ETC/ 6</td><td><u>DC Multiple Power Supply</u>
i. DC Output 0-30V / 2A , 0 to ± 15V /1A variable, 4.5V-5.5V/5A
ii. Setting Resolution V : 10mV, I : 5 mA
iii. Load Regulation < ± (0.05% + 10 mV)
iv. Line Regulation< ± (0.05% + 10 mV)
v. Ripple & Noise: < 1mVrms
vi. Current Limit adjustment: 100mA to max.
vii. Display: Switchable 3 digit seven segment LED for Voltage & current
viii. Built in overheat, over voltage protections</td><td>10</td><td>2000/-</td></tr>
<tr><td>07</td><td>ETC/ 7</td><td><u>Hand Held 3 ¾ Digit Multimeter</u>
i. Display: 3¾ digit, 4,000 counts, auto/manual range
ii. DC Voltage: 400mV - 1000V ((0.8%)
iii. AC Voltage : 4V to 750V
iv. DC Amp: 400μA to 10A in 6 ranges
v. AC Amp : 400μA to 10A in 6 ranges
vi. Resistance: 400 Ω to 40M.Ω
vii. Capacitance: 40nF to 100μF in 5 ranges
viii. Frequency: 10Hz to 10MHz
ix. Continuity, diode test, Duty Cycle, Data Hold, auto power off facility.
x. Accessory: Battery, spare fuse, test leads, manual.</td><td>40</td><td>1200/-</td></tr>
<tr><td>08</td><td>ETC/ 8</td><td><u>Analog Multimeter:</u>
i. DC VOLTS
<table>
<tr><th>Ranges</th><th>Sensitivity</th><th>Accuracy</th></tr>
<tr><td>2.5,10,50,250,1000V</td><td>20,000 ohms/volt</td><td>±3%DC of full scale</td></tr>
</table>
ii)AC VOLTS
<table>
<tr><th>Ranges</th><th>Sensitivity</th><th>Accuracy</th></tr>
<tr><td>10,50,250,1000V</td><td>8,000 ohms/volts</td><td>Within± 4%AC of full scale</td></tr>
<tr><td>Frequency Response</td><td colspan="2">Rated accuracy to 50,000Hz on all ranges through 10V to 1KHz on 50 V range</td></tr>
</table>
iii)DC CURRENT
<table>
<tr><th>Range</th><th>Potential Drop</th><th>Accuracy</th></tr>
<tr><td>2.5,25,250ma,10A (10A on separate jack)</td><td>0.25V on all range</td><td>With ±3%full scale on all ranges</td></tr>
</table>
iv)RESISTANCE
<table>
<tr><th>Ranges</th><th>Accuracy</th></tr>
</table></td><td>10</td><td>250/-</td></tr>
</table>

		R x 1 0-2000ohm (20 ohm center) R x 10 0-20000ohm (200 ohm center) R x 1K 0-2M ohm (20K ohm center) R x 10K 0-20M ohm (200K ohm center) — $\pm 3^0$arc v)DB RANGES -10DB to +22 DB — on 10V AC range +4 DB to +36 DB — on 50V AC range +18 DB to +50 DB — on 250 V AC range +30 DB to + 62 DB — on 1000 V AC range Zero DB referenced to 1 milli watt at 600 ohm		
09	ETC/ 9	**Digital Image Processing Trainer kit based on DSP** (TI- 64xx series) i. 512K bytes on-chip RAM. ii. fixed point arithmetic. iii. On Board 16M bytes on-chip SDRAM Memory. iv. Boot ROM (8K x 16) via SCI. v. On Board XDS100 Emulator for Execution. vi. Onboard IEEE 1149.1 JTAG emulation connector. vii. On Board 25 MHz crystals. viii. On Board 16K I2C Serial EEPROM. ix. On Board 512K bytes SPI Flash Memory. x. Motor Control Peripherals. xi. Serial Communications Interfaces (SCIs), UART xii. On Board 2.7V Dual Channel 12-Bit A/D Converter with l)SPI Serial Interface. xiii. Up to 109 individually Programmable, Multiplexed General-Purpose Input/output (GPIO) Pins. xiv. 12 Digital LED Outputs and 8 Digital Inputs. xv. Multiple Booting Option DIP Switches. xvi. On Board Reset Switch.	03	1800/-
10	ETC/ 10	**TMS320C6713 DSP Starter Kit** - Floating Point DSP Texas Instrument's TMS320C6713 DSP - , Embedded USB JTAG controller with plug and play drivers, USB cable included, On board IEEE 1149.1 JTAG connection for optional emulator debug - TLV320AIC codec, 2M x 32 on board SDRAM, 512K bytes of on board Flash ROM, 3 expansion connectors (Memory Interface, Peripheral Interface, and Host Port Interface) - Provisions to interface daughter cards eg: Image daughter card, MATLAB/SIMULINK, LABVIEW Compatibility for real time programs - ., Four 3.5 mm. audio jacks (microphone, line-in, speaker, and line out), - 4 user definable LEDs, 4 position dip switch, user definable, +5 Volt power supply included, - Texas Instruments Certification for Projects on DSP Kits	02	1000/-
11	ETC/ 11	**IMPEDENCE AND CV CHARACTERISTICS ANALYZER** Test Frequency ≤20 Hz to ≥10 MHz (Upgradable option is needed) Frequency Resolution 1 mHz (minimum) Resistance ≤25 mΩ to ≥30 MΩ Inductance ≤10 pH to ≥1 H Capacitance ≤1 fF to ≥1 F Impedance ≤25 mΩ to ≥50 MΩ (± 10% measurement accuracy (minimum)) Basic Accuracy ≤± 0.08% Voltage Signal Level ≤5 mVrms to ≥1 Vrms Current Signal Level ≤300 μArms to ≤20 mArms DC Bias(Voltage & Current) Inbuilt type (≥ 0 to ± 35 V/± 100 mA) Measurement types and number of Points Four terminal measurement auto balancing types (At least 1500 points). Sweep Type: Linear and log type for frequency, signal and DC bias (Up and down) Sweep Parameters : Frequency, Signal Voltage/Current , DC bias voltage/current Cable specification: Cable output should match with the required specifications	01	12000/-

		Test Fixtures :Impedance and Dielectric Constant Measurement facility required No. of Channel/Traces :Minimum 4 channel/4 trace. At least10 independent markers per trace Interface and Data storage USB/GPIB/LAN. Video output will be preferred. Real time data acquisition features through the PC is needed. Data Analysis features (like Equivalent Circuit Analysis) should be available. A compatible good quality keyboard and a mouse with the system are required Display:Built-in Help menu with Operation Manual with Windows 7 OS or with other compatible software. Power Supply:230 V, 50 Hz. ac		
12	ETC/ 12	**Branded desktop computer- i7** Make: Branded like Lenovo, Dell, HP i. Intel Core i7-4th generation processor, ii. Intel Q85 Chipset iii. 1 TB 7200rpm SATA HDD , iv. 8 GB DDR3 RAM extendable upto 32GB, Memory Slots 4UDIMM v. SATA DVD writer vi. 19.5" Wide LED Monitor, Integrated Intel HD Graphics, Gigabit Ethernet, LAN,USB 3.0(minimum-2) Keyboard & Mouse , Microtower ATX Cabinet. vii. OS WINDOWS 8.1 or higher preloaded viii. 64 bit Windows ix. 3Years onsite warranty	03	3000/-
13	ETC/ 13	**Branded desktop computer- i5** Make: Branded like Lenovo, Dell, HP i. Intel Core i5-4th generation processor, ii. Intel Q85 Chipset iii. 500GB 7200rpm SATA HDD , iv. 4 GB DDR3 RAM extendable upto 32GB, Memory Slots 4UDIMM v. SATA DVD writer , vi. 18.5" Wide LED Monitor, Integrated Intel HD Graphics, Gigabit Ethernet, LAN,USB 3.0(minimum-2) Keyboard & Mouse , Microtower ATX Cabinet. vii. OS WINDOWS 8.1 or higher preloaded viii. 64 bit Windows ix. 3Years onsite warranty	05	4500/-
14	ETC/ 14	**Branded desktop computer- i3** Make: Branded like Lenovo, Dell, HP, Acer i. Intel Core i3-4th generation processor, ii. Intel H81 Chipset iii. 500GB 7200rpm SATA HDD , iv. 4 GB DDR3 RAM extendable upto 16GB v. SATA DVD writer , vi. 18.5" Wide LED Monitor, Integrated graphics, Gigabit Ethernet, LAN,USB 3.0(minimum-2) Keyboard & Mouse , ATX Cabinet. vii. OS WINDOWS 8.1 or higher preloaded viii. 64 bit Windows ix. 3Years onsite warranty	12	7500/-
15	ETC/ 15	**Motorized Antenna Positioner along with Antenna Measurement Software and GPIB Cable** Computer controlled, Motorized Single axis, able to take load up to 2 Kg with 1 degree step Multiple Polar/Amplitude Traces plot 3D and Spherical Plots Full 3D interface Required Multiple overlay and display	01	2000/-
16	ETC/ 16	**8085 Microprocessor Trainer kit :** **CPU**: 8085 **Memory**: 64KB Max (32KB EPROM and 32 KB RAM) with Battery option for RAM. (The System can be supplied with 16KB EPROM and 8KB RAM) **I/O Parallel**: 48I/O lines using two 8255. **I/O Serial**: One RS 232 Compatible interface.	05	1200/-

		Timer: Three 16 Bit Counter/Timer Using 8253. **Key Board**: 28 numbers of Computer grade keys. Displays: Six numbers of seven segment displays. **BUS Signals**: All Address, Data and Control signals are terminated in 50pin berg stick for user expansion. **PIC**: Optional facility for 8259. All the 8 interrupts are terminated in berg stick **Monitor Software**: 16KB of powerful user friendly monitor software with keyboard and serial modes. **Power Supply**: External power supply +5 V (1.5A), ±12V (Interfacing facility with Computer with all accessories)		
17	ETC/ 17	**8086 Microprocessor Trainer kit :** **CPU** : 5MHz in Max mode with provision for 8087 Co-Processor Memory Maximum of 128KB on board EPROM. **RAM**: 64KB of on board RAM. Battery Backup option for RAM. **I/O PARALLEL**: 48 I/O lines using two 8255. **I/O SERIAL**: One RS232 Compatible interface. **TIMER**: Three 16 bit counter/timer using 8253. **KEY BOARD**: Consisting of 28 numbers of computer grade keys. **DISPLAY**: Eight numbers of seven segment display. **BUS SIGNALS**: All Address, Data and Control signals are terminated in 50 pin berg stick for user expansion. **PIC**: Programmable Interrupt Controller Using 8259. **MONITOR SOFTWARE**: 64KB of powerful user friendly monitor software with keyboard and serial modes. **Power Supply**: External power supply +5 V (2.5A), ±12V, + 26V (Interfacing facility with Computer with all accessories)	03	1000/-
18	ETC/ 18	**8051 Microcontroller Trainer kit :** **CPU**: 8051 **MEMORY**: EPROM1 32KKB bytes with monitor software EPROM2 Optional -32 KB ROM RAM1 32 KB Data RAM RAM 2 32 KB Program/Data RAM **I/O PARALLEL** : 48 I/O Lines using two 8255 **I/O SERIAL** : One RS232 Compatible interface **TIMER** : Three 16 bit counter/timer using 8253 **KEYBOARD** : 28 numbers of computer grade keys **DISPLAY**: Six numbers of seven segment displays. **BUS SIGNALS**: All bus signals are terminated in berg stick. Controller specific lines like port are terminated in a burg stick header. **MONITOR SOFTWARE**: 32 KB of powerful user friendly monitor software with keyboard and serial modes. **Power Supply**: External power supply +5 V (1.5A), ±12V (Interfacing facility with Computer with all accessories)	03	1000/-
19	ETC/ 19	**Interfacing Module** (Compatible with all trainer board 8085, 8086, 8051) i. Stepper Motor controller With Power Supply & Motor ii. DUAL DAC iii. 8 BIT ADC iv. Key board & Display v. Traffic light vi. 8255 Study Card vii. Elevator viii. 8279 Card ix. Matrix Key board x. Temperature Controller With Water Barth DC Motor Controller	03	1500/-

<table>
<tr><td>20</td><td>ETC/ 20</td><td><u>Analog Digital Trainer kit</u>
i. Bread Board: Good Quality Standard Bread Board (Original Wish (WB202)or Equivalent make) -3Nos with 630 tie points in each.
ii. Built in Power Supply: 0.2V t o +15V variable @0.2A, -0.2V t o -15V variable @0.2A, +15V,-15V, +5V @1A Each
iii. Built in AC Sources 5V, 10V, 15V, 20V at 50Hz @0.2A
iv. Sine/Square/Triangular Wave Generator: 10Hz-1MHz frequency in Six step and variable within steps having amp.for Sine 10mV-15V(p-p) , Square 10 mV-10V(p-p)
v. Fixed TTL (Clock): 1Hz, 5Hz, 10Hz, 100 Hz
vi. Data Input Switch: 8Nos(with buffered TTL Logic with High-Low Indicator LED display)
vii. Output Display: 8Nos LED (with buffered)
viii. POT: 330Ω, 2.2K Ω, 10K Ω, 22K Ω, 47K Ω, 100K Ω.
ix. INPUT Power: 220V, ±10%, 50Hz
x. SPEAKER is built in for audio use.
xi. Accessories: Patch cord and power cord, BNC probe.</td><td>15</td><td>4500/-</td></tr>
<tr><td>21</td><td>ETC/ 21</td><td><u>RESONANT CIRCUIT (SERIES and PARALLEL) TRAINER KIT</u>
i) On board components(Different Values of Resistors, Inductors and Capacitors) for making different combination
ii) Audio oscillator
iii) Frequency counters
iv) Voltmeter, ammeter
v) Patch cords</td><td>05</td><td>1000/-</td></tr>
<tr><td>22</td><td>ETC/ 22</td><td><u>Amplitude Modulation Transmitter Kit</u>
Audio oscillator (sine wave generator)<table><tr><td>Frequency</td><td>: 100Hz~5KHz</td></tr><tr><td>Amplitude</td><td>: 0~2Vpp</td></tr><tr><td>Audio input</td><td>: Audio preamplifier with microphone input</td></tr></table>Voltage controlled oscillator<table><tr><td>Output signal</td><td>: Sine wave</td></tr><tr><td>Frequency range</td><td>: 500KHz~1500KHz</td></tr><tr><td>Amplitude</td><td>: 0~2Vpp</td></tr><tr><td>Output impedance</td><td>: 50 Ohm</td></tr></table>AM/ DSB/ SSB/ modulator<table><tr><td>Modulation</td><td>: Amplitude modulation</td></tr><tr><td></td><td>: Double side band, Single side band(SSB)</td></tr><tr><td>Carrier input</td><td>: 1~1000KHz</td></tr><tr><td>Modulating input</td><td>: 0.1~100KHz</td></tr><tr><td>Carrier null</td><td>: Adjustable</td></tr><tr><td>Output amplitude</td><td>: Adjustable</td></tr></table>Ceramic filter<table><tr><td>Center frequency</td><td>: 455KHz</td></tr><tr><td>Bandwidth</td><td>: 10KHz ± 5KHz</td></tr></table>Output amplifier: Gain adjustable connected to cable or antenna
Antenna: MW Coil
Power supply: GND,+5V,+12V, -12V</td><td>02</td><td>350/-</td></tr>
<tr><td>23</td><td>ETC/ 23</td><td><u>Amplitude Demodulation Receiver Kit</u>
Super heterodyne receiver<table><tr><td></td><td></td></tr><tr><td>Frequency</td><td>: 500KHz~1.5MHz</td></tr><tr><td>Intermediate frequency</td><td>: 455KHz</td></tr><tr><td>Inputs</td><td>: RF signal</td></tr><tr><td>Output IF frequency</td><td>: 455KHz adjustable</td></tr><tr><td>RF amplifier with variable gain</td><td></td></tr></table>Mixer (frequency converter)<table><tr><td>Output Frequency</td><td>:455 KHz adjustable</td></tr><tr><td>Band pass filter</td><td>:455 KHz center frequency</td></tr></table></td><td>02</td><td>350/-</td></tr>
</table>

<table>
<tr><td></td><td></td><td>Local oscillator<table><tr><td>Waveform</td><td>: Sine wave</td></tr><tr><td>Frequency</td><td>:900KHz ~2.1MHz</td></tr><tr><td>Output Voltage</td><td>: Adjustable from 0 to 2Vp-p</td></tr></table>1st IF and 2nd IF amplifier<table><tr><td>Central frequency</td><td>: 455KHz</td></tr><tr><td>Load impedance</td><td>: Variable R-L-C</td></tr><tr><td>Gain</td><td>: Adjustable</td></tr></table>Diode envelope detector
Detection of the positive and negative envelope with variable RC filter DSB
Product detector: for SSB signal DemodulationAudio output
Amplifier with speaker.
<table><tr><td>Audio amplifier gain</td><td>(adjustable)</td></tr></table>Receiving media
MW coil antenna and via cable
Adequate test points</td><td></td><td></td></tr>
<tr><td>24</td><td>ETC/ 24</td><td><u>Frequency Modulation Transmitter Kit</u><table><tr><td>Frequency Generator</td><td>: Sine, Square, Triangular</td></tr><tr><td>Frequency range</td><td>: 100Hz~100KHz</td></tr></table>Audio input
Audio preamplifier with microphone
FM modulators
Varactor/ Reactance modulator with carrier frequency adjustment
<table><tr><td>Operating frequency</td><td>: Adjustable from 400KHz~500KHz</td></tr></table>Power Supply
GND, +5V, +12V, -12V
Adequate test points</td><td>02</td><td>350/-</td></tr>
<tr><td>25</td><td>ETC/ 25</td><td><u>Frequency Demodulation Receiver Kit</u>
At least three demodulation techniques (Foster-Seeley detector, Ratio detector, PLL base detector)Foster-Seeley detector<table><tr><td>Operating frequency</td><td>: Adjustable from 400 KHz ~ 500 KHz</td></tr></table>Ratio discriminator detector<table><tr><td>Operating frequency</td><td>: Adjustable from 400 KHz ~ 500 KHz</td></tr></table>Phase lock loop detector (PLL)<table><tr><td>Operating frequency</td><td>: Adjustable from 400 KHz ~ 500 KHz</td></tr></table>Low pass filter
4th order butter worth filterAudio output<table><tr><td>Audio amplifier gain</td><td>(adjustable)</td></tr></table>Adequate test pointsPower supply
GND, +5V, +12V, -12V</td><td>02</td><td>350/-</td></tr>
<tr><td>26</td><td>ETC/ 26</td><td><u>FDM Transmitter / Receiver Kit</u>Carrier Generator
Multiplexing : 2 Channel frequency division multiplexing
De-modulation : Amplitude de-modulation DSBSC
De-multiplexing : 2 Channel frequency division de-multiplexing
<table><tr><td>Multiplexing</td><td>: 2 Channel frequency division multiplexing</td></tr><tr><td>De-modulation</td><td>: Amplitude de-modulation DSBSC</td></tr><tr><td>De-multiplexing</td><td>: 2 Channel frequency division de-multiplexing</td></tr></table>Band pass filterLow pass filter
2nd & 4th order butter worth filter
Power supply
GND, +5V, +12V, -12V
Adequate test points</td><td>02</td><td>350/-</td></tr>
</table>

<table>
<tr><td>27</td><td>ETC/ 27</td><td><u>Analog Signal Sampling and Reconstruction Kit</u>
On-board signals
Sine wave generator<table><tr><td>Frequency</td><td>: 1 KHz, 2 KHz</td></tr><tr><td>Amplitude</td><td>: 0 ~ 4Vpp</td></tr></table>Sampling Clock<table><tr><td>Internal frequency</td><td>: 2 KHz, 4 KHz, 8 KHz, 16 KHz, 32 KHz, and 64 KHz</td></tr><tr><td>Duty cycle</td><td>: 10 ~ 90% selectable in steps of 10%</td></tr></table>Sampling Method
Natural sampling circuit
Sample and hold circuit
Flat top sampling circuit
Reconstruction
2nd order and 4 order low pass Butterworth filters with 3.4 KHz cut-off frequency
Power Supply
GND, +5V, +12V, -12V
Adequate test points</td><td>02</td><td>300/-</td></tr>
<tr><td>28</td><td>ETC/ 28</td><td><u>Delta-Sigma And Adaptive Delta Modulation-Demodulation kit</u>
On-board signals Sine wave<table><tr><td>Frequency</td><td>: 250Hz, 500Hz, 1KHz, and 2 KHz</td></tr><tr><td>Amplitude</td><td>: 0 ~ 4Vpp</td></tr><tr><td>DC</td><td>: 0 ~ 5V</td></tr></table>Sampling<table><tr><td>Clock</td><td>: 8 KHz, 16 KHz, 32 KHz, 64 KHz, and 128 KHz</td></tr></table>Modulation-demodulation techniques supported
Delta modulation, sigma delta modulation, adaptive delta modulation, CVSD modulation
Low pass butter worth filter
2 order and 4 order low pass butter worth and filter with cut-off frequency not more than 3.4 KHz
Power supply
GND, +5V, +12V, -12V
Adequate test points</td><td>02</td><td>500/-</td></tr>
<tr><td>29</td><td>ETC/ 29</td><td><u>PAM Time Division Multiplexing / Demultiplexing Kit</u>
On-board signals
Sine wave<table><tr><td>Frequency</td><td>: Four distinct frequency values within voice band</td></tr><tr><td>Amplitude</td><td>: Adjustable</td></tr></table>At least Input channels:4
Multiplexing:Time division multiplexing
Sampling rate:4/8/16/32 KHz
Modulation: Pulse amplitude modulation
Low pass filter
4th order butter worth filters (3.4 KHz cut off)
Power supply
GND, +5V, +12V, -12V</td><td>02</td><td>300/-</td></tr>
<tr><td>30</td><td>ETC/ 30</td><td>NI (National Instrument) MULTISIM software with 10 user perpetual department license for academic use</td><td>01</td><td>5000/-</td></tr>
<tr><td>31</td><td>ETC/ 31</td><td>Micro C Pro Software for AVR Microcontroller with 5 user license</td><td>01</td><td>1000/-</td></tr>
<tr><td>32</td><td>ETC/ 32</td><td><u>Audio and Video wireless Transmitter and receiver kit with CCD camera.</u>
Selectable channels -2.4Ghz- 5.4Ghz
Minimum 1km range
Transmitting power: 1000mW
- Working frequency: 2400~2481MHz
- Transmitter power: 1000mW
- Receive sensitivity: -110dBm
- Input VSWR: 2:1
- Port impedance: 50 ohm</td><td>03</td><td>2000/-</td></tr>
</table>

		- Transmission range: 1000m - Transmitter working current: - Transmitter working voltage: 12V /1A - Receiver working current: - Receiver working voltage: 12V /1A - High working frequency and superior anti-interface - Well designed circuit to have wide bandwidth, has excellent audio and video reception quality - Providing a multiplicity of channels for user selection, interface between different channels minimized - Possessing application expandability, highly adaptable. 1 x Transmitter 1 x Receiver 2 x DC power supply adaptor (2-flat-pin plug / 50 / 70cm) 1 x English user manual		
33	ETC/ 33	**Blue Tooth Trainer kit** □ Integrated 2.4GHz, IEEE 802.15 transceiver □ Frequency Range: 2402MHz – 2480MHz □ Transmit Power: : +18dBm □ RF Data Rate: 250kbps □ 2 AIO (Analog Input): : On Board Temperature Sensor & Variable Voltage Source for ADC □ 5 DIO (Digital input): On board Relay, LED & Switch output) □ Power Supply: +5VDC ~ 0.5A □ OS Support: Windows7/windows 8.1/windows 10. □ USB A-B Interfacing facility with PC □ Integrated Chip Antenna □ On board Audio Coder for audio communication □ User friendly GUI for Configuring Bluetooth Modem **ON BOARD PERIPHERALS** **Relay** □ 5V SPDT Mechanical Relay □ NO & NC LED indicator □ Screw Terminal Block Connector for external device **Temperature Sensor** □ Operating Temperature range: 0°C - 120°C □ Scale Factor: 10mV/°C □ ADC **Audio Coder** **Switch & LED** □ Six SMD LEDs (3-Red for power, 1-Green for Status,2-Red User accessible). □ Three Tactical Switch for RESET, FACTORY RESET& BT-MODE □ Four Toggle Slide Switches (2- User accessible, Power ON/OFF, Audio Coder ON/OFF)	03	2000/-
34	ETC/ 34	**Digital Gauss meter** Range: 0-2KG & 0-20KG Accuracy: ±0.5% Temperature: Upto 50°C Resolution: 0.1gauss at 200G range Display : 3½ digit, 7 segment LED DPM Power Supply: 220V ± 10%, 50Hz Transducer/Detector: Hall Probe - In AS Special Feature: Indicate the direction of the magnetic field	01	200/-
35	ETC/ 35	**Oscilloscope Trainer** i. open form on single PCB ii. separate section with color identification iii. test points in each sections iv. fault creation & rectification provided v. bandwidth DC 20MHz(-3dB) vi. Maximum input voltage 350V(DC+ Peak AC)	02	500/-
36	ETC/ 36	**Trainer Kit on Strain Gauge Linear Transducer Test RIG Power Supply Instrumentation Module Bridge circuit & Accessories** i. Build in DC power supply	02	200/-

		ii. 3 digit LED display iii. Onboard gain adjustment iv. Test points (8 nos) to observe input outputs of each block v. Strain gauge 350 ohm (4 nos) vi. Gauge factor 2.1 vii. Bridge voltage +8 V DC Power consumption 3VA(approx.)		
37	ETC/ 37	**PMMC type Galvanometer Trainer Kit set** i. 0-30 V DC voltmeter ii. 0-15 V DC voltmeter, iii. 470 K 5W variable resistors	02	200/-
38	ETC/ 38	**Trainer Kit on LCR Bridge –Q Meter** Measuring resistances, capacitors, inductors Frequency range 100Hz to 1 KHz	02	300/-
39	ETC/ 39	**Trainer kit on study with LVDT** i. Measurement range 20mm(+/- 10mm) ii. Excitation frequency 4KHz iii. Excitation Voltage 4Vp-p (approximately) iv. Sensitivity 10mvolt DC/mm v. Linear range full scale vi. Micrometer scale 25mm vii. Test points 8 nos. viii. Power consumptions 2VA(approx.) Onboard LVDT displacement measurement jig with micrometer	02	350/-
40	ETC/ 40	**Microwave Test Bench (X-band)** List of components: Gunn Power Supply, Micrometer tunable Gunn oscillator, PIN modulator, Isolator, Variable attenuator, Direct reading Frequency Meter, Slotted Line with Probe, Detector, VSWR meter, Movable Short, S.S. Tuner precision micrometer, Fixed Short, Matched Termination, Waveguide Stands – 5 nos., Accessories- Necessary Cables etc.	02	2000/-
41	ETC/ 41	**Transmission Line Demonstrator (Simulated By Lumped Elements):** Simulation of transmission lines simulated distributed resistive and reactive transmission line of different characteristic impedances. Variable simulated line length, variable distributed line attenuation. To study and measure power loss, characteristic impedance, standing wave display, delay, the effect of line resistance and capacitance, loading effect of capacitance and inductance, matching, reflection, pulse input etc. Built-in step function generator, built-in pulse generator, built-in DC regulated power supplies, summing amplifier, pulse squarer, buffer, switched faults, a set of terminating components (resistors, capacitors) with series or parallel connection provision	01	300/-

For any clarifications e-mail to: **hod@telecom.iiests.ac.in, pradip.mistry75@gmail.com**