

**BHAGALPUR COLLEGE OF ENGINEERING, NH -80,  
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(Department of science & Technology, Government of Bihar)



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**Letter for Expression of Interest.**

Bhagalpur College of Engineering intends to procure equipment for **Electronics and Communication Department-Communication Lab**. List of equipment is in Annexure-1. Interested manufacturers/Suppliers are requested to submit following details through mail within 1 (one) week of publishing of this notice at [tpobcebgs8@gmail.com](mailto:tpobcebgs8@gmail.com).

**Information Required.**

- (1) Name of the firm:
- (2) Complete address with pin
- (3) Name of contact person
- (4) Email id of the contact person
- (5) Mobile no of the contact person

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**Annexure-1**  
**COMMUNICATION LAB**

SN	Items name	Specification
1.	<p align="center"><b>Sampling &amp; Reconstruction (standard comp.) Trainer:</b></p>	<ul style="list-style-type: none"> <li>• Onboard synchronized 1 KHz Sine-wave generator.</li> <li>• Sampling frequency 2,4,8,16,32 KHz</li> <li>• On-board separate Sample and Sample &amp; Hold circuit / output.</li> <li>• Sampling Duty cycle of 0-90% in steps</li> <li>• On-board 2nd &amp; 4th order Low pass filter with cut off frequency of 3.4kHz</li> <li>• In-Built Power Supply</li> </ul>
2.	<p align="center"><b>TDM Pulse Amplitude Modulation/ Demodulation Trainer:</b></p>	<ul style="list-style-type: none"> <li>• Input channels: 4 numbers</li> <li>• Switching: Time Division Multiplexing</li> <li>• Modulation: Pulse Amplitude Modulation</li> <li>• Sampling rate: 16 KHz</li> <li>• Maximum signal BW: 2 KHz</li> <li>• Onboard sine waves: 2KHz, 1KHz, 500Hz, 250Hz, 0-5V variable amplitude</li> <li>• Synchronization pulse generation: Using variable DC level</li> <li>• Phase lock loop: Generates receiver clock and channel information</li> <li>• Low pass filter type: 4th order Butterworth filter</li> <li>• Interconnection: 2 mm banana socket</li> <li>• Power Supply: +5V, +/-12V</li> </ul>
3.	<p align="center"><b>TDM Pulse code modulation Transmitter Trainer :-</b></p>	<p>Crystal Frequency : 16 MHz, On Board Analog Signal : 2 KHz, 4 KHz (Sine wave synchronized to sampling pulse Adjustable amplitude and separate variable DC level)</p> <p>Input Channels : 2 nos.,</p>
4.	<p align="center"><b>TDM Pulse code modulation Receiver Trainer:-</b></p>	<p>Input Channel : Time Division Multiplexed Serial Input with in-built Power Supply : 220 V <math>\pm</math>10%, 50Hz</p>
5.	<p align="center"><b>Adaptive Delta And Delta Sigma modulation &amp; demodulation trainer kit:</b></p>	<ul style="list-style-type: none"> <li>• Crystal Frequency : 4.096 MHz</li> <li>• Sampling Frequencies : 32 KHz, 64KHz, 128KHz, 256KHz, (switch selectable)</li> <li>• On - Board Generator :</li> </ul>

		<p>Synchronized &amp; Adjustable Amplitude Sine wave Generator at 250Hz, 500 Hz, 1KHz, 2KHz, Separate variable D.C. Level</p> <ul style="list-style-type: none"> <li>• Integrator : 4 Integrator gain setting norm, X 2 X 4 X 8</li> <li>• LP Filters : 4th order Butterworth (3.4 KHz cut off frequency)</li> <li>• Test Points : More than 55</li> <li>• Interconnections : 2/4 mm socket</li> <li>• Cabinet : Enclosed in ABS plastic cabinet with detachable cover</li> <li>• Power : 220V AC <math>\pm 10\%</math>, 50/60Hz mains operated</li> </ul>
6.	<b>Data Formatting And carrier modulation/Transmitter trainer:</b>	<ul style="list-style-type: none"> <li>• Input : 2 Channel Time Division Multiplexed Data</li> <li>• Data Formatting : NRZ (L), NRZ (M), AMI, RB, Biphas (Manchester), Bi phase (Mark), differentially encoded dibit pair</li> <li>• Carrier Modulation : ASK, FSK, PSK, DPSK, &amp; QPSK</li> <li>• On - Board Carrier : Sine wave Synchronized to transmit data at 1.44MHz, 960 KHz, (0 deg. phase) 960 KHz (90 deg phase)</li> <li>• Test Points : More than 38</li> <li>• Interconnections : 2/4 mm socket</li> <li>• Cabinet : Enclosed in ABS plastic cabinet with detachable cover</li> <li>• Power : 220V AC <math>\pm 10\%</math>, 50/60Hz mains operated</li> </ul>
7.	<b>Data Reformatting And carrier Demodulation Receiver Trainer:</b>	<ul style="list-style-type: none"> <li>• <b>Input</b> : From Transmitter Kit.</li> <li>• <b>Output</b> : 2 Channel TDM Multiplexed Data Stream.</li> <li>• <b>De conditioning Options</b> : NRZ (M), RZ, AMI, RB Bi phase (Manchester), Bi phase (Mark), differentially encoded dibit pair to NRZ (L).</li> <li>• <b>Carrier Demodulation</b> : <ul style="list-style-type: none"> <li>○ - ASK Rectifier Diode</li> <li>○ - FSK PLL Detector</li> <li>○ - PSK &amp; DPSK Square Loop Detector</li> <li>○ - QPSK Fourth Power Loop</li> </ul> </li> </ul>

		<p>Detector</p> <ul style="list-style-type: none"> <li>• <b>Bi phase clock recovery :</b> by PLL.</li> <li>• <b>Test Points :</b> More than 50.</li> <li>• <b>Interconnections :</b> 2/4 mm socket.</li> <li>• <b>Cabinet :</b> Enclosed in ABS plastic cabinet with detachable cover.</li> <li>• <b>Power :</b> 220V AC <math>\pm 10\%</math>, 50/60Hz mains operated.</li> </ul>
8.	<b>DSB/SSB Suppressed carrier AM Transmitter Trainer</b>	<p>Balanced Modulator with Band, Carrier Frequency -Crystal controlled, Transmitter Amplifier Output(Gain adjustable) DSB (1 MHz), SSB (1.445 MHz) connected to Antenna/cable</p>
9.	<b>DSB/SSB AM Receiver Trainer</b>	<p>with in-built Power Supply : 220 V <math>\pm 10\%</math>, 50Hz  Frequency Range : 455 KHz to 1800 KHz  Intermediate Frequency : 455 KHz</p> <ul style="list-style-type: none"> <li>• Input Circuits : RF Amplifier, Mixer, Local Oscillator, Beat Frequency Oscillator, IF Amplifier-1, IF Amplifier-2</li> <li>• Tuning : With variable capacitor Dial marking on board</li> <li>• Receiving media : Telescopic antenna / Cable</li> <li>• Detectors: Diode detector for DSB, Product detector for SSB</li> <li>• Audio Output : Amplifier with speaker</li> <li>• Gain Control : Potentiometer Control Amplitude</li> <li>• Interconnections : 2 mm Banana sockets</li> <li>• Test points : 12nos.</li> <li>• Power Supply : 230V AC <math>\pm 10\%</math>, 50/60Hz</li> </ul>
10.	<b>Amplitude Modulation And Demodulation trainer Kit with in-built Power Supply : 220 V <math>\pm 10\%</math>, 50Hz</b>	<ul style="list-style-type: none"> <li>• Circuit diagram printed on pcb</li> <li>• On-board Carrier Generator</li> <li>• On-board Modulating Function (Signal) Generator with variable amplitude &amp; frequency</li> <li>• On-board Amplitude Modulator</li> <li>• On-board Amplitude Demodulator</li> <li>• On-board potentiometer for varying depth/percent of modulation</li> <li>• Interconnection: 2/4mm banana sockets</li> <li>• DC Supply: Built-in IC regulated power supplies 220V <math>\pm 10\%</math>, 50Hz mains</li> </ul>

		<ul style="list-style-type: none"> <li>operated</li> <li>Enclosed in an attractive ABS plastic cabinet with cover</li> </ul>
11.	<b>FDM Trainer: frequency division multiplexing &amp; Demultiplexing with sinusoidal &amp; Audio Input</b>	<ul style="list-style-type: none"> <li>Linear mixer (Summing amplifier).</li> <li>Amplitude modulator.</li> <li>Transistor demodulator.</li> <li>Band pass filters.</li> <li>Carrier generator generates minimum 20KHz to maximum 200KHz frequency and the amplitude to be 12V(P-P).</li> <li>Signal source with four different frequency vin1 (500Hz), vin2 (2.5KHz), vin3 (5KHz), vin4 (10KHz) (approx.)</li> <li><b>Built it regulated power supply: DC +/- 12V/300 mA</b></li> <li><b>Power Supply: Voltage range : AC 100V - 230V , Frequency Range : 50-60Hz</b></li> </ul>
12.	<b>FM Transmitter &amp; Receiver kit</b>	<ul style="list-style-type: none"> <li>Carrier signal Generator</li> <li>Modulating - Externally Input provision</li> <li>Wood Box (Closed Type)</li> <li>Input : 230V, AC</li> </ul>
13.	<b>QPSK Trainer Kit</b>	<ul style="list-style-type: none"> <li>Word Length : 8 Bits</li> <li>Word Clock Frequency : 8 KHz to 12 KHz</li> <li>Data Format : NRZ &amp; Bipolar NRZ, Modulator</li> <li>Type : Balanced Modulator as Phase Modulator</li> <li>Demodulator Type : Balanced Modulator as Phase detector. Bit clock recovery section</li> </ul>
14.	<b>FSK Trainer Kit:</b>	<ul style="list-style-type: none"> <li>Message Signal 1 : 8 Bit variable Data Amplitude 5V</li> <li>Message Signal 2 : Debounce Data Amplitude Low (0) &amp; High (5V)</li> <li>Message Signal 3 : Fixed Data 1K, 2K, 4K Amplitude 5V</li> <li>Carrier Signal : Sine wave Mark 70 KHz / Space 30 KHz Amplitude 5V</li> <li>Modulator Type : XR 2006 Based</li> <li>Demodulator : PLL Detector &amp;</li> </ul>

		<p>LPF</p> <ul style="list-style-type: none"> <li>• Comparator : LM 311 Based</li> <li>• Supply Voltage (Board) : +12V, +5V / DC</li> <li>• Supply current : 100 mA (Minimum)</li> <li>• Input Voltage : 230 V/ 50 Hz AC</li> <li>• Interface connectors : 2mm socket</li> </ul>
15.	<b>BPSK Trainer Kit -</b>	<ul style="list-style-type: none"> <li>• On Board Modulating Digital Data signal generator to generate any binary input word with Bit clock &amp; Word clock,</li> <li>• Word Length : 8 Bits, Word Clock Frequency : 8 KHz to 12 KHz,</li> <li>• Data Format : NRZ &amp; Bipolar NRZ,</li> <li>• Modulator Type : Balanced Modulator as Phase modulator,</li> <li>• Demodulator Type : Balanced Modulator as Phase detector.</li> </ul>
16.	<b>PAM/PWM/PPM modulation &amp; Demodulation Trainer kit:</b>	<p>On-board Sampling : 2 KHz to 64 KHz</p> <ul style="list-style-type: none"> <li>• Variable duty Cycle : 0 to 90% Variable</li> <li>• On-board Generator Sine wave : 1 KHz to 4 KHz, Amplitude: 0 to 5vpp</li> <li>• Low Pass Filter : 2nd order BW filter</li> <li>• Voice communication : Voice link using dynamic MIC &amp; speaker</li> <li>• AC Amplifier : With adjustable Gain Control</li> <li>• Interconnections : 2mm banana sockets</li> <li>• Test Points : More than 10 nos.</li> <li>• Power Supply : 230 V, <math>\pm</math> 10%, 50 / 60 Hz</li> </ul>
17.	<b>Super Hetrodyne Receiver:</b>	<ul style="list-style-type: none"> <li>• Tuning Range : 520 KHz - 1620 KHz</li> <li>• IF Frequency : 455 KHz</li> <li>• Tracking : - 3 db from 700 KHz to 1400 KHz</li> <li>• 10 db Signal to Noise at 200 microvolt typical</li> </ul>
18.	<b>PCM Trainer kit:</b>	<p>Message Signal 1 : Frequency 500 Hz Amplitude 0 to 2.5V</p>