



**TENDER DOCUMENTS**

**ELECTRICAL LAB EQUIPMENT**

**NUTECH/SCM/Electrical Lab-2019/TD-032**

**NATIONAL UNIVERSITY OF TECHNOLOGY**

## **TENDER NOTICE**

**National University of Technology (NUTECH)**

**NUTECH/SCM/Electrical Lab-2019/TD-032**

Sealed bids are invited from Government / FBR Registered Firms for the procurement of Electrical laboratory equipment for NUTECH Technology Labs.

1. Tender documents containing terms & conditions and detailed specifications of items can be downloaded from NUTECH website "<https://nutech.edu.pk/d-p.php>" w.e.f **12 Feb 2019**.
2. Quotations shall be submitted as per requirement of the tender documents.
- a. Bidders will be required to submit bank draft/PO equal to 5% of quoted value as Bid Bond in favor of National University of Technology (NUTECH).
3. Sealed bids with detailed specification should reach on the following address latest by **0930 hours on 04 Mar 2019**. Late submission will not be entertained.
4. Bids will be opened at **1000 hours on 04 Mar 2019** at SCM Office.
5. Project is to be completed in 75 days from the date of award of contract.
6. Submit Rs 1500/- as Tender fee in favour of NUTECH, Bank Alfalah Acct:5546-5001002354. Please attach bank receipt with technical offer. Offers will not be entertained without payment of processing fee.

**Deputy Director (Supply Chain Management Office)**  
**NATIONAL UNIVERSITY OF TECHNOLOGY (NUTECH) UPROAD,SECI-12,**  
**ISLAMABAD**  
**Tel: 0092-51-5476768, Ext :178**



## NATIONAL UNIVERSITY OF TECHNOLOGY

### SUPPLY CHAIN MANAGEMENT OFFICE

#### INVITATION TO TENDER

**Submission Date/Time** 04 Mar 2019 at 0930 hours

1. NUTECH desires to procure the list of item(s)/Store(s) as per **Annexure-A**. Interested bidders are requested to send their bids through courier or deliver at NUTECH under two separate sealed envelopes (placed together in third envelope), marked clearly, "**Technical Offer**" and "**Commercial Offer**", respectively to the undersigned, latest by or before above mentioned due date. If due to any unforeseen circumstances, NUTECH establishment remains closed, then the last date of submission will be extended to next working day.
2. Please also note that Technical Offer should contain Annexes-A & B duly filled in (supported with relevant technical literature /details/ catalogues etc) and receipt of tender processing fee. Commercial Offer will contain Annexure-C and bid bond. Please ensure no space is left blank in the annexes.
3. Following must be noted for this IT (Invitation to Tender):-
  - a. 2 x copies of technical offer are to be provided.
  - b. Annexes A, B and C must be signed and stamped, Attach only relevant documents.
  - c. Please complete all document as per given format. Do not use any other format or letter head. Offer may be rejected if given format is not followed.
  - d. Validity of offer will be 90 days.
  - e. Delivery period will be 75 days from date of award of contract.
  - f. Tender(s) must be accompanied with a Bid Bond in agreement of faithful compliance of the conditions of Contract/Purchase Order. This amount will be equivalent to 5% of the total quoted value. In case of non-acceptance of any offer, the Bid Bond will be returned to the bidder by fastest possible means. The Bid Bond amount submitted by the successful bidder will however, be refunded on effective termination of Contract/ Purchase Order. (The Bid Bond will be forfeited in case of default by the bidder from his commitments made through his offer). Submission of Bid Bond is mandatory, otherwise your offer will be rejected.
  - g. 2 years warranty against 5% bank guarantee will be required from the successful bidders from the date of commissioning.

h. Rates should be quoted on Free Delivery basis at NUTECH Islamabad.

4. We reserve the rights to accept or reject any or all tenders as a whole or in part without assigning any reason whatsoever. The decision in this regard will be firm, final and binding on all bidders.

DD (Supply Chain Management)



**NATIONAL UNIVERSITY OF TECHNOLOGY**  
**SUPPLY CHAIN MANAGEMENT OFFICE**

**TECHNICAL OFFER**

**Annex A**

User Reference No **Electrical Lab Eqpt-002** Date: **21-01-2019**

**Technical Specification**

| Ser | Nomen/<br>Experiment                                 | Description   | Country of<br>Origin  | A/U | Qty<br>Req | Bidder Compliance |    |                    | Tech Scrutiny to be<br>done by user |          |
|-----|--|---|-----------------------|-----|------------|-------------------|----|--------------------|-------------------------------------|----------|
|     |  |   |                       |     |            | Yes               | No | Alternate<br>Offer | Accepted                            | Rejected |
|     |  |   |                       |     |            |                   |    |                    | Reason of Rejection                 |          |
| 1.  | <b>FPGA based<br/>Embedded<br/>Design<br/>Device</b> | <ul style="list-style-type: none"> <li>• 10 analog inputs, 6 analog outputs, 40 digital I/O lines</li> <li>• Wireless, LEDs, push button, accelerometer onboard</li> <li>• Xilinx FPGA and dual-core ARM Cortex-A9 processor</li> <li>• Fully programmable with LabVIEW or C; adaptable for different programming levels</li> <li>• <b>Accessories include</b></li> <li>• Driver and software evaluation DVDs</li> <li>• USB cable</li> <li>• Power supply with international adapters</li> <li>• 1 MXP protoboard accessory</li> <li>• screwdriver and MSP screw-terminal connector</li> <li>• <b>Sensors and Actuators Kit</b></li> </ul> | European/<br>American | No  | 10         |                   |    |                    |                                     |          |

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|--|--|--|--|--|--|--|--|--|--|
|  | <ul style="list-style-type: none"> <li>• Barrel connector with leads</li> <li>• Assorted capacitors</li> <li>• Diodes</li> <li>• 7-segment display</li> <li>• Mechanical rotary encoder</li> <li>• Photo interruptor (light sensor with LED)</li> <li>• Assorted op-amps</li> <li>• Assorted LEDs</li> <li>• Small DC motor (1 VDC to 3 VDC, no load speed: 6600 rpm)</li> <li>• Microphone with audio jack</li> <li>• MXP Breadboard Accessory</li> <li>• Potentiometer (500 k<math>\Omega</math>)</li> <li>• Relay</li> <li>• Assorted resistors</li> <li>• Piezoelectric sensor</li> <li>• Photocell</li> <li>• 2 Hall effect sensors (latch and switch)</li> <li>• Buzzer</li> <li>• Assorted switches (DIP, slide, and rotary)</li> <li>• Thermistor (NTC: 10 k<math>\Omega</math>, 25 degrees)</li> <li>• Assorted transistors</li> <li>• Force sensing resistor</li> <li>• Wire kit</li> <li>• Keypad</li> <li>• Digital temperature sensor (I2C)</li> <li>• Character LCD (I2C, SPI, and UART)</li> <li>• Digital potentiometer (SPI)</li> <li>• Bluetooth interface (UART)</li> <li>• EEPROM (SPI)</li> <li>• LED matrix</li> <li>• Geared motor 19:1 (includes encoder for rotation and speed, 12</li> </ul> |  |  |  |  |  |  |  |  |
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|----|---|--|-----------------------|----|----|--|--|--|--|
|    |   | <ul style="list-style-type: none"> <li>V)</li> <li>• Ultrasonic range finder (accurate readings of 0 in. to 255 in. or 6.45 m)</li> <li>• Compass</li> <li>• Servo motor: standard (215 degrees rotation)</li> <li>• Servo motor: continuous rotation</li> <li>• Accelerometer (3 axis, digital - SPI and I2C)</li> <li>• H-bridge driver (compatible with gear motor)</li> <li>• Gyroscope (3 axis, digital - SPI and I2C)</li> <li>• Infrared proximity sensor (10 cm to 80 cm)</li> <li>• Ambient light sensor</li> </ul> |                       |    |    |  |  |  |  |
| 2. | <b>Raspberry Pi</b>   | For embedded systems   | European/<br>American | No | 10 |  |  |  |  |
| 3. | <b>Arduino</b>  | For embedded systems   | European/<br>American | No | 10 |  |  |  |  |
| 4. | <b>Microcontroller Bundle</b>   | 80C51 PIC 16F688-80C55   | European/<br>American | No | 20 |  |  |  |  |
| 5. | <b>Robotics Kit with embedded controller (Rover Vehicle, Balancing Arm, Self-</b> | <ul style="list-style-type: none"> <li>• Fully programmable with embedded design device which features Xilinx FPGA and dual-core ARM Cortex-A9 processor</li> <li>• Motor Board to connect all included sensors and actuators with ease</li> <li>• 10-Cell AA NiMH Battery Pack</li> </ul>   | European/<br>American | No | 10 |  |  |  |  |

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|----|---|---|-------------------|----|----|--|--|--|--|
|    | <b>Balancing Robot)</b>                                   | <ul style="list-style-type: none"> <li>• Battery Charger</li> <li>• Sensors and actuators: Standard Servo, 2 DC Motors, Ambient Light Sensor, Gyro Sensor, IR Rangefinder</li> <li>• Camera for Image Processing</li> <li>• Ability to connect to robot sensors and actuators</li> <li>• Obstacle avoidance, mapping, and path planning</li> <li>• Inverse kinematics, JAUS, and simulation capabilities</li> <li>• Includes all the necessary mechanical and electrical parts as well as instructions to construct 3 robot models directly out of the box.</li> <li>• Rover Vehicle</li> <li>• Balancing Arm</li> <li>• Self- Balancing Robot</li> </ul> |                   |    |    |  |  |  |  |
| 6. | <b>Digital Electronics and DLD Lab Platform with FPGA</b> | <ul style="list-style-type: none"> <li>• FPGA, programmable with Multisim and LabVIEW</li> <li>• 2.8 in. capacitive touch display</li> <li>• 8 LEDs, 8 slide switches, 4 push buttons, 4-digit 7-segment display</li> <li>• USB, Ethernet, and Micro SD card ports</li> <li>• Audio, VGA, and HDMI ports</li> </ul>   | European/American | No | 10 |  |  |  |  |
| 7. | <b>Controls Trainer</b>                                   | <ul style="list-style-type: none"> <li>• Highly linear brushed DC motor</li> <li>• Removable inertia load for variable dynamics</li> <li>• High-resolution optical encoder and current sense</li> <li>• Optional pendulum attached</li> <li>• Highly Linear Motor Response to enable directly relational modeling</li> </ul>  | European/American | No | 3  |  |  |  |  |



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|----|---|--|-------------------|----|----|--|--|--|--|
|    |   | <p>and control design</p> <ul style="list-style-type: none"> <li>• Access and customize all levels of the interfacing and control software using LabVIEW</li> <li>• Complete Package: Hardware and courseware enable courses to cover the essentials of introductory and advanced controls</li> <li>• Simulink Compatibility</li> </ul>  |                   |    |    |  |  |  |  |
| 8. | <b>Digital/Analog Communications Lab Platform</b> | <p>Hardware Blocks:</p> <ul style="list-style-type: none"> <li>• 100kHz BPF</li> <li>• 150kHz LPF</li> <li>• Adder x 2</li> <li>• Analog MUX</li> <li>• Comparator</li> <li>• I&amp;D and I&amp;H</li> <li>• Limiter</li> <li>• Master Signals</li> <li>• Multiplier x 4</li> <li>• Parellel/Serial</li> <li>• Phase Shifter</li> <li>• Precision Rectifier</li> <li>• RC LPF</li> <li>• RRC LPF x 4</li> <li>• Sample and Hold</li> <li>• Generator x 2</li> <li>• Speech</li> <li>• TLPF</li> <li>• VCO</li> <li>• X-OR</li> <li>• Oscilloscope 4ch, 100MS/s, 14bit</li> <li>• Function generator: 2ch, 100MS/s, 15MHz, 14bit</li> <li>• Logic analyzer 16ch, 100MS/s</li> <li>• IV analyzer: <math>\pm 10</math> V, <math>\pm 30</math> mA, 15 MHz</li> <li>• Digital Multimeter</li> </ul> | European/American | No | 10 |  |  |  |  |

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|----|----------|---|-------------------|----|----|--|--|--|--|
|    |          | <ul style="list-style-type: none"> <li>• Variable power supply: <math>\pm 15</math> V, 500 mA</li> <li>• Processor FPGA: Xilinx Zynq-7020</li> <li>• AI/AO: 16 ch, 16 bits/4 ch, 16 bits</li> <li>• DIO: 40ch</li> <li>• SFP Support: windows Mac, Web</li> <li>• Programming Language Support: LabVIEW, Python, C++</li> </ul>   |                   |    |    |  |  |  |  |
| 9. | DSP Kits | <p><b>Multifunction DAQ device</b></p> <ul style="list-style-type: none"> <li>• Compact, portable, and USB-powered educational device for use anywhere, anytime</li> <li>• Oscilloscope, DMM, Function Generator, Variable Power Supply, Bode Analyzer, Dynamic Signal Analyzer, Arbitrary Waveform Generator, DIO,</li> <li>• Single device provides 8 plug-and-play computer-based lab instruments</li> <li>• Data acquisition engine with analog inputs/outputs and digital lines</li> <li>• Extend capabilities by programming with NI LabVIEW software</li> <li>• Simulate and compare with Multisim SPICE software</li> </ul> <p><b>DSP Kit</b></p> <ul style="list-style-type: none"> <li>• Entry-level teaching tool for hands-on learning of digital filters</li> <li>• 50 MHz microchip DSP with anti-aliasing filters and reconstruction filters on the output</li> <li>• 32-bit precision to create filters up to the 10th order</li> </ul> <p>The included lab manuals provide</p> | European/American | No | 10 |  |  |  |  |

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|     |  | exercises to support the student learning experience  |                   |    |   |  |  |  |  |
| 10. | <b>Wireless Communications Teaching Bundle with 2 x 2 MIMO</b> | <ul style="list-style-type: none"> <li>2 USRP-2901 software defined transceivers (2X2 MIMO, 70 MHz to 6 GHz)</li> <li>Covers FM radio, GPS, GSM, Bluetooth, and ISM bands</li> <li>Up to 56 MHz bandwidth with USB 3.0 connectivity</li> </ul> <b>Accessories</b> <ul style="list-style-type: none"> <li>2 x Power Supplies</li> <li>2 x 144 MHz, 400 MHz, 1200 MHz , Tri Band Vertical Antenna</li> <li>2 x 824-960 MHz, 1710-1990 MHz Dual-band Vertical Antenna</li> </ul> | European/American | No | 3 |  |  |  |  |

### Special Instructions

| Description  | Bidder |    |                 | Tech Scrutiny to be done by User |          |                      |
|--|--------|----|-----------------|----------------------------------|----------|----------------------|
|  | Yes    | No | Alternate Offer | Accepted                         | Rejected | Reasons of Rejection |
| <b>Environment Conditions:</b><br>(a) Temperature range: 05°C to +45°C<br>(b) Relative humidity: 0-70% non-condensing  |        |    |                 |                                  |          |                      |
| <b>Warranty period:</b> Two years from the date of commissioning. A warranty sticker is to be pasted on each imported item by the Supplier / OEM highlighting Name of Firm, Contract No and date, Description of Store and Warranty validity |        |    |                 |                                  |          |                      |
| <b>Training Notes:</b> Supplier will provide a set of handouts for training on operation and maintenance of the equipment  |        |    |                 |                                  |          |                      |
| <b>Publications:</b> Supplier is to provide hard and soft copies (CD) of following manuals.  |        |    |                 |                                  |          |                      |

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|---|--|--|--|--|--|--|--|
| <p>(a) <b>Operational / Maintenance manual:</b> - Qty 01 with Equipment and additional Qty 02 for record purposes and should consist of following sections:-</p> <p>(1)<b>Equipment Description /Operation:-</b></p> <p>(a)Specifications<br/>(b)Description<br/>(c)Operation</p> <p>(2)<b>Servicing:-</b></p> <p>(a)Maintenance Schedule<br/>(b )Adjustment / test<br/>(c)Removal / Installation procedure<br/>(d)Tools Used</p> <p>(3) Trouble shooting guide<br/>(4) Cleaning requirements<br/>(5) Shipping and receiving<br/>(6) Storage requirements</p> <p>(b) <b>IPB</b> (Illustrated Parts Breakdown Manual) should have full parts description along with detailed diagrams (exploded view).</p> <p>(c) <b>Experimental manuals</b> which must contain the list and procedure of the experiments that equipment can perform.</p> |  |  |  |  |  |  |  |
| <p><b>Spares / Technical Support:</b></p> <p>(a) Supplier to have in-country spares / technical support and ensure spares and technical support / assistance for next 10 years</p> <p>(b) Comprehensive list of spares required for scheduled maintenance of Equipment is to be provided</p> <p>(c) Any software provided must have its license</p> <p>(d) Software upgrade support must be provided free of cost for 10 x years with renewed license at every upgrade</p> <p>(e) Supplier must also provide calibration service for at least 5 x years after commissioning</p>   |  |  |  |  |  |  |  |
| <p><b>Additional Spare / Replaceable parts:</b></p> <p>(a) Replaceable spare / parts during scheduled inspections are to be identified and provided as per requirement along with equipment sufficient to cater five years consumption.</p> <p>(b) All specialized / standard tools required for inspection /</p>   |  |  |  |  |  |  |  |

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| repair / servicing must be supplied along with equipment.   |  |  |  |  |  |  |
| <p><b>Physical Inspection Criteria:</b> 100% physical inspection of store will be carried out before commissioning of the equipment for following details:-</p> <ul style="list-style-type: none"> <li>(a) For physical damage, scratches and deformity.</li> <li>(b) Accessories /components as per contractual specifications.</li> <li>(c) Technical Manuals (Operation manual, user guide, IPBs).</li> <li>(d) Quality certificate and calibration certificate by the OEM</li> <li>(e) OEM certificate and verifiable documents by the supplier that store has been procured from certified source and is factory new and from latest production.</li> <li>(f) Brand name and country of origin.</li> </ul> |  |  |  |  |  |  |
| <p><b>Commissioning:</b></p> <ul style="list-style-type: none"> <li>(a) Commissioning of the equipment will be carried out by OEM rep at his own cost and risk at designated place at NUTECH.</li> <li>(b) Any special requirement for installation, operation and commissioning must be specified in the offer by the supplier.</li> </ul>   |  |  |  |  |  |  |
| <p><b>Training:</b> 01 week OEM operational/ maintenance training at NUTECH</p>   |  |  |  |  |  |  |
| <p><b>Improvement and Safety Measures:</b><br/>Any improvement and safety measures suggested by NUTECH during commissioning are to be resolved by the supplier / manufacturer at no extra cost.</p>   |  |  |  |  |  |  |
| <p><b>Liability of Supplier:</b></p> <ul style="list-style-type: none"> <li>(a) OEM certificate of authorized dealership Supplier is to provide original OEM certificate of subject equipment bought directly from the manufacturer and being an authorized dealer.</li> <li>(b) In case the equipment supplied is not compatible with</li> </ul>   |  |  |  |  |  |  |

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| <p>specifications, the supplier will be obliged to call his representatives at his own cost for consultation and corrective action</p>  |  |  |  |  |  |  |
| <p><b>Special Notes:</b><br/> (a) Additional requirements for the maintenance of equipment (if any) must be intimated by the supplier in technical offer.<br/> (b) Supplier must provide the list of organizations using same equipment in Pakistan (if any).<br/> (c) Equipment must be a standard product of OEM available at web address of OEM.<br/> (d) In case of premature failure of the equipment, OEM has to replace / rectify the item free of cost. Required transportation charges would be borne by the supplier.</p> |  |  |  |  |  |  |

|                  |
|------------------|
| Firm Name_____   |
| Signature_____   |
| Name_____        |
| Designation_____ |



**NATIONAL UNIVERSITY OF TECHNOLOGY**  
**SUPPLY CHAIN MANAGEMENT OFFICE**

**TECHNICAL OFFER**

**Annex B**

User Reference No **Electrical Lab Eqpt-002** Date: **21-01-2019**

**Please fill in the following essential parameters:**

1. Validity of Offer: \_\_\_\_\_ Days (Should not be less than 90 days)
2. Delivery Period: \_\_\_\_\_ Days (After Placement of order)
3. Country of Origin: \_\_\_\_\_
4. Warranty/Guarantee: \_\_\_\_\_ Months from the date of final acceptance of the stores.

**General**

GST No: \_\_\_\_\_ (Please enclose copy)

NTN/CNIC: \_\_\_\_\_ (if exempted, please provide valid exemption certificate)

**Payment Terms:**

1. 50 % advance payment (Against valid bank Guarantee)
2. 50% Payment after delivery, installation /commissioning, user satisfaction certificate

**Details of Payment Recipient**

(1) Name/Title: \_\_\_\_\_

(2) Address: \_\_\_\_\_

Signature: \_\_\_\_\_

Official Seal: \_\_\_\_\_

Name: \_\_\_\_\_

Designation: \_\_\_\_\_



**NATIONAL UNIVERSITY OF TECHNOLOGY**  
**SUPPLY CHAIN MANAGEMENT OFFICE**

**FINANCIAL OFFER**

**Annex C**

User Reference No **Electrical Lab Eqpt-002** Date: **21-01-2019**

| Ser | Nomen/<br>Experiment                             | Description   | A/U | Qty Req | Unit Price<br>(Rs)<br>(excluding<br>GST) | GST<br>(If<br>applicable) | Custom Duty<br>(Rs) (If<br>applicable) | Total<br>amount<br>(Rs) |
|-----|--|---|-----|---------|--|---------------------------|--|-------------------------|
| 1.  | <b>FPGA based<br/>Embedded Design<br/>Device</b> | <ul style="list-style-type: none"> <li>• 10 analog inputs, 6 analog outputs, 40 digital I/O lines</li> <li>• Wireless, LEDs, push button, accelerometer onboard</li> <li>• Xilinx FPGA and dual-core ARM Cortex-A9 processor</li> <li>• Fully programmable with LabVIEW or C; adaptable for different programming levels</li> <li>• <b>Accessories include</b></li> <li>• Driver and software evaluation DVDs</li> <li>• USB cable</li> <li>• Power supply with international adapters</li> <li>• 1 MXP protoboard</li> </ul> | No  | 10      |  |                           |  |                         |



|  |  |  |  |  |  |  |  |  |
|--|--|--|--|--|--|--|--|--|
|  |  | <ul style="list-style-type: none"> <li>accessory</li> <li>• screwdriver and MSP screw-terminal connector</li> <li>• <b>Sensors and Actuators Kit</b></li> <li>• Barrel connector with leads</li> <li>• Assorted capacitors</li> <li>• Diodes</li> <li>• 7-segment display</li> <li>• Mechanical rotary encoder</li> <li>• Photo interruptor (light sensor with LED)</li> <li>• Assorted op-amps</li> <li>• Assorted LEDs</li> <li>• Small DC motor (1 VDC to 3 VDC, no load speed: 6600 rpm)</li> <li>• Microphone with audio jack</li> <li>• MXP Breadboard Accessory</li> <li>• Potentiometer (500 k<math>\Omega</math>)</li> <li>• Relay</li> <li>• Assorted resistors</li> <li>• Piezoelectric sensor</li> <li>• Photocell</li> <li>• 2 Hall effect sensors (latch and switch)</li> <li>• Buzzer</li> <li>• Assorted switches (DIP, slide, and rotary)</li> <li>• Thermistor (NTC: 10 k<math>\Omega</math>, 25 degrees)</li> <li>• Assorted transistors</li> <li>• Force sensing resistor</li> </ul> |  |  |  |  |  |  |
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|-----------|---------------------|--|----|----|--|--|--|--|--|
|           |                     | <ul style="list-style-type: none"> <li>• Wire kit</li> <li>• Keypad</li> <li>• Digital temperature sensor (I2C)</li> <li>• Character LCD (I2C, SPI, and UART)</li> <li>• Digital potentiometer (SPI)</li> <li>• Bluetooth interface (UART)</li> <li>• EEPROM (SPI)</li> <li>• LED matrix</li> <li>• Geared motor 19:1 (includes encoder for rotation and speed, 12 V)</li> <li>• Ultrasonic range finder (accurate readings of 0 in. to 255 in. or 6.45 m)</li> <li>• Compass</li> <li>• Servo motor: standard (215 degrees rotation)</li> <li>• Servo motor: continuous rotation</li> <li>• Accelerometer (3 axis, digital - SPI and I2C)</li> <li>• H-bridge driver (compatible with gear motor)</li> <li>• Gyroscope (3 axis, digital - SPI and I2C)</li> <li>• Infrared proximity sensor (10 cm to 80 cm)</li> <li>• Ambient light sensor</li> </ul> |    |    |  |  |  |  |  |
| <b>2.</b> | <b>Raspberry Pi</b> | For embedded systems   | No | 10 |  |  |  |  |  |
| <b>3.</b> | <b>Arduino</b>      | For embedded systems   | No | 10 |  |  |  |  |  |

|    |   |   |    |    |  |  |  |  |
|----|---|---|----|----|--|--|--|--|
| 4. | <b>Microcontroller Bundle</b>   | 80C51 PIC 16F688-80C55  | No | 20 |  |  |  |  |
| 5. | <b>Robotics Kit with embedded controller (Rover Vehicle, Balancing Arm, Self-Balancing Robot)</b> | <ul style="list-style-type: none"> <li>• Fully programmable with embedded design device which features Xilinx FPGA and dual-core ARM Cortex-A9 processor</li> <li>• Motor Board to connect all included sensors and actuators with ease</li> <li>• 10-Cell AA NiMH Battery Pack</li> <li>• Battery Charger</li> <li>• Sensors and actuators: Standard Servo, 2 DC Motors, Ambient Light Sensor, Gyro Sensor, IR Rangefinder</li> <li>• Camera for Image Processing</li> <li>• Ability to connect to robot sensors and actuators</li> <li>• Obstacle avoidance, mapping, and path planning</li> <li>• Inverse kinematics, JAUS, and simulation capabilities</li> <li>• Includes all the necessary mechanical and electrical parts as well as instructions to construct 3 robot models directly out of the box.</li> <li>• Rover Vehicle</li> </ul> | No | 10 |  |  |  |  |

|  |  |  |  |  |  |  |  |  |
|--|--|--|--|--|--|--|--|--|
|  |  | <ul style="list-style-type: none"> <li>• Balancing Arm</li> <li>•</li> <li>• Self Balancing Robot</li> </ul> |  |  |  |  |  |  |
|--|--|--|--|--|--|--|--|--|

|    |   |  |    |    |  |  |  |  |
|----|---|--|----|----|--|--|--|--|
| 6. | <b>Digital Electronics and DLD Lab Platform with FPGA</b> | <ul style="list-style-type: none"> <li>• FPGA, programmable with Multisim and LabVIEW</li> <li>• 2.8 in. capacitive touch display</li> <li>• 8 LEDs, 8 slide switches, 4 push buttons, 4-digit 7-segment display</li> <li>• USB, Ethernet, and Micro SD card ports</li> <li>• Audio, VGA, and HDMI ports</li> </ul>  | No | 10 |  |  |  |  |
| 7. | <b>Controls Trainer</b>                                   | <ul style="list-style-type: none"> <li>• Highly linear brushed DC motor</li> <li>• Removable inertia load for variable dynamics</li> <li>• High-resolution optical encoder and current sense</li> <li>• Optional pendulum attached</li> <li>• Highly Linear Motor Response to enable directly relational modeling and control design</li> <li>• Access and customize all levels of the interfacing and control software using LabVIEW</li> <li>• Complete Package: Hardware and courseware enable</li> </ul> | No | 3  |  |  |  |  |

|    |   |   |    |    |  |  |  |  |
|----|---|---|----|----|--|--|--|--|
|    |   | courses to cover the essentials of introductory and advanced controls <ul style="list-style-type: none"> <li>• Simulink Compatibility</li> </ul>  |    |    |  |  |  |  |
| 8. | <b>Digital/Analog Communications Lab Platform</b> | Hardware Blocks: <ul style="list-style-type: none"> <li>• 100kHz BPF</li> <li>• 150kHz LPF</li> <li>• Adder x 2</li> <li>• Analog MUX</li> <li>• Comparator</li> <li>• I&amp;D and I&amp;H</li> <li>• Limiter</li> <li>• Master Signals</li> <li>• Multiplier x 4</li> <li>• Parellel/Serial</li> <li>• Phase Shifter</li> <li>• Precision Rectifier</li> <li>• RC LPF</li> <li>• RRC LPF x 4</li> <li>• Sample and Hold</li> <li>• Generator x 2</li> <li>• Speech</li> <li>• TLPF</li> <li>• VCO</li> <li>• X-OR</li> <li>• Oscilloscope 4ch, 100MS/s, 14bit</li> <li>• Function generator: 2ch, 100MS/s, 15MHz, 14bit</li> <li>• Logic analyzer 16ch, 100MS/s</li> <li>• IV analyzer: <math>\pm 10</math> V, <math>\pm 30</math> mA, 15 MHz</li> <li>• Digital Multimeter</li> <li>• Variable power supply: <math>\pm 15</math> V, 500 mA</li> <li>• Processor FPGA: Xilinx</li> </ul> | No | 10 |  |  |  |  |

|    |                 |  |    |    |  |  |  |  |
|----|-----------------|--|----|----|--|--|--|--|
|    |                 | <p>Zynq-7020</p> <ul style="list-style-type: none"> <li>• AI/AO: 16 ch, 16 bits/4 ch, 16 bits</li> <li>• DIO: 40ch</li> <li>• SFP Support: windows Mac, Web</li> <li>• Programming Language Support: LabVIEW, Python, C++</li> </ul>   |    |    |  |  |  |  |
| 9. | <b>DSP Kits</b> | <p><b>Multifunction DAQ device</b></p> <ul style="list-style-type: none"> <li>• Compact, portable, and USB-powered educational device for use anywhere, anytime</li> <li>• Oscilloscope, DMM, Function Generator, Variable Power Supply, Bode Analyzer, Dynamic Signal Analyzer, Arbitrary Waveform Generator, DIO,</li> <li>• Single device provides 8 plug-and-play computer-based lab instruments</li> <li>• Data acquisition engine with analog inputs/outputs and digital lines</li> <li>• Extend capabilities by programming with NI LabVIEW software</li> <li>• Simulate and compare with Multisim SPICE software</li> </ul> <p><b>DSP Kit</b></p> <ul style="list-style-type: none"> <li>• Entry-level teaching tool for hands-on learning of digital filters</li> </ul> | No | 10 |  |  |  |  |

|     |  |  |    |              |  |  |  |  |
|-----|--|--|----|--------------|--|--|--|--|
|     |  | <ul style="list-style-type: none"> <li>• 50 MHz microchip DSP with anti-aliasing filters and reconstruction filters on the output</li> <li>• 32-bit precision to create filters up to the 10th order</li> </ul> <p>The included lab manuals provide exercises to support the student learning experience</p>   |    |              |  |  |  |  |
| 10. | <b>Wireless Communications Teaching Bundle with 2 x 2 MIMO</b> | <ul style="list-style-type: none"> <li>• 2 USRP-2901 software defined transceivers (2X2 MIMO, 70 MHz to 6 GHz)</li> <li>• Covers FM radio, GPS, GSM, Bluetooth, and ISM bands</li> <li>• Up to 56 MHz bandwidth with USB 3.0 connectivity</li> </ul> <p><b>Accessories</b></p> <ul style="list-style-type: none"> <li>• 2 x Power Supplies</li> <li>• 2 x 144 MHz, 400 MHz, 1200 MHz , Tri Band Vertical Antenna</li> <li>• 2 x 824-960 MHz, 1710-1990 MHz Dual-band Vertical Antenna</li> </ul> | No | 3            |  |  |  |  |
|     |  |  |    | <b>Total</b> |  |  |  |  |

Bid Bond Ref\_\_\_\_\_

Total Gross Value\_\_\_\_\_

\*Custom duty is to be quoted separately.

\*\*Bid Bond to be attached with Annex C. Copy of Bid Bond be attached with  
Technical offer without showing its value)

Firm Name\_\_\_\_\_

Signature\_\_\_\_\_

Name\_\_\_\_\_

Designation\_\_\_\_\_