

## Tender Notice

Sealed Tenders are invited from the Firms, Authorized Distributors/Dealers/Supplier having established credentials in terms of Technical, Financial and Managerial capabilities for the supply of **Equipments** for University College of Engineering & Technology, The Islamia University of Bahawalpur as per details given below, both on C&F and FOR basis, separately.

Tender No.	Category	Estimated Cost	Bid Security (CDR)
A	<b>Equipment:</b> (Qty. & Specifications as available in Tender Documents)	Rs. 2,41,00,000/-	Rs. 4,82,000/-
B	<b>Equipment:</b> (Qty. & Specifications as available in Tender Documents)	Rs. 4,16,00,000/-	Rs. 8,32,000/-
C	<b>Equipment:</b> (Qty. & Specifications as available in Tender Documents)	Rs. 4,81,00,000/-	Rs. 9,62,000/-

- Interested bidders may get the Tender Documents containing detailed specifications, terms and conditions from the Purchase Section, Treasurer's Office Abbasia Campus (Old), the Islamia University of Bahawalpur during office hours 8:00 A.M. to 4:00 P.M. on submission of written application on letter head and a copy of CNIC OR can be down loaded from the IUB Website [www.iub.edu.pk](http://www.iub.edu.pk) or PPRA website [www.ppra.punjab.gov.pk](http://www.ppra.punjab.gov.pk) on payment of (non refundable fee) of Rs.1000/- (separately for each category) through Bank challan HBL in A/C 14730000010403 or pay order in the name of the Treasurer Islamia University of Bahawalpur for bidding documents.
- 02% bid security** of the total estimated cost as mentioned above separately in each category (Refundable) in shape of CDR shall be attached with the bid, otherwise bid will be rejected.
- Single Stage – Two Envelopes** bidding procedure will be adopted as per PPRA Rules 38- 2(a). The Envelopes shall be marked as “**TECHNICAL PROPOSAL**” AND “**FINANCIAL PROPOSAL**” in legible letters. Financial Proposal of bids found technically non-responsive shall be returned unopened.
- Procurement shall be governed under the Punjab Procurement Rules, 2014.
- The rates should be quoted inclusive of all taxes. Copy of paid bank challan Professional tax also be provided.
- The Islamia University of Bahawalpur however, reserves the rights to reject all bids at any time prior to acceptance of a bid as per clause 35 of the Punjab Procurement Rules and grounds of rejection will be conveyed to the bidders upon their request.
- Tender should reach in the Office of the Chairman (SMPC), Department of Chemistry, The Islamia University of Bahawalpur upto **16<sup>th</sup> of May, 2017** by **11:00 A.M.** Tenders will be opened on the same day at **11:30 A.M.** in the presence of bidders or their representatives.
- All bids submitted after the given time shall not be accepted.
- Taxes will be applicable as per Govt. Rules & Regulations.
- The rates should be valid upto 90-days from the date of opening the tender.
- In case of closed/forced holidays, tender opening time/date will be considered as the next working day.

IPB-428



Chairman SMPC, the Islamia University of Bahawalpur, Baghdad-ul-Jadeed Campus, Bahawalpur. Phone: 062-9255473



# The Islamia University of Bahawalpur

## PROCUREMENT OF EQUIPMENT

### TENDER-A FORM

1. Name of Firm: \_\_\_\_\_
2. Mailing Address: \_\_\_\_\_
3. Phone No: \_\_\_\_\_ 4. Fax No: \_\_\_\_\_
5. Tender Fee Challan No. & amount \_\_\_\_\_ CDR No. & Amount \_\_\_\_\_
6. General Sale Tax No: \_\_\_\_\_ 7. Income Tax No. \_\_\_\_\_
8. Professional Tax No: \_\_\_\_\_

Sr	Equipment	Specifications	Qty	Rate per item
<b>A-Survey Laboratory</b>				
1	<b>GPS complete survey system (GNSS)</b>	<p><b>General:</b> Color touch-screen indicators for satellite tracking, data logging, Application programs for job and data management, Compact Flash card removable memory,</p> <p><b>Technical Specifications: Static and FastStatic GPS surveying:</b> Horizontal (<math>\pm 5</math> mm +0.5 ppm RMS) (Vertical. <math>\pm 5</math> mm +1 ppm RMS), <b>Real-Time/ Post processed Kinematic surveying:</b> (Horizontal <math>\pm(10</math> mm + 1 ppm) RMS) , (Vertical. <math>\pm (20</math> mm + 1 ppm) RMS), Initialization. Automatic OTF (on-the-fly) while moving, Initialization time. Typically &lt;30 seconds, Start-up &lt;90 seconds from power on to positioning &amp;&lt;30 seconds with recent ephemeris. <b>Code differential GPS positioning:</b> WAAS/EGNOS differential positioning accuracy: Typically &lt;5m 3DRMS. <b>Measurements;</b> Highly accurate GPS L1/L2 technology, Unfiltered &amp; unsmoothed pseudorange measurement data for low noise, low multipath error, low time domain correlation and high dynamic response, Very low noise L1 and L2 carrier phase measurements with 1 mm precision in a 1Hz bandwidth, Low elevation satellite tracking technology, 24 channels L1 C/A Code, L1/L2 Full Cycle Carrier, WAAS/EGNOS, NMEA-0183: (AVR, GSV, HDT, VGK, VHD, ROT, G GK, GGA, GSA, ZDA, VTG, GST, PJT, and PJK), 5 Hz position rate, Ports: USB, I/O. DE-9, RS232, <b>Environmental;</b> Water/Dust. IEC 144/855420 IP67. <b>Electrical</b> Average operating times on internal battery: RTK: 8 hours.</p> <p><b>Country of Origin: USA, Canada, Japan, Germany, UK, France, Italy, Sweden</b></p>	02	
2	<b>Total Station (Motorized, Auto-pointing, 1")</b>	<p><b>Telescope:</b> Magnification / Resolving power: 30x / 2.5", Length: 168mm, Objective aperture: 45mm (50mm (1.9in.) for EDM), Image: Erect, Field of view: 1°30', Minimum focus: 1.3m. <b>Angle Measurement:</b> Display Resolution: 0.5" /1", Accuracy: 1" Dual-axis liquid tilt sensor, working range: <math>\pm 6'</math>, with Collimation compensation &amp; IACS</p> <p><b>Distance Measurement:</b> Laser output: Reflectorless mode: Class 3R / Prism / sheet mode: Class 1, Measuring range: Reflectorless: 0.3 to 800m, Display Resolution: Fine/Rapid: 0.0001m / 0.001m, Accuracy: Reflectorless: (2 + 2ppm x D) mm, Reflective sheet: (2 + 2ppm x D) mm AP/CP prism: (0.5 + 2ppm x D) mm, Measuring time: Fine: 0.9s (initial 1.7s), Rapid: 0.6s (initial 1.3s), Tracking: 0.3s (initial 1.3s)</p>	01	

		<p><b>Interface and Data management:</b> 3.5in TFT color display, Windows CE 6.0, 500MB internal, Plug-in memory device USB flash memory, Interface: Serial RS-232C, USB2.0, Bluetooth® modem (option): Bluetooth® Class 1, Ver.2.1+EDR, operating range: up to 600m, TS-shield trackable. <b>General</b> Coaxial red laser using EDM beam, Red laser diode (690nm), <b>Auto-pointing, Auto-tracking:</b> Range (1.3m to 1000m) with DC servo @ 70°/sec, <b>Dust and water protection:</b> IP65. <b>Power supply:</b> Detachable battery Li-ion rechargeable battery.</p> <p><b>Country of Origin: USA, Canada, Japan, Germany, UK, France, Italy, Sweden.</b></p>		
3	<b>Total Station (2")</b>	<p><b>Telescope:</b> Magnification / Resolving power: 30x / 2.5", Length: 171mm , Objective aperture: 45mm (48mm (1.9in.) for EDM), Image: Erect, Field of view: 1°30', Minimum focus: 1.3m. <b>Angle Measurement:</b> Display Resolution: 1" /5", Accuracy: 2" Dual-axis liquid tilt sensor, working range: ±6', with Collimation compensation <b>Distance Measurement:</b> Laser output: Reflectorless mode: Class 3R / Prism / sheet mode: Class 1, Measuring range: Reflectorless: 0.3 to 500m, Display Resolution: Fine/Rapid: 0.001m / 0.01ft. / 1/8in. Tracking: 0.01m / 0.1ft. / 1/2in., Accuracy: Reflectorless: (3 + 2ppm x D) mm, Reflective sheet: (3 + 2ppm x D) mm AP/CP prism: (2 + 2ppm x D) mm, Measuring time: Fine: 0.9s (initial 1.7s), Rapid: 0.7s (initial 1.4s), Tracking: 0.3s (initial 1.4s) <b>Interface and Data management:</b> Graphic LCD, 192 x 80 dots, backlight, contrast adjustment / Alphanumeric keyboard / 25 keys with backlight, Internal memory Approx. 10,000 points, Plug-in memory device USB flash memory, Interface: Serial RS-232C, USB2.0 (Type A, for USB flash memory), Bluetooth® modem (option): Bluetooth® Class 1, Ver.2.1+EDR, operating range: up to 300m (980ft.) <b>General:</b> Coaxial red laser using EDM beam, Guide light as Green LED (524nm) and Red LED (626nm), Operating range: 1.3 to 150m (4.3 to 490ft.), Levels: Graphic 6' (Inner Circle), Circular level 10' / 2mm, Optical plummet: Magnification: 3x, Minimum focus: 0.3m, Laser plummet: Red laser diode (635nm±10nm), Beam accuracy: ≤1.0mm@1.3m, Class 2 laser product, Dust and water protection: IP66. <b>Power supply:</b> Detachable battery Li-ion rechargeable battery, Operating time Approx. 36 hours.</p> <p><b>Country of Origin: USA, Canada, Japan, Germany, UK, France, Italy, Sweden.</b></p>	01	
4	<b>Total Station (7")</b>	<p><b>Telescope:</b> Magnification / Resolving power: 30x / 3.5", Length: 171mm , Objective aperture: 45mm (48mm (1.9in.) for EDM), Image: Erect, Field of view: 1°30', Minimum focus: 1.3m. <b>Angle Measurement:</b> Display Resolution: 1" /5", Accuracy: 7" Dual-axis liquid tilt sensor, working range: ±6', with Collimation compensation <b>Distance Measurement:</b> Laser output: Reflectorless mode: Class 3R / Prism / sheet mode: Class 1, Measuring range: Reflectorless: 0.3 to 500m, Display Resolution: Fine/Rapid: 0.001m / 0.01ft. / 1/8in. Tracking: 0.01m / 0.1ft. / 1/2in., Accuracy: Reflectorless: (3 + 2ppm x D) mm, Reflective sheet: (3 + 2ppm x D) mm AP/CP prism: (2 + 2ppm x D) mm, Measuring time: Fine: 0.9s (initial 1.7s), Rapid: 0.7s (initial 1.4s), Tracking: 0.3s (initial 1.4s) <b>Interface and Data management:</b> Graphic LCD, 192 x 80 dots, backlight, contrast adjustment / Alphanumeric keyboard / 25 keys with backlight, Internal memory Approx. 10,000 points, Plug-in memory device USB flash memory, Interface: Serial RS-</p>	03	

		<p>232C, USB2.0 (Type A, for USB flash memory), Bluetooth® modem (option): Bluetooth® Class 1, Ver.2.1+EDR, operating range: up to 300m (980ft.)</p> <p><b>General:</b> Coaxial red laser using EDM beam, Guide light as Green LED (524nm) and Red LED (626nm), Operating range: 1.3 to 150m (4.3 to 490ft.), Levels: Graphic 6° (Inner Circle), Circular level 10' / 2mm, Optical plummet: Magnification: 3x, Minimum focus: 0.3m, Laser plummet: Red laser diode (635nm±10nm), Beam accuracy: ≤1.0mm@1.3m, Class 2 laser product, Dust and water protection: IP66. <b>Power supply:</b> Detachable battery Li-ion rechargeable battery, Operating time Approx. 36 hours.</p> <p><b>Country of Origin: USA, Canada, Japan, Germany, UK, France, Italy, Sweden.</b></p>		
5	<p><b>Tripods &amp; Aluminum Staff Set with misc. survey accessories</b></p>	<ul style="list-style-type: none"> <li>a) Adjustable Tripod stand with table fixture (01 No.)</li> <li>b) Wooden Plain table 30" x 24" approx. (01 No.)</li> <li>c) Alidade (01 No.)</li> <li>d) Plumbing Fork (01 No.)</li> <li>e) Plumb Bob (01 No.)</li> <li>f) Spirit Level (01 No.)</li> <li>g) Prismatic compass (01 No.)</li> <li>h) Round pocket compass (01 No.)</li> <li>i) 15 ft. erectable aluminum Staff Rod (01 No.)</li> <li>j) 20m engineer's chain (GI material) (01 No.)</li> <li>k) 30m engineer's chain (GI material) (01 No.)</li> <li>l) Thermometer (01 No.)</li> <li>m) Measuring tape Steel, 10m, 15m, 20m &amp; 30m (01 No. each)</li> <li>n) 100ft measuring tape fiber (01 No.)</li> <li>o) 100m measuring tape Fiber (01 No.)</li> <li>p) Set square (01 No.)</li> <li>q) Plotting scale (01 No.)</li> <li>r) Velocity Rod for survey (01 No.)</li> <li>s) Binocular (01 No.)</li> <li>t) Optical square (01 No.)</li> <li>u) Clinometer (01 No.)</li> <li>v) Abney Level (01 No.)</li> <li>w) 6ft GI pipe painted ranging rod (06 Nos)</li> <li>x) 12 inch GI wire made Arrows (08 Nos)</li> <li>y) 6 inch wooden pegs (20 Nos)</li> </ul> <p><b>Note: No. of accessories required are for ONE set. Hence the total required No of each accessory will be No. of sets x No of accessory required e.g item (y) Required No of wooden pegs = 10 Sets x 20 No. = 200.</b></p>	10 sets	
6	<p><b>7''Theodolite with accessories</b></p>	<p><b>Angle Measurement:</b> Reading system: photoelectric incremental encoder, Circle diameter: 79 mm (3.1 in), Unit of reading: degree/gon/mil, Minimum digital reading: 5/10", 1/2 mgon, 0.02/0.05 mil, Accuracy: (DIN 18723), 7"/2 mgon. <b>Telescope:</b> Effective diameter of objective: 45 mm (1.8 in), Magnification: 30x, Image erect, Field of view: (at 100ft) 1°20' (2.3 ft), Minimum focusing distance: 0.7 m (2.3 ft), Stadia multiplier constant: 100, Reticle illuminator. <b>Display / Keypad: Front:</b> Type dot-matrix LCD (20 characters x 2 lines), Backlight 1-level illumination, Keypad 5 buttons, <b>Optical Plummet:</b> Magnification: 2.2x, Field of</p>	01	

		view: 5° Focus range: 1.3 m (4.3 ft) fixed, <b>Level Sensitivity:</b> Plate level: 40"/2 mm, Circular level: 10"/2 mm, <b>Power Supply:</b> Battery continuous operating time 48 hours. <b>Country of Origin: USA, Canada, Japan, Germany, UK, France, Italy, Sweden.</b>		
7	<b>10" Theodolite with accessories</b>	<b>Angle Measurement:</b> Reading system: photoelectric incremental encoder, Circle diameter: 79 mm (3.1 in), Unit of reading: degree/gon/mil, Minimum digital reading: 10/20", 2/5 mgon, 0.05/0.1 mil, Accuracy: (DIN 18723), 10"/3 mgon. <b>Telescope:</b> Effective diameter of objective: 45 mm (1.8 in), Magnification: 30x, Image erect, Field of view: (at 100ft) 1°20' (at 2.3 ft), Minimum focusing distance: 0.7 m (2.3 ft), Stadia multiplier constant 100, Reticle illuminator. <b>Display / Keypad: Front:</b> Type dot-matrix LCD (20 characters x 2 lines), Backlight 1-level illumination, Keypad 5 buttons, <b>Optical Plummet:</b> Magnification 2.2x, Field of view 5° Focus range 1.3 m (4.3 ft) fixed, <b>Level Sensitivity:</b> Plate level 60"/2 mm, Circular level: 10"/2 mm, <b>Power Supply:</b> Battery continuous operating time 48 hours. IP54 rating. <b>Country of Origin: USA, Canada, Japan, Germany, UK, France, Italy, Sweden.</b>	05	
8	<b>Distance Meters, Laser &amp; Wheel based</b>	(a) <b>Laser Distance Meter:</b> Passive range up to 150 m , Range to reflector 600 m, Accuracy 10 cm, Resolution 1 cm, Compass Heading accuracy 2°2 & Resolution 0.1°, Inclinator Range: -70° to + 70° Accuracy: 0.2° & Resolution:0.1°, Laser Eye Safety: Class 1 with 5x magnification, monopod/tripod mount, Min Battery 1100 mAh rechargeable, Dust proof and water resistant per IP63 standard (b) <b>Digital Measuring Wheel:</b> Wall-to wall measurements, capable of length & area measurements in various units, large display, with built-in memory, shower proof, steel shaft & ball bearing assembly, convenient kickstand & handle. <b>Country of Origin: USA, Canada, Japan, Germany, UK, France, Italy, Sweden.</b>	a) 2 b) 4	
9	<b>Digital Planimeter</b>	8-digit readout, Accuracy better than 0.2%, Measuring range: 300cm x 30cm approx., English or Metric scales, multiple measurement averaging, display hold, accumulative measurement, and electronic zero reset, auto inactive off, provision for input of different X and Y scale factors, direct measurements in (square centimeter, meters, inches, feet, or acres), LCD display with zero suppression, Full numeric keypad, rechargeable battery 30hrs operation+ AC adapter, carrying case. <b>Country of Origin: USA, Canada, Japan, Germany, UK, France, Italy, Sweden.</b>	03	
10	<b>Rotating Laser Level</b>	Working Range 800m, Self levelling horizontal range ±5°, Accuracy ±10 arc seconds, Rotating prism, 600rpm, battery life 100 hours, ¼-20 tripod mounts, weatherproof rating IP66. <b>Country of Origin: USA, Canada, Japan, Germany, UK, France, Italy, Sweden.</b>	01	
11	<b>Digital &amp; Automatic Levels</b>	(a) <b>Digital Level (0.3mm):</b> DIN 18723 standard deviation measuring accuracy of 0.3mm per 1 km of double leveling, Erect Image , 32X magnification, objective aperture 40mm or higher, Resolution power 2.5", Field of view 1°20',	a) 1 b) 4	

		<p>Minimum focusing distance: 3.28 ft (1.0 m), automatic compensator with Compensation range of <math>\pm 15'</math> and accuracy of <math>\pm 0.2''</math>, With data storage, USB &amp; RS-232 interface, Dust- and waterproofing IP55, Li-ion batteries of Approx. 72hrs operating time. With all minor accessories like Plumb bob, vinyl cover, cleaning cloth, carrying case &amp; tripod etc.</p> <p><b>(b) Automatic Level (0.7 mm):</b> Measuring accuracy(standard deviation) of 0.7mm per 1 km of double leveling, Erect Image , 32X magnification, objective aperture 42 mm or higher, Resolution power 2.5", Field of view 1°20', Stadia Ratio 100, Circular Level vial sensitivity 10'/2mm, Minimum focusing distance: 0.6m, automatic compensator with Compensation range of <math>\pm 12'</math> and accuracy of <math>\pm 0.3''</math>, Multi-functional measuring program, With data storage &amp; RS-232 interface, Dust- and waterproofing IP55, Li-ion batteries of Approx. 48hrs operating time. With all minor accessories like Plumb bob, vinyl cover, cleaning cloth, carrying case &amp; tripod etc.</p> <p><b>Country of Origin: USA, Canada, Japan, Germany, UK, France, Italy, Sweden.</b></p>		
12	<b>GPS Handheld</b>	<p>220 channel, Real-time RTK/VRS &amp; post-processed technology, Cellular, WiFi &amp; Bluetooth connectivity, Sunlight readable, polarized Color display min 4", Touch screen, Accuracy <math>\pm 0.05m</math>, Built-in 5MP Camera, built-in memory, USB slot &amp; cable, SD card slot &amp; 8GB card, IP65 rating, Battery 2Ah or higher.</p> <p><b>Country of Origin: USA, Canada, Japan, Germany, UK, France, Italy, Sweden.</b></p>	05	
<p><b><u>Important Note</u></b></p> <p>The rates should be individually quoted for each of the separate item and cost analysis will be on item rate basis, for 'Tender-A'</p>				

## Tender- (B)

### **B- Fluid Mechanics Laboratory**

1	<b>Hydraulic Bench for Experiments in Fluid Mechanics</b>	<p><b>Required features in the experimental setup:</b> Hydraulic Bench; base module for supplying experimental units in fluid mechanics, closed water circuit with storage tank, submersible pump and measuring tank, measuring tank divided in two for volumetric flow rate measurements, measuring beaker with scale for very small volumetric flow rates, measurement of volumetric flow rates by using a stopwatch, work surface with integrated flume for experiments with weirs, work surface with inside edge for safe placement of the accessory and for collecting the dripping water, storage tank, measuring tank and work surface made of GRP. <b>Dimensions of the Items:</b> Pump; power consumption: 250W, max. flow rate: 150L/min, max. head: 7.6m, Storage tank, capacity: 180L. Measuring tank; at large volumetric flow rates: 40L, at small volumetric flow rates: 10L. Flume; LxWxH: 530x150x180mm, Measuring beaker with scale for very small volumetric flow rates, capacity: 2L, Stopwatch; measuring range: 0-9h 59min 59sec.</p> <p><b>Country of Origin: USA, Canada, Japan, Germany, UK, France, Italy, Sweden.</b></p>	06	
2	<b>Experimental Setup for Dead Weight Calibrator (calibration of bourdon tube pressure gauge)</b>	<p><b>Required features in the experimental setup:</b> Bourdon tube pressure gauge for pressure measurement, transparent dial face with a view of the spring mechanism, accurately fitting piston and cylinder of the piston manometer without seals, hydraulic oil for transfer of the force, hydraulic pump with storage tank and bleed mechanism. <b>Dimensions of the Items:</b> Piston manometer; pressure piston: diameter: 12mm. Hydraulic cylinder: diameter: 25mm, length=225mm. Oil: ISO viscosity grade VG 32. Set of weights; weight holder: 385g / 0.334bar, 1x 193g / 0.166bar, 4x 578g / 0.5bar. Measuring range; pressure: 0-2.5bar.</p> <p><b>Country of Origin: USA, Canada, Japan, Germany, UK, France, Italy, Sweden.</b></p>	01	
3	<b>Experimental Setup for Hydrostatic Pressure</b>	<p><b>Required features in the experimental setup:</b> investigation of the hydrostatic pressure in fluids at rest, tiltable water tank with fill level scale, lever arm with different weights. <b>Specifications of the items:</b> Water tank; inclination angle: 0°-90°, content: 0-1.8L, scale: 0-250mm, effective area max. 75x100mm. Lever arm; max. length 250mm. Weights; 1x 2.5N, 1x 2N, 2x 1N, 1x 0.5N.</p>	01	
4	<b>Experimental Setup for Metacentric Height</b>	<p><b>Required features in the experimental setup:</b> investigating the stability of a floating body and determining the metacenter, transparent floating body with rectangular frame cross-section, one horizontally movable clamped weight for adjusting the heel, one vertically movable clamped weight for adjusting the centre of gravity, clinometer with scale for displaying the heel, other floating bodies with different shapes of frame, determination of the metacenter of 2 floating bodies with different frame shapes, 1 shape of frame: hard chine, 1 shape of frame: round bilge. <b>Dimensions of the Items:</b> Floating body; LxWxH: 300x130x190mm. mast height: 400mm. Horizontal scale: 180mm. Vertical scale: 400mm. Height scale of the floating body: 120mm. Clinometer scale: +/- 35°. Weights; floating body without clamped weights: approx. 2.7kg, vertical clamped weight: 575g, horizontal clamped weight: 196g. Tank for water: 50L. Hard chine frame: LxWxH 300x200x140mm. Round bilge frame: LxWxH 300x200x100mm. Mast length: 240mm. Horizontal scale: 180mm. Vertical scale: 240mm. Height scale of the floating body: 120mm. Scale for heel: +/- 35°. Weights; floating body without clamped weights: hard chine: approx. 2.9kg, round bilge: approx. 2.4kg, vertical clamped weight: 575g, horizontal clamped</p>	01	

		weight: 196g <b>Country of Origin: USA, Canada, Japan, Germany, UK, France, Italy, Sweden.</b>		
5	<b>Experimental Setup for the Demonstration of Bernoulli's Theorem</b>	<b>Required features in the experimental setup:</b> familiarization with Bernoulli's principle, Venturi nozzle with transparent front panel and measuring points for measuring the static pressures, axially movable Pitot tube for determining the total pressure at various points within the Venturi nozzle, 6 tube manometers for displaying the static pressures, single tube manometer for displaying the total pressure. <b>Dimensions of the Items:</b> Venturi nozzle; A: 84-338mm <sup>2</sup> , angle at the inlet: 10.5°, angle at the outlet: 4°, Pitot tube; movable range: 0-200mm, diameter: 4mm. Pipes and pipe connectors: PVC, Measuring ranges; static pressure: 0-290mmWC, total pressure: 0-370mmWC. <b>Country of Origin: USA, Canada, Japan, Germany, UK, France, Italy, Sweden.</b>	01	
6	<b>Experimental Setup for the Demonstration of Impact of Jet</b>	<b>Required features in the experimental setup:</b> investigation of jet forces and demonstration of the principle of linear momentum, tank made of transparent material for observing the experiments, nozzle for generating the water jet, jet force adjustable via flow rate, four different shaped deflectors: (flat surface, oblique surface, semi-circular surface, conical surface), measurement of the jet forces via weight-loaded scale. <b>Dimensions of the Items:</b> Tank; inner diameter: 200mm, height: 340mm. Nozzle; diameter: 10mm. Deflector; flat surface: 90°, oblique surface: 45°/135°, semi-circular surface: 180°, conical surface: 135°. Weights; 4x 0.2N, 3x 0.3N, 2x 1N, 2x 2N, 2x 5N. <b>Country of Origin: USA, Canada, Japan, Germany, UK, France, Italy, Sweden.</b>	01	
7	<b>Experimental Setup for the Demonstration of Orifice Discharge</b>	<b>(a) Required features in the experimental setup for Flow Meter Trainer;</b> comparison and calibration of different flow meters, water circuit with tank, pump and valve to adjust flow rate, 2 measuring locations for vertical or horizontal installation of the flow meters under test, electromagnetic flow rate sensor for reference measurement, 1 differential pressure sensor and twin tube manometers for measurement of pressure losses, DC voltage source to supply the flow meters with auxiliary power. <b>Dimensions of the Items:</b> Tank: approx. 55L, Pump; max. flow rate: approx. 225L/min, max. head: approx. 11m. Accuracy of electromagnetic flow rate sensor; 0.5% of final value. Measuring ranges; flow rate (reference): 0-4760L/h, differential pressure sensor: 0-2bar, twin tube manometers: 0-680mmWC <b>(b) Required features in the experimental setup for Measuring Nozzle:</b> measuring nozzle for flow rate measurement, operation based on the differential pressure method, display of pressure difference, connections to facilitate pressure loss measurement, meter housing made from transparent material, vertical and horizontal installation possible, Measuring nozzle; material: brass, diameter: 14mm, Pipe connections: DN 32 <b>(c) Required features in the experimental setup for Orifice Plate Flow Meter with Transducer:</b> orifice Plate Flow Meter with electronic differential pressure transducer for flow rate measurement, operation based on the differential pressure method, display indicating differential pressure, connections to facilitate pressure loss measurement, connections to supply auxiliary power, vertical and horizontal installation possible. Orifice plate material: brass. diameter: 18,5mm, with 45° chamfer. Transducer; measuring range: 0-500mbar, Pipe connections: DN 32 <b>Country of Origin: USA, Canada, Japan, Germany, UK,</b>	01	

		<b>France, Italy, Sweden.</b>		
8	<b>Experimental Setup for the Demonstration of Energy Losses in Pipes</b>	<p>(a) <b>Required features in the experimental setup for Pipe Friction for Laminar/Turbulent Flow:</b> investigation of the pipe friction in laminar or turbulent flow, transparent tank with overflow ensures constant water inlet pressure in the pipe section for experiments with laminar flow, flow rate adjustment via valves, twin tube manometers for measurements in laminar flow, dial-gauge manometer for measurements in turbulent flow. <b>Dimensions of the Items:</b> Pipe section; length: 400mm, inside diameter: 3mm, Tank: approx. 2L, Measuring ranges; differential pressure (twin tube manometers):2x 370mmWC, differential pressure (dial-gauge manometer): 0-0.4bar</p> <p>(b) <b>Required features in the experimental setup for Losses in Pipe Systems:</b> investigation of pressure losses in piping elements and shut-off devices, different measuring objects for determining flow rate according to the differential pressure method, six pipe sections capable of being individually shut off, with different piping elements: sudden contraction, sudden enlargement, Y-pieces, T-pieces, corners and bends, one pipe section to hold interchangeable shut-off/measuring objects, measuring objects made of transparent material: Venturi nozzle, orifice plate flow meter and measuring nozzle, shut-off devices: angle seat valve, gate valve, annular chambers for measurement of pressure without interaction, 2 twin tube manometers for measuring the pressure difference. <b>Dimensions of the Items:</b> Pipe section to hold fittings or measuring objects; 20x1.5mm, PVC Pipe sections Inside diameters; (straight: d=20x1,5mm, length: 800mm, PVC), (sudden contraction: d=32x1,8-20x1,5mm, PVC), (sudden enlargement: d=20x1,5-32x1,8mm, PVC), (with 2x Y-piece 45° and 2x T-piece), (with 2x 90° elbow/bend: d=20x1,5mm, PVC and 2x 45° elbow: d=20x1,5mm, PVC), (2x twin tube manometers: 0-1000mmWC), Measuring range; pressure: 0-0.1bar</p> <p>(c) <b>Required features in the experimental setup:</b> Energy Losses in Piping Elements</p> <p>investigation of the pressure loss in flow through pipe fittings and in the ball valve, sudden contraction and sudden enlargement, pipe bend, segment bend, pipe angle and ball valve as measurement objects,annular chambers allow precise measurement of pressure, 6 tube manometers for displaying the pressures, Bourdon tube pressure gauge for pressure measurement. <b>Dimensions of the Items:</b> Pipe, PVC, inner diameter: 17mm, Pipe elements, PVC. Inner diameters; (sudden contraction: from d=17 to d=9,2mm), (sudden enlargement: from d=9,2 to d=17mm), (segment bend: d=17mm, 90°), (pipe angle: d=17mm, 90°), (narrow pipe bend: d=17mm, r=40mm, 90°), (wide pipe bend: d=17mm, r=100mm, 90°), Measuring ranges; Bourdon tube pressure gauge: 0-1.6bar, tube manometer: 0-0.03bar</p> <p><b>Country of Origin: USA, Canada, Japan, Germany, UK, France, Italy, Sweden.</b></p>	01	
9	<b>Experimental Setup for Flow Channel Demonstration</b>	<p>(a) <b>Required features in the experimental setup for Plate Weirs for Hydraulic Bench:</b> discharge measurement in open channels using 2 measuring weirs, Thomson weir with V-profile, Rehbock weir with rectangular profile, level gauge with scale for determining the head, level gauge capable to be positioned anywhere along the experimental flume. <b>Dimensions of the Items:</b> Weirs; material: PVC, self-sealing, rectangular profile 60mm, V-profile: angle of the section 90°, height of the, section 50mm. Measuring range; head: 0-200mm</p> <p>(b) <b>Required features in the experimental setup for</b></p>	01	

		<p><b>Visualization of Streamlines in an Open Channel:</b> visualization of streamlines during incident flow and flow around various weirs and drag bodies, transparent experimental flume, incident flow demonstrated on two weirs, demonstration of flow around four different drag bodies, contrast medium: ink, distributor for contrast medium with seven nozzles, water level in the experimental flume adjustable via sluice gate at the water inlet and weir at the water outlet, flow straightener for even, non-vortical water inlet. <b>Dimensions of the Items:</b> Experimental flume; LxWxH: 625x20x150mm, Contrast medium: ink. Injection of the contrast medium; 7 nozzles. Tank for water: 12.5L. Tank for ink: 200mL. Drag bodies; small cylinder diameter: 35mm, large cylinder diameter: 60mm, streamlined body, guide vane profile. Weirs; broad-crested weir, sharp-crested weir</p> <p>(c) <b>Required features in the experimental setup for Visualization of Streamlines:</b> visualization of streamlines water as flowing medium and ink as contrast medium, upper glass plate, hinged for interchanging models, bottom plate with water connections for generating sources/sinks, sources/sinks can be combined as required, different drag bodies and changes in cross-section included, rubber plate for creating your own models included, flow velocity, water supply and water drain in sources/sinks as well as adjustable dosage of contrast medium by valves. <b>Dimensions of the Items:</b> Flow chamber containing two plates, distance between the plates: 2mm, upper plate made of glass, bottom glass plate with four water connections for, sources/sinks, size experiment area: LxW: 400x280mm, 10 drag bodies and changes in cross-section, Rubber plate for models; LxH: 300x400mm, thickness: 2mm. Injection of the contrast medium (ink); 15 holes, Tank for contrast medium: 500mL</p> <p><b>Country of Origin: USA, Canada, Japan, Germany, UK, France, Italy, Sweden.</b></p>		
10	<b>Experimental Setup for Flow Meter Demonstration</b>	<p><b>Required features in the experimental setup:</b> different methods of flow rate measurement, measuring instruments: orifice plate flow meter/measuring nozzle, Venturi nozzle and rotameter, 6 tube manometers to determine the pressure distribution in Venturi nozzle, orifice plate flow meter and measuring nozzle, measurement of the total pressure with Pitot tube. <b>Dimensions of the Items:</b> Venturi nozzle: A=84-338mm<sup>2</sup>, angle at the inlet: 10.5°, angle at the outlet: 4°. Orifice plate flow meter: diameter r =14mm. Measuring nozzle: diameter=18.5mm. Rotameter: max. 1700L/h. 6 tube manometers: 390mmWC.</p> <p><b>Country of Origin: USA, Canada, Japan, Germany, UK, France, Italy, Sweden.</b></p>	01	
11	<b>Experimental Setup for the Demonstration of Free and Forced Vortices</b>	<p><b>Required features in the experimental setup:</b> generation and investigation of vortices, transparent tank allows visualisation of vortex formation, two nozzles for radial water supply (free vortex), two nozzles for tangential water supply (forced vortex), different inserts for the water drain to generate free vortex, impeller for generating a forced vortex, point gauges detect the surface profile. <b>Dimensions of the Items:</b> Tank; diameter: 250mm, height: 190mm. 4 inserts for the water drain; diameter: 8, 12, 16 and 24mm. Impeller with 3 blades, Vertical point gauge; 6 movable rods. Horizontal point gauge; 2 movable rods. Measuring tube; movable, horizontal 0-90mm, vertical 70-190mm, diameter: 4mm.</p> <p><b>Country of Origin: USA, Canada, Japan, Germany, UK, France, Italy, Sweden.</b></p>	01	
12	<b>Experimental Setup for Series and Parallel</b>	<p>(a) <b>Required features in the experimental setup for Series and Parallel Configuration of Pumps:</b> investigation of series and parallel configuration of pumps, two identical centrifugal pumps,</p>	01	

	<p><b>Pumps + Centrifugal Pump</b></p>	<p>transparent tank as intake tank, overflow in the tank ensures constant suction head, ball valves used to switch between series and parallel operation, manometers at inlet and outlet of each pump. <b>Dimensions of the Items:</b></p> <p>2x centrifugal pump, power consumption: 370W, max. flow rate: 21L/min, max. head: 12m. Tank: 13L. Pipes and pipe connections: PVC, Measuring ranges; pressure (inlet): 2x -1-1.5bar, pressure (outlet): 3x 0-2.5bar</p> <p><b>(b) Required features in the experimental setup for Centrifugal Pump:</b> investigation of a centrifugal pump, drive with variable speed via frequency converter, ball valve to adjust the head, manometers on the inlet and outlet side of the pump, digital display of speed and power. <b>Dimensions of the Items:</b></p> <p>Centrifugal pump, self-priming, max. flow rate: 3000L/h, max. head: 36.9m. Asynchronous motor, nominal power: 370W. Measuring ranges; pressure (outlet side): -1-5bar, pressure (inlet side): -1-1.5bar, speed: 0-3000/min, power: 0-1000W.</p> <p><b>Country of Origin: USA, Canada, Japan, Germany, UK, France, Italy, Sweden.</b></p>		
13	<p><b>Multi-Purpose Teaching Flume + Experimental Setup for Hydraulic Flow Demonstration</b></p>	<p><b>(a) Required features in the experimental setup for Horizontal Flow from a Tank:</b> study of horizontal flows from tanks, determining the contraction coefficient for different outlet contours and diameters, tank with adjustable overflow and scale, four interchangeable inserts with different diameters and contours, point gauge with eight movable rods for visualisation of the jet path, white panel for recording the trajectory. <b>Dimensions of the Items:</b> Tank; height: 510mm, diameter: 190mm, contents: approx. 13.5L, Inserts with rounded contour; 1x diameter: 4mm, 1x diameter: 8mm. Inserts with square contour; 1x diameter: 4mm, 1x diameter: 8mm. Point gauge, 8 movable rods</p> <p style="text-align: center;">length: 350mm</p> <p><b>(b) Required features in the experimental setup for Vertical Flow from a Tank:</b> study of pressure losses in vertical flows from tanks, determining the contraction coefficient for different contours and diameters, tank with adjustable overflow, 5 interchangeable inserts with different contours, measuring device for determining the jet diameter, Pitot tube for determining the total pressure, pressure display on twin tube manometers. <b>Dimensions of the Items:</b> Tank; capacity: approx. 13L, overflow height: max. 400mm, max. flow rate: 14L/min. Inserts; Inside diameters: d1=inlet, d2=outlet. 1x cylindrical hole, d=12mm. (1x outlet from the insert: cone. d1=24mm, d2=12mm), (1x inlet to the insert: orifice plate, d1=24mm, d2=12mm), (1x inlet to the insert: cone, d1=30mm, d2=12mm), (1x inlet to the insert: rounded, d=12mm). Measuring ranges; pressure: 500mmWC, jet radius: 0-10mm</p> <p><b>Country of Origin: USA, Canada, Japan, Germany, UK, France, Italy, Sweden.</b></p>	01	
14	<p><b>Experimental Setup for the Demonstration of Pressure Surge in a Pipe</b></p>	<p><b>Required features in the experimental setup:</b> formation and effect of water hammer, pumping using water hammer, fixed overflow tank is used as a water source, e.g. river, pool. elevated tank with variable pump head, waste valve with adjustable lift, cyclic closure due to flow force of the water, tank with check valve and air volume is used as an air vessel, air volume in the air vessel variable by vent valve, flow rate measurement. <b>Dimensions of the Items:</b> Ram; max. head 0.27m, max. flow rate: 90L/h</p> <p><b>Country of Origin: USA, Canada, Japan, Germany, UK, France, Italy, Sweden.</b></p>	01	

15	Pelton Turbine	<p>(a) <b>Pelton Turbine, Required features in the experimental setup:</b> Operating Principle of a Pelton Turbine, function of a Pelton turbine, transparent front panel for observing the operating area, loading the turbine by use of the band brake, adjustable nozzle needle for setting different nozzle cross-sections, marking on brake drum for non-contact speed measurement, instruments: spring balances for determining the torque, manometer shows pressure at turbine inlet. <b>Dimensions of the Items:</b> Pelton turbine; output: 5W at 500min<sup>-1</sup>, approx. 30L/min, H=2m. Pelton wheel; 14 blades, blade width: 33.5mm, external diameter: 132mm. Needle nozzle; jet diameter: 10mm. Measuring ranges; braking force (spring balance): 10N, pressure: 0-1bar</p> <p>(b) <b>Francis Turbine, Required features in the experimental setup:</b> Operating Principle of a Francis Turbine, function of a Francis turbine, transparent front panel for observing the operating area, loading the turbine by use of the band brake, adjustable guide vanes for setting different angles of attack, marking on brake drum for non-contact speed measurement, instruments: spring balances for determining the torque, manometer shows pressure at turbine inlet. <b>Dimensions of the Items:</b> Turbine; output: 12W at 1100min<sup>-1</sup>, approx. 40L/min, H=8m, rotor-7 blades, blade width: 5mm external diameter: 50mm. guide vanes: 6 vanes, adjustable (20 stages). Measuring ranges: braking force (spring balance): 10N, pressure: 0-1.0bar.</p> <p><b>Country of Origin: USA, Canada, Japan, Germany, UK, France, Italy, Sweden.</b></p>	01	
16	Laminar Flow Table	<p>(a) <b>Required features in the experimental setup:</b> visualisation of streamlines, water as flowing medium and ink as contrast medium, upper glass plate, hinged for interchanging models, bottom plate with water connections for generating sources/sinks, sources/sinks can be combined as required, different drag bodies and changes in cross-section included, rubber plate for creating any models, flow velocity, water supply and water drain in sources/sinks as well as adjustable dosage of the contrast medium by valves. <b>Dimensions of the Items:</b> Flow chamber contains two plates; distance between the plates 2mm, upper plate made of glass, bottom glass plate with four water connections for sources/sinks, size experiment area: LxW: 400x280mm, 10 drag bodies and changes in cross-section, Rubber plate for your own models LxH: 300x400mm, thickness: 2mm. Injection of the contrast medium (ink) with 15 holes. Tank for contrast medium: 500mL</p> <p>(b) <b>Osborne Reynolds Experiment, Required features in the experimental setup:</b> visualization of laminar and turbulent flow in the Osborne Reynolds experiment, water as flowing medium and ink as contrast medium, vertical glass pipe section, water tank with glass beads to stabilize the flow, flow rate in the pipe section can be adjusted via a valve. <b>Dimensions of the item:</b> Water tank; capacity: 2200mL. Pipe section; length: 675mm, inside diameter: 10mm, Tank for ink; capacity: approx. 250mL.</p> <p><b>Country of Origin: USA, Canada, Japan, Germany, UK, France, Italy, Sweden.</b></p>	01	
17	Experimental Setup for Flow Over Weirs	<p><b>Required features in the experimental setup:</b> experimental unit for visualisation of various flow processes, illuminated flow section with transparent front panel, open-channel flow demonstrated on 2 weirs, flow through demonstrated with 3 differently shaped models, flow around solid bodies demonstrated on four drag bodies, contrast medium: ink, optional operation via laboratory supply or as closed water circuit. <b>Dimensions of the Items:</b> Flow section: approx. 5L, Contrast medium: ink. Injection of the contrast medium; 5 nozzles. Pump;</p>	01	

		<p>flow rate: 10L/min, head: 5.7m. Weirs; broad-crested, sharp-crested. Drag body; 2 cylinder cross-sections, aerofoil, symmetrical aerofoil, asymmetrical. Models (different shapes), gradual contraction / sudden enlargement, sudden contraction / enlargement, tube bundle.</p> <p><b>Country of Origin: USA, Canada, Japan, Germany, UK, France, Italy, Sweden.</b></p>		
18	<b>Basic Self Contained Flume – 5 Meter</b>	<p><b>Required features in the experimental setup:</b> basic principles of open-channel flow, experimental flume with experimental section, inlet and outlet element and closed water circuit, length of the experimental section 2.5m or 5m, smoothly adjustable inclination of the experimental section, experimental section with 10 evenly spaced threaded holes on the bottom for installing models or for water level measurement using pressure, side walls of the experimental section made of tempered glass for excellent observation of the experiments, all surfaces in contact with water made of corrosion-resistant materials, flow-optimised inlet element for low-turbulence entry into the experimental section, closed water circuit with water tank, pump, flow rate sensor and manual flow adjustment.</p> <p><b>Dimensions of the Items:</b> Experimental section; length: 2.5m or 5m, flow cross-section WxH: 86x300mm, inclination adjustment: -0.5-+3%, Tank: 280L, Pump; power consumption: 1.02kW, max. flow rate: 22.5m<sup>3</sup>/h, max. head: 13.7m, Flow rate measuring range: 0-10m<sup>3</sup>/h.</p> <p><b>Country of Origin: USA, Canada, Japan, Germany, UK, France, Italy, Sweden.</b></p>	01	
19	<b>Pitotstatic Tube</b>	<p><b>Required features in the experimental setup:</b> determination of discharge velocity for the experimental flume, determination of velocity via differential pressure, holder with vertical scale to indicate the position of the pitotstatic tube, hoses connect the pitotstatic tube and the battery-operated differential pressure display. <b>Dimensions of the Items:</b> Scale: 0-800mm, graduation: 1mm. Measuring range: differential pressure 0-140mm, graduation: 0.1mbar</p> <p><b>Country of Origin: USA, Canada, Japan, Germany, UK, France, Italy, Sweden.</b></p>	01	
<p><b><u>Important Note</u></b></p> <p>Items1-19 of this lab will be financially evaluated as a group and cost comparison will be on accumulative cost basis. But the bidders are still required to quote individual prices of the items 1-19, for ‘Tender - B’</p>				

## Tender-(C)

### **C-Engineering Mechanics and Structure Laboratory**

<b>1</b>	<b>Experimental setup for Torsional Vibration Apparatus</b>	<p><b>Required features in the experimental setup:</b> Torsional vibrations on different torsion bars, five aluminum torsion bars with different diameters (Approx. length: 1100mm, diameter: 2mm, 3mm, 4mm, 5mm, 6mm), adjustable effective length of the torsion bars, quick-action chucks to swap components, generate torsional vibration via a circular disk (approx. moment of inertia 0.0096kgm<sup>2</sup>) or circular ring (approx. moment of inertia 0.01335kgm<sup>2</sup>), stopwatch to measure the oscillation period, bracket for wall mounting.</p> <p><b>Country of Origin: USA, Canada, Japan, Germany, UK, France, Italy, Sweden.</b></p>	<b>1</b>	
<b>2</b>	<b>Experimental setup for Vibration of a Spiral Spring</b>	<p><b>Required features in the experimental setup:</b> investigate vibrations on a spring-mass system, lever with sliding mass to deflect the helical spring (Specs; cross-section: 10x1mm, spring length: approx. 800mm, inner radius: 10mm, outer radius: 50mm, winding distance: 8,5mm, Sliding mass: 2x 0,5kg), adjustable distance of the mass to the rotation axis (around 36-150mm), angle scale for reading the angle of deflection (max. 360° &amp; graduation: 1°), stopwatch to measure the oscillation period, determine the natural frequency and the spring stiffness, bracket for wall mounting.</p> <p><b>Country of Origin: USA, Canada, Japan, Germany, UK, France, Italy, Sweden.</b></p>	<b>1</b>	
<b>3</b>	<b>Experimental setup for Friction on an Inclined Steel Plane</b>	<p><b>Required features in the experimental setup:</b> experiment relating to friction on the inclined plane, inclined plane with plastic coating, drag link with angle scale and ball bearing-mounted deflection roller, angle of plane adjustable, 2 samples, graduated weight set, Friction body (Specs; LxWxH: each 80x60x44mm, dead-weight force: each 10N, 1x steel / polypropylene, 1x aluminum / brass), Inclined plane (Specs; length: 1000mm, adjustable angle range: ±45°), Weights;(1x 1N (hanger), 4x 0,1N, 1x 0,5N, 4x 1N, 1x 5N).</p> <p><b>Country of Origin: USA, Canada, Japan, Germany, UK, France, Italy, Sweden.</b></p>	<b>1</b>	
<b>4</b>	<b>Bearing Friction Apparatus</b>	<p><b>Required features in the experimental setup:</b> comparison of dynamic friction and rolling friction, experiments on rotational dynamics are possible, bearing shells of different materials as slide bearings, steel flywheel (galvanized), drive via cable drum and weights, storage system for parts, bracket for wall mounting. <b>Dimensions of items:</b> Bearing shells as slide bearing, half-shells (GG-25, red bronze, PTFE -Teflon), Deep-groove ball bearing (type 6203, Shaft bearing journal, Ø=17mm), Flywheel (Ø=300mm, weight: 22.2kg), Weights (1x 1N (hanger), 5x 1N, 1x 2N, 3x 5N), Base plate (LxW: 250x200mm).</p> <p><b>Country of Origin: USA, Canada, Japan, Germany, UK, France, Italy, Sweden.</b></p>	<b>1</b>	
<b>5</b>	<b>Energy of a Flywheel Apparatus</b>	<p><b>Required features in the experimental setup:</b> investigate the inertia of a flywheel, generate a uniformly accelerated rotational motion of the flywheel, driven by weights, influence of weight on time taken to roll down, measure the time and the acceleration distance, determine the mass moment of inertia, bracket for wall mounting, <b>Dimensions of items:</b> Flywheel (diameter: 300mm, thickness: 40mm, mass: 22,2kg), Shaft (diameter: 22mm), Weight for the drive; (1x 1N (hanger), 4x 1N, 3x 5N).</p>	<b>1</b>	

		<b>Country of Origin: USA, Canada, Japan, Germany, UK, France, Italy, Sweden.</b>		
6	<b>Shearing Force Apparatus</b>	<p><b>Required features in the experimental setup:</b> investigation of shear force on beam mounted on 2 supports, measurement of shear force in beam by low-friction hinge with 1 degree of freedom, position of hinge at 1/3 span, 2 bearing supports, loading of beam by 1 to 3 point loads, force gauge to indicate shear force, adjusting nut for horizontal alignment of beam, storage system to house the components. Specimen; (diameter x l: 6x26mm, made of electrical grade copper).</p> <p><b>Country of Origin: USA, Canada, Japan, Germany, UK, France, Italy, Sweden.</b></p>	1	
7	<b>Bending Moment Apparatus</b>	<p><b>Required features in the experimental setup:</b> investigation of bending moment on beam mounted on 2 supports, indication of bending moment in beam by low-friction hinge with 1 degree of freedom, position of hinge at 1/3 span, 2 bearing supports, loading of beam by 1 to 3 point loads, force gauge and lever arm to indicate bending moment, adjusting nut for horizontal alignment of beam, storage system to house the components, <b>Dimensions of items:</b> Beam; (total length: 1000mm, span: 800mm), Bending moment measuring range: 10Nm, Weights; ( 3x 1N (hanger), 12x 1N, 9x 5N, max. weight per hanger: 20N).</p> <p><b>Country of Origin: USA, Canada, Japan, Germany, UK, France, Italy, Sweden.</b></p>	1	
8	<b>Centrifugal Force Apparatus</b>	<p><b>Required features in the experimental setup:</b> measure the centrifugal force on rotating masses, adjustment of the orbital radii, selection of different masses, continuous adjustment of the speed, drive with DC motor, transmission of centrifugal force via the connecting rod and member to a bending beam, force-proportional deformation of the bending beam, measure the centrifugal force via an inductive position transducer on the bending beam, digital display of force and speed, protective cover with electronic coupling to the drive ensures safe operation. <b>Dimensions of items:</b> Orbit (orbital radii: 25mm, 50mm, 75mm, 100mm, 125mm &amp; max. velocity: 6,5m/s), Masses; (50g, 75g, 100g), Drive motor; (max. power: 35W, max. speed: 6000min<sup>-1</sup>), Measuring ranges; (speed: 0-500min<sup>-1</sup>, force; (0-25N, resolution 0.1N).</p> <p><b>Country of Origin: USA, Canada, Japan, Germany, UK, France, Italy, Sweden.</b></p>	01	
9	<b>Setup for Deformation of frames with mounting Frame</b>	<p><b>Required features in the Mounting Frame;</b> frame for mounting of experiments in statics, strength of materials and dynamics, sturdy sectional steel double frame( welded), easy &amp; exact mounting of all components by precision clamp fixings, stable on laboratory desktops or workbenches, frame supplied disassembled. <b>Dimensions of items:</b> Mounting frame made of steel sections (frame opening WxH: 1250x900mm, section groove width: 40mm).</p> <p><b>Required features in the Deformation of frames setup;</b> investigation of the deformation of steel frames under load, 1 U-shaped and 1 S-shaped frame, statically determinate or statically indeterminate bearing support possible, 1 long and 1 short clamping pillar, roller bearing for statically indeterminate support, weights with a movable hook to adjust to any load application point, dial gauges record the deformation of the investigated frame under load, storage system to house the components. <b>Dimensions of items:</b> Frame made of steel (edge length: 600mm, cross-section: 20x10mm, U-shaped: 600x600mm, S-shaped: 600x600mm), Dial gauges: (measuring</p>	01	

		range: 0-20mm, graduation: 0.01mm), Weights: (2x 1N (hanger), 8x 1N, 6x 5N). <b>Country of Origin: USA, Canada, Japan, Germany, UK, France, Italy, Sweden.</b>		
10	<b>Hook's Law Apparatus</b>	<b>Required features in the experimental setup:</b> experiments relating to Hookes law and oscillation experiments on a spring-mass system, metal stand with integral scale, 2 helical spring as tension springs, tension springs configured in series or singly, load applied to tension spring by weights, storage system to house the components. <b>Dimensions of items:</b> Helical spring short; (coils: 53, $\varnothing = 18,3\text{mm}$ , wire diameter: $\varnothing = 1,0\text{mm}$ ), Helical spring long; (coils: 109, $\varnothing = 18,3\text{mm}$ , wire diameter: $\varnothing = 1,0\text{mm}$ ), Scale graduation: 1mm, Weights; (1x 1N (hanger), 10x 0,5N). <b>Country of Origin: USA, Canada, Japan, Germany, UK, France, Italy, Sweden.</b>	1	
11	<b>Plastic Bending of Beams</b>	<b>Required features in the experimental setup:</b> study a beam until plastic deformation, load on the beam from point load, fixed and movable support for supporting the beam, beams of different materials and profiles, dial gauge for recording the deformation, storage system for parts. <b>Dimensions of items:</b> Beams: (1x 1000x15x3mm, steel), (1x 1000x15x3mm, aluminium), (1x H-profile, 1000x15x15x2mm, aluminium), Load application device: (max. load: 5000N, max. travel: 100mm), Measuring range: 0-50mm. <b>Country of Origin: USA, Canada, Japan, Germany, UK, France, Italy, Sweden.</b>	1	
12	<b>Universal Structure Testing Frame (20KN, approx.)</b>	<b>Required features:</b> Classic experiments from destructive materials testing, tensile tests, Brinell hardness test, generation of tensile and compressive forces, forces generated by hand-operated hydraulic system; no power supply required, force gauge, pointer instrument with drag indicator, dial gauge for determining the elongation, materials of hardness specimens: aluminium, copper, steel, brass, tensile specimens according to DIN 50125: aluminium, copper, steel, brass. <b>Dimensions of items:</b> Test force: max. 20kN, Stroke: max. 45mm, Free installation space for specimens: 165x65mm Tensile specimens: B6x30mm, DIN 50125, Hardness specimens: LxWxH 30x30x10mm, Sphere for hardness testing: diameter 10mm, Measuring ranges; (force: 0-20kN, graduation: 0. 5kN, displacement: 0-20mm, graduation: 0.01mm) <b>Country of Origin: USA, Canada, Japan, Germany, UK, France, Italy, Sweden.</b>	1	
13	<b>Universal Structure Testing Frame (50 KN, approx.)</b>	<b>Required features:</b> hydraulically operated trainer for materials testing, based on industrial standards, generation of tensile and compressive forces, adjustable test load and travel velocity, generation of test load via gear pump and double-acting hydraulic cylinder, force measurement via a strain-gauge full bridge with acoustic overload signal, max. overload 150%, displacement measurement via linear potentiometer, LED displays for force and displacement with tare and maximum-value storage. <b>Dimensions of items:</b> Operating area, WxH: 300x925mm, Hydraulic generation of the test load (test load: 0-50kN, max. system pressure: 175bar, max. piston stroke: 150mm, traverse velocity: 0-425mm/min, gear pump (max. flow rate: 1cm <sup>3</sup> /revolution, power consumption: 0.55kW), Measuring ranges; (force: 0-50kN, displacement: 0-150mm), 230V, 50/60Hz, 1 phase operated <b>Country of Origin: USA, Canada, Japan, Germany, UK,</b>	1	

		<p><b>France, Italy, Sweden.</b></p>		
<p>14</p>	<p><b>Experimental setup for Forces in Truss</b></p>	<p><b>(a) Experimental setup for Forces in various single plane trusses.</b>  Required features in the experimental setup: investigation of bar forces in a statically determinate truss, construction of various trusses possible, 2 supports with node disks, load application device with force gauge mountable on different node disks, measuring points to measure force on each bar, storage system to house the components. <b>Dimensions of the Items;</b> Bars: 19 (2 bars 150mm, 5 bars 259mm, 7 bars 300mm, 1 bar 397mm, 3 bars 424mm, 1 bar 520mm), angle between bars: (30°, 45°, 60°, 90°), maximum bar force: 500N, measuring points on each bar, height of truss max. 450mm, length of truss max. 900mm, Load application device; ±500N &amp; graduation: 10N.</p> <p><b>(b) Experimental setup for Forces in an over-determinate truss.</b>  Required features in the experimental setup: investigation of bar forces in statically over-determinate trusses, surplus bar, longitudinally adjustable, straight and inclined loading possible, load application device with force gauge mountable on different node disks, measuring point to measure force on each bar, measuring amplifier, storage system to house the components. <b>Dimensions of items;</b> Bars: 8 (5 bars-fixed 300mm, 2 bars-fixed 424mm, 1 bar-adjustable 400-450mm), angle between bars: (30°, 45°, 60°, 90°), maximum bar force: 500N, measuring point on each bar, height of truss max. 270mm, length of truss max. 500mm, Load application device; ±500N &amp; graduation: 10N, Dial gauge: measuring range: 0-20mm.</p> <p><b>(c) Forces in a Howe truss</b>  Required features in the experimental setup: investigation of bar forces in a single plane, statically determinate truss, ready assembled Howe truss, frame for horizontal experimental setup, influence of dead weight minimized by horizontal experimental setup, any straight and inclined load cases possible, fine adjustment of load force, low-friction knife-edge bearing, 2 supports for vertical forces, 1 support for horizontal forces, pre-balanced strain gauge connection box with connection to measuring amplifier. <b>Dimensions of items;</b> Truss: Howe type, bar cross-section: 10x3mm-stainless steel, bar lengths: (115.5, 200, 231 mm), external loading: max. 500N, bars: 13-of which 7 with measuring points, Load application device with force gauge; tensile force: max. 600N, stroke: 30mm, Node disks:8, Angle between bars: (30°, 45°).</p> <p><b>(d) Truss beam: Warren girder</b>  Required features in the experimental setup; investigation of bar forces in a single plane, statically determinate truss, ready assembled Warren truss beam, influence of dead-weight minimised by horizontal experiment layout, any straight and inclined load cases possible, pre-balanced strain gauge connection box. <b>Dimensions of items;</b> Truss beam: Warren type, bar cross-section: 10x3mm-stainless steel, bar lengths: (270mm, 186.5mm), tensile force: max. 500N, bars: 13-of which 7 with measuring points, Nodedisks: 8.</p> <p><b>Country of Origin: USA, Canada, Japan, Germany, UK, France, Italy, Sweden.</b></p>	<p><b>01 each</b></p>	

15	<p><b>UNIVERSAL TESTING MACHINE (2000kN)</b></p>	<p><b>UNIVERSAL TESTING MACHINE*</b>: 2000 KN, High Capacity Computer-Controlled Electro Hydraulic Servo UTM. Servo-hydraulic Universal Testing Machine for high-capacity tension, compression, bend/flex, and shear testing. In accordance with the EN, ISO, ASTM, JIS, GB and other standards. Dual spaces frames feature for quick change between tension and compression testing without having to remove heavy fixtures. Extra-length screws and columns, with an adjustable lower crosshead, to increase the available test space for longer test specimens. Semi-open front hydraulic wedge clamps for easier loading and allowing rapid loading and unloading of specimens. Rigid 4-column load frame construction providing superior axial and lateral stiffness and minimum maintenance, low reaction at specimen failure point. Movable lower crosshead to increase distance between grips. Servo valve attached directly on actuator providing close-coupled servo valve and accumulators for improved performance and reduced pressure fluctuations. With digital displacement transducer for the best positioning and measuring accuracy. Hydraulic operated wedge grips. Grip control system mounted directly on the machine. Fixtures for tension, compression, bend/flex, shear, and other tests. Chrome-plated columns for easy maintenance and long useful life.</p> <p><b>Control Module</b></p> <p>Digital control system for force, displacement or deformation. Closed loop control of static material testing machines. All digital, multi-channel, multitasking control system with high resolution and high accuracy control and data acquisition rate with synchronization of all channels</p> <p><b>Configuration:</b></p> <p>Control System: high quality proportioning servo valve, hydraulic oil pump, High precision wheel-load sensor, Draw-out digital displacement sensor, Electronic photoelectric encoder Extensometer (Gauge length: 50mm; tensile range: 50%; precision: 0.03%), PC (Computer (19" LCD)), Color Inkjet Printer, Testing and Monitoring Software, Tensile Grip (Round Vice: two sets with eight inserts; plate vice: one set with four inserts), Bending Testing Fixture (space between two supporting seats: 30~560mm), Compression Plates (each for top and bottom cover plates), Shearing Grip (1 set of shearing seat and shearing pressure Head), All required tools included.</p> <p><b>Features:</b></p> <p>Resolution up to <math>\pm 500,000</math>, Up to 4 or 8 measuring and control channels, Several CPUs parallel work with high speed, realizes multi-task parallel operation in real time, Visible PID adjustment: immediate display of result of PID, Plug and Play identification of the plug boards automatically. Automatic transducer recognition/calibration and balancing, Automatic identification after the specimen is fractured. Optional digital hand operated wheel with additional functions for easy setting of the test. Crosshead speed continuously adjustable. Automatic recognition of all transducers by sensor plug with transducer coding. All system settings be done by software.</p> <p><b>Application range</b></p> <p>Metals including wires, rods, tubes, strips, plates. Fasteners/fixtures (tensile, proof, single and double shear). Construction materials (reinforcement bar, wire, mesh, folding, compression of concrete and components).</p> <p><b>Compliant with the following standards:</b></p> <p>EN10002-1, ISO 6892, ASTM E8, ASTM C39,/EN12390-3,</p>	01
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	<p>UNI6556/ASTMC469/DIN1048/ISO6784, ASTM A 370/A416, ISO 15630, ISO 7438, GB/T 232, ASTM E190, AWS B4.0, API 5L, ASTM F606, SAE J429, NASM 1312, ISO 898-1 CE Compliant.</p> <p><b>Country of Origin: USA, Canada, Japan, Germany, UK, France, Italy, Sweden.</b></p> <p><b>* Note: Installation and commissioning (including base construction) is included.</b></p>	
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**Important Note**

The rates should be individually quoted for each of the separate item and cost analysis will be on item rate basis, for '**Tender-C**'

**General Terms & Conditions**

1. Only certified dealers/distributors of the manufacturers (from the countries of origin as mentioned against each item) are eligible. Eligible Bidder/Tenderer is a Bidder/Tenderer who has authorization of the principal/manufacturer/dealer.
2. Prices should be quoted separately both on C&F & FOR basis delivery to the University College of Engineering & Technology, The Islamia University of Bahawalpur. If the items supplied are not according to the required specification/make it will have to be replaced by the firms on their own cost.
3. Letter of credit (L/C) will be opened by the Islamia University of Bahawalpur and the exemption letter will be issued to the selected bidders accordingly. The sole agent will be responsible for all the charges (clearing, freight etc.) for delivery of items at site.
4. Agreement on stamp paper @ 0.25 percent of total cost should be submitted by the firm.
5. The successful Tenderer/The Contractor against each Item(s) shall furnish Performance Security as under:
  - a) Within **twenty (20) days** of the receipt of the Acceptance Letter from the Purchaser, in the form of Demand Draft / Pay Order / Call Deposit Receipt, in the name of the Treasurer, The Islamia University of Bahawalpur, issued by a scheduled bank operating in Pakistan, for a sum equivalent to **10%** of the contract value denominated in Pak Rupees.
  - b) The Performance Security shall be confiscated, on occurrence of any / all of the following conditions and it will be retained for the period of warranty (i.e. 1 year):-
    - i. If the Contractor commits a default under the Contract;
    - ii. If the Contractor fails to fulfill the obligations under the Contract;
    - iii. If the Contractor violates any of the terms and conditions of the Contract.
6. Technical Proposal shall comprise the following, **without quoting the price**:
  - a) Technical Proposal Form
  - b) Covering letter duly signed and stamped by authorized representative.
  - c) Authorized Certificate / document from the principal / manufacturer.
  - d) Technical Brochures / Literature
7. The Tenderer shall also enclose soft copies of the Technical Proposal, including all Forms, Annexes, Schedules, Charts, Drawings, Documents, Brochures, Literature, etc., in the form of MS Word Documents, MS Excel Worksheets and Scanned images, with the hard copies.
8. Delivery period is within Sixteen (16) weeks from the issuance of Acceptance Letter.
9. The Contractor shall furnish the user documentation, the operation manuals, and service manuals for each appropriate unit of the supplied items and other information pertaining to the performance of the items, in hard copy format and in soft copy format.
10. Warranty Requirements are as under;
  - a) The Contractor shall warrant to the Purchaser that the equipments supplied by the Contractor, under the Contract are genuine, brand new, non- refurbished, un-altered in any way. The component(s) of any item(s) found dead on arrival /defective shall be replaced with new item(s) or component(s) by the contractor as such and shall in no way be referred to the warranty.
  - b) The Contractor shall provide Manufacturer's guaranty for minimum one (1) year after the issuance of Taking-over Certificate in respect of the items or any portion thereof, as the case may be, which will include: Free, on repair / replacement of defective / damaged parts and labor, within four weeks of intimation.
  - c) The Contractor shall clearly mention Terms and Conditions of service agreements for the items supplied after the expiry of initial warranty period.

11. The taking-over certificates will be issued after the supply of the items (including installation, configuration, deployment, commissioning, testing, and training of the delivered items).
12. Validity of rate should be for 190 days from the date of opening of tenders.
13. The vendors will be responsible for any damages during Transit/Delivery. They will also be responsible for any accident and their consequent damages.
14. The Contractor shall arrange and undertake a comprehensive training program for the staff nominated by the Principal UCET, to ensure that they shall acquire a good working knowledge of the operation, and general maintenance of the equipments to be supplied under the Contract.

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

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

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

**Date:** \_\_\_\_\_

**Attachments:**

Earnest Money draft	(Yes/No)
Affidavit for non black listing	(Yes/No)
Bid Validity	(Yes/No)
Signed terms & conditions	(Yes/No)

**Note:** Bid shall be signed by the bidder/authorized person for bidder.