AMMAN ARAB UNIVERSITY جامعة عمان العربية

Measurement Laboratory Tender

Item #	Required specifications	Quantity
1.	**Apparatus name : Hydrostatic pressure in liquids**	1
	Objective: This Equipment is used to enable the students to investigate the pressure distribution along an effective area in a liquid at rest, lateral force of the hydrostatic pressure, the center of pressure and center of area and determination of the resulting compressive force.	
	Technical specifications as below :-	
	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 LxWxH approx..: 400x500x450 mm Weight: approx. 12kg All the dimensions mentioned above are approximate. Different dimensions can be provided.	
2.	**Apparatus name : Methods of flow measurement**	**1**
	Objective: This Equipment is used to enable the students to investigate the flow measurement with orifice plate flow meter and measuring, nozzle, Venturi nozzle and rotameter, measure the pressure with Pitot tube, compare different instruments for flow measurement and determine the corresponding flow coefficients, calibrating measuring instruments.	
	Technical specifications as below :-	
	Different methods of flow rate measurement: - 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. Venturi nozzle: A=84…338mm2 • angle at the inlet: 10,5° • angle at the outlet: 4° Orifice plate flow meter: Ø 14mm Measuring nozzle: Ø 18,5mm Rotameter: max. 1700L/h Measuring ranges • pressure: 6x 0…390mmWC LxWxH: 1100x672x900mm	

	(closed water circuit system) or water connection system, Drain 1 experimental unit 1 set of measuring instruments 1 set of hoses 1 set of tools Weight: approx. 30kg All the dimensions mentioned above are approximate. Different dimensions can be provided.	
3.	**Apparatus name : Measurement of jet forces**	**1**
	Objective: This Equipment is used to enable students to demonstrate the principle of linear momentum, study of the jet forces, influence of flow rate and flow velocity and influence of different deflection angles.	
	Technical specifications as below :-	
	Tank made of transparent material for observing the experiments. Jet force can be adjusted via flow rate. Four different shaped deflectors: flat surface, oblique surface, semi-circular surface, conical surface. Tank • Ø inner: 200mm • height: 340mm Nozzle • Ø 10mm Deflector • flat surface: 90° • oblique surface: 45°/135° • semi-circular surface: 180° • conical surface: 135° LxWxH: 400x400x880mm	

	1 experimental unit 1 set of weights 4 deflectors 1 set of instructional material (closed water circuit system) or water connection system, Drain. Weight: approx. 23kg All the dimensions mentioned above are approximate. Different dimensions can be provided.	
4.	**Apparatus name : Base module for experiments in fluid mechanics**	**1**
	Objective: This Equipment is used to enable students to understand the free overfall at the sharp-crested weir plate weirs as measuring weirs, determine the discharge coefficient comparison of measuring weirs, to determine the discharge comparison of theoretical and measured discharge	
	Technical specifications as below :-	
	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. 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 220-240 volts, 1 phase, 50 Hz UL/CSA optional LxWxH: 1230x770x1070mm 1 base module 2 weir plates 1 level gauge 2 stopwatches 1 measuring cup 1 set of accessories Weight: approx. 85kg. All the dimensions mentioned above are approximate. Different dimensions can be provided.	
5.	**Apparatus name : Calibration of pressure gauges**	**1**
	Objective: This Equipment is used to enable students to investigate the working principle of a Bourdon tube pressure gauge, calibrate manometers, read off applied pressure, determine systematic errors and principle of operation and working with a piston manometer.	
	Technical specifications as below :-	
	transparent dial face with a view of the spring mechanism. hydraulic oil for transfer of the force. hydraulic pump with storage tank and bleed mechanism.	

	Piston manometer • pressure piston: diameter: 12mm • hydraulic cylinder: diameter: 25mm, length=225mm • oil: hydraulic oil Set of weights • weight holder: 385g / 0,334bar • 1x 193g / 0,166bar • 4x 578g / 0,5bar Measuring ranges • pressure: 0…2,5bar LxWxH: 400x400x400mm Weight: approx. 16kg 1 experimental unit 1 set of weights 1 oil (500mL) All the dimensions mentioned above are approximate. Different dimensions can be provided.	
6.	**Apparatus name :Dimensions measuring equipment's**	**4**
	- **Objective:** These Equipment are used to enable the students to learn how to measure different items (length, circular cross section, angles, holes and grooves).	
	a) Steel Rulers: types - Narrow tempered steel ruler - Flexible filter ruler - Angle ruler. • Qty. (4) each. • Range within (0- 30) cm. • Accuracy not less than 0.5 mm.	

	b) Depth Gauge (T- series) for measurement range (0-60) mm. - Analog type. - Digital type. • Qty. (4) each. • Accuracy not less than 0.1 mm.	
	c) Calipers with various types and sizes: - Digital caliper. - Vernier caliper. • Qty. (4) for each • Accuracy not less than (0.05) mm. • Range approximately within (0- 25) cm.	
	d) Micrometers with various types and sizes: - Outer micrometers. - Inside micrometer. - Screw Thread micrometer. • Qty. (4) for each • Range approximately within (0- 25) mm. • Accuracy of 0.01 mm.	
	e) Angle measurement: various types and sizes of angle measurement tools: - Bevel Protector. - Sine Bars. - Set of Angle Gauges. • Qty. (4) for each • Range to be mentioned.	
	f) The standard samples set for each one mentioned above should be provided. All the dimensions mentioned above are approximate. Different dimensions can be provided.	

7.	**Apparatus name: Analog Multimeter**	**5**
	- **Objective: : to able the students to measure AC & DC Voltage, DC Current, Resistance.**	
	1) **Technical specification** :-	
	a) Analog Multimeter can measure voltage (AC&DC), current (DC), and resistance. b) Analog Multimeter must have the following ranges: - DC Voltage: 0.5V, 2.5V, 10V, 50V, 250V. - AC voltage: 2.5V, 10V, 50V, 250V, 500V. - DC Current: 100µA, 2.5mA, 25mA, 250mA. - Resistance: X1 , X10, X100, X1k, X10k. c) Portable (easy to handle and carry) d) Overload Protection. e) Heavy duty. f) Tilt back-stand g) Accuracy: not more than ± 5.0% for all ranges. h) Cables: • Banana – banana, different length 20 up to 50 cm. Qty (10) • Banana – crocodile, different length 20 up to 50 cm. Qty (10)	