

Section VI. Schedule of Requirements

The delivery schedule expressed as weeks/months stipulates hereafter a delivery date which is the date of delivery to the project site.

Item No.	Description	Quantity	Unit	Delivered, Weeks/Months
1	<p>Small engine test set Specifications:</p> <ul style="list-style-type: none"> • Instrumentation Dimensions (fully assembled with fuel tank): Width 1400 mm x depth 300 mm x height 820 mm • Bed and Trolley dimensions (without engine): Width 950 mm x depth 475 mm x height 1050 mm Dynamometer: Hydraulic variable fill Maximum absorption: 7.5 kW @ 7000 rev.min⁻¹ • Typical engine range: 3 to 4 kW, 3000 rev.min⁻¹, 150 to 250 cc • Speed measurement: Proximity pick up and digital display • Torque measurement: Strain gauged load cell and digital display • Air consumption measurement: Air-box and orifice plate, pressure transducer and digital display • Ambient Air temperature and barometric pressure measurement: Thermocouple, pressure transducer and digital display • Exhaust temperature measurement: Engine thermocouple and digital display • Fuel consumption: Precision volumetric fuel gauges (analogue or automatic digital versions available) 	1	lot	One hundred twenty (120) calendar days
1.1	<p>Auto volumetric fuel gauge with digital read-out</p> <ul style="list-style-type: none"> • Automatic volumetric fuel gauge • Accurately and automatically calculates fuel consumption • Directly displays fuel consumption on digital read-out • Can cycle continuously or run once only • Fully compatible with Data Acquisition System and software • Self-sealing couplings enable quick and efficient connection and disconnection of fuel lines with minimum loss or 			

	<p>spillage of fuel</p> <p>The Automatic Volumetric Fuel Gauge consists of a:</p> <ul style="list-style-type: none"> • precision fuel gauge with sensors; • digital read-out (display) unit which shows fuel consumption and allows data to be transferred to a suitable PC via the data acquisition system 			
1.2	<p>Modified 4 stroke diesel engine (electric start)</p> <p>Learning Outcomes</p> <p>investigations into the performance and characteristics of a four-stroke diesel engine, including:</p> <ul style="list-style-type: none"> • Torque, speed and power relationship • Brake mean effective pressure • Engine performance curves • Air and fuel consumption • Volumetric and thermal efficiencies • Willans line <p>When used with Small Engine Test Set, Cylinder Head Pressure Transducer, Crank Angle Encoder and Engine Cycle Analyser, students can investigate further features including:</p> <ul style="list-style-type: none"> • Plotting p-q and p-V diagrams • Engine cycle analysis • Indicated mean effective pressure • Indicated power • Comparison of brake and indicated mean effective pressures • Mechanical efficiency of the engine <p>Fuel: Diesel to minimum specifications EN590, BS2869 A1/A2 or ASTM D 975 - 1D/2D</p> <p>Engine Capacity: 232 cc</p> <p>Power and Torque : 3.1 kW at 3450 RPM</p> <p>Torque 10 Nm at 1700 RPM</p> <p>Speed: Governed to 3200 to 3400 RPM</p> <p>Cooling: Air cooled</p>			
1.3	<p>Engine cycle analyzer</p> <ul style="list-style-type: none"> • Significantly enhances practical investigations, demonstrations and studies of internal combustion engines • Can also be used with other engines fitted with suitable cylinder head transducers and crank angle encoders 			

	<ul style="list-style-type: none"> • Includes powerful Windows based software specially designed for educational use • Automatic calculation and real-time display of p-q plots and p-V plots and other important parameters • Useful snap-shot, replay and animation functions • Accurate, clear animations of crank, piston, inlet and exhaust valve positions help students visualise the engine cycle • Students can export data for further analysis <p>Learning Outcomes</p> <p>When used with suitable test engines, the analyser allows investigations into a variety of internal combustion engine characteristics, including:</p> <ul style="list-style-type: none"> • The thermodynamic cycle of an internal combustion engine • Calculation of indicated mean effective pressure and indicated power • Comparison of indicated mean effective pressure and brake mean effective pressure • Mechanical efficiency of the test engine • Further work using exported data such as combustion analysis <p>Crank angle input: Shaft encoder with 360 pulses per revolution Resolution: 1 degree Pressure signal conditioning: Precision charge amplifier with digital thumb-wheel calibration Maximum engine speed: 7000 rev.min⁻¹ PC connection: Via USB type 1.1 or 2 Auxiliary input: 0 to 10 V via BNC connector</p>			
1.4	<p>Data acquisition frame mounted</p> <p>Key Specifications</p> <ul style="list-style-type: none"> • All mains connectors and cables • STP (shielded twisted pair) cables for equipment connection • Data Export: – XLSX file (default) – HTML file (optional) <p>Software features:</p>			

	<ul style="list-style-type: none"> • Recording data manually or automatically • Data capture set by time or intervals • Display of real-time data, in digital form or as an analogue meter • Real-time traces of analogue signals • Logging data for printing and later analysis • Exporting data for use by other software • Performing real-time calculations to generate userdefined data • Creating and printing charts and data tables • Customisable layouts <p>Accessories (supplied):</p> <ul style="list-style-type: none"> • All mains connectors and cables • STP (shielded twisted pair) cables for equipment connection <p>Digital Inputs:</p> <ul style="list-style-type: none"> • 6 off RJ45 connection • 4 off SPC (DTI) inputs <p>Analogue Inputs:</p> <ul style="list-style-type: none"> • 1 DIN type socket for dual trigger input • 2 DIN type sockets for signal inputs of 0 to 10 V or 4 to 20 mA • Sample rate up to 25 kHz with 12 bit resolution • Bandwidth/Filter cut-off 3 kHz (nominal) <p>Data Export: • XLSX file (default) • HTML file (optional)</p>			
1.5	<p>Online Learning Management Software (include 1-year subscription)</p> <ul style="list-style-type: none"> • Subscription: 1 year • Software features include: <ul style="list-style-type: none"> o Monitors student participation through time logging o Records data manually or automatically o Data capture can be set by time or intervals o Displays real-time data in digital form or as an analogue meter o Real-time traces of analogue signals o Logs data for printing and later analysis o Exports data for use by other software o Performs real-time calculations to generate user defined data o Creates and prints charts and data tables o Customizable layouts 			

	<ul style="list-style-type: none"> o Provides automatic calculation, recording, charting and data export remotely o An unlimited number of students can simultaneously acquire and process live experimental data remotely from their computer, just as they would in the laboratory o Students can individually manipulate the experiment data remotely o Intuitive and easy-to-use, with clear, customisable display and layout options o To monitor engagement, the connection status of students are time logged o Suited to remote classroom demonstrations, laboratory experiments and group work • Standard Features: <ul style="list-style-type: none"> o Supplied with comprehensive user guide • Data Export: <ul style="list-style-type: none"> o XLSX file (default) o HTML file (optional) 			
2.	<p>Branded Laptop (1 unit) Processor: Intel Core i7 Memory: 8 GB Storage: 512GB SSD Screen: 15.6" Operating System: Windows 10</p>	1	unit	One hundred twenty (120) calendar days
***** Nothing Follows*****				