

**Schedule of Requirements**  
**Lab Metallurgy & Material Engineering**

S#	Description	Justification	Qty.	Unit Price C&F	Total Price C&F
1	<b>Metallography Lab</b> (strengthening of existing lab) Metallurgical Microscope with camera + image display monitor + image analyser computerized measuring microscope with image display system to observe Microstructures of Metallurgical sample at high magnifications = 50x to 2000x ASTM Grain size measurement	Very old version microscope is available in department which is not functioning properly. Therefore it is the basic most important equipment required in materials research.	1		
2	Polishing/Grinding Machines, Twin disc type polishing/grinding machines, with consumable Alumina powder in various micron size, diamond paste, polishing cloth, and grinding papers, qty=10 Manual type choice of 2x230mm-250mm platen Speed 600-700 RPM	Polishing is an important step in materials surface preparation and experiment result depends upon grinding and polishing operation in sample preparation.	1		
3	Cut-off Machines Abrasive cut-off Machines for cutting metallurgical materials, Floor standing with holding clamps and	Appropriate cutting of small samples are necessary for further sample preparation, this machine is not available in department.	1		

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	various grit size in reasonable quantity				
4	Sample Mounting Press, with heater and clod mount facility and consumable mounting materials in reasonable quantity	The mounting of small irregular sample is necessary for further sample preparations handling, this unit is not available in MME department.	1		
1	<b>Heat Treatment Lab</b> (strengthening of existing lab) Furnaces, Controlled Atmosphere Heat Treatment Furnace Furnace temperature up to 1800 C Working chamber size=200-300 x 200-300x 200-300mm and 100mm dia tube type along with thermocouple wire K and R type, 50 and 30 meters respectively	High temperature controlled atmosphere furnace needed for treatment of metals, alloys, ceramic sintering.	1		
1	<b>NDT Lab Equipment</b> (establishment of new lab) Ultrasonic Flaw Detector with Oscilloscope and probes, qty=01 each Eddy Current Tester with probes, qty=01 X-ray inspection unit qty=01 Magnetic particle inspection 01	The department is already planning to establish NDT lab for providing the job oriented practical knowledge to the graduate students. This lab is also recommended by HEC/PEC	1 Set		
1	<b>Corrosion Lab</b> (establishment of new lab)	Corrosion engineering is a wide subject. This subject is being taught to	1 Set		

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	<p>Test Equipment's are capable of testing corrosion rates in different environments such as salty, sea, chlorine, and acid atmospheres</p> <p>Computerised Universal Corrosion Measuring System, qty=01 Salt spray Chamber , qty=01</p> <p>Humidity Chamber, qty=01 Research Potentiostat, qty=01 Plotter/Record, qty=01 Zero resistance Ammeter, qty=01 Small Plating units qty=04</p>	metallurgy and petroleum and gas engineering. Pakistan is rich in natural resources and corrosion and corrosion control is the main issue concerned with many industrial sectors oil and gas pipeline and steel structure. This lab is desired to provide practical knowledge to the students			
1	<p><b>Foundry Lab</b> (strengthening of existing lab) Gas fired Pit Furnace, qty=01</p> <p>Sand and Mould Testers, qty=01 each Sieves with shaker, qty=01 Mixer/Muller for sand with binder, qty=01 Green strength tester, qty=01 Weighing balance etc. Permeability Tester, qty=01</p>	PEC has strongly recommended for establishment of foundry lab in the department. Foundry lab covered major core subjects including the materials development and casting. Facilities will be jointly shared by the all department except electronic engineering therefore	1 Set		

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1	<b>Metallurgical Educational Software Lab</b> (strengthening of existing lab) Casting simulation, qty=01 Phase Diagram simulation, qty=01 Alloy Composition Prediction Programme, qty=01  Mechanical working Simulation, Rolling, Forging, Extrusion, Drawing, qty=01 each Heat Treatment simulation, qty=01	A wide range of simulation software's are being used in educational institutions for research and development work to reduce the expensive labour oriented time consuming tasks in materials research.  This computer based education is highly required for quality engineering education.	1 Set		
1	<b>Ceramic &amp; Power Materials Lab</b> (establishment of new lab) Equipment's Ball mill, capacity =0.5kg with tungsten with a set of carbide balls in appropriate quantity for milling and grinding, qty=01 Motorized Mortar and Pastel, qty=01 Conical and rotary mixers, qty=01 Sieve with Shaker, qty=01 Grinder, disc type, qty=01 Jaw crusher with silicon carbide jaws, qty=01 Particle Analyser , qty=01	Powder metallurgy and engineering ceramics are the core subjects. The practical facilities are required to meet HEC/PEC requirements	1 Set		

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1	<b>Polymer and composite Materials Lab</b> (strengthening of existing lab) Equipment's Injection moulding machine Extruder, qty=01	Polymers and composite are emerging technologies. Therefore, Polymeric materials development	1 Set		
1	<b>Welding and Joining Lab</b> (establishment of new lab) Gas Welding: Acetylene Cylinder Oxygen Cylinder Regulators Welding Torch Filler Rods Hose Goggles Tip Cleaner	Welding and joining lab has significant importance in the field of materials engineering research and development work. Therefore, and most important activities required for awarding the combined degree	1 Set		
2	<b>Arc welding:</b> Welding Generator Electrode Holder Electrodes Protective Shields Gloves Wire Brush Chipping Hammer Cables & Electrical Connections Lab Coat Cutting Torch Helmet	- do -	01 Set Each		

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	<b>Resistance welding</b> Resistance spot welding unit Weight: 100-200KG Dimensions: 650*550*850MM Rated Capacity: 2KVA Warranty: 1 year Rated Duty Cycle: 25%				
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