G. S. Mandal's

MARATHWADA INSTITUTE OF TECHNOLOGY, AURANGABAD

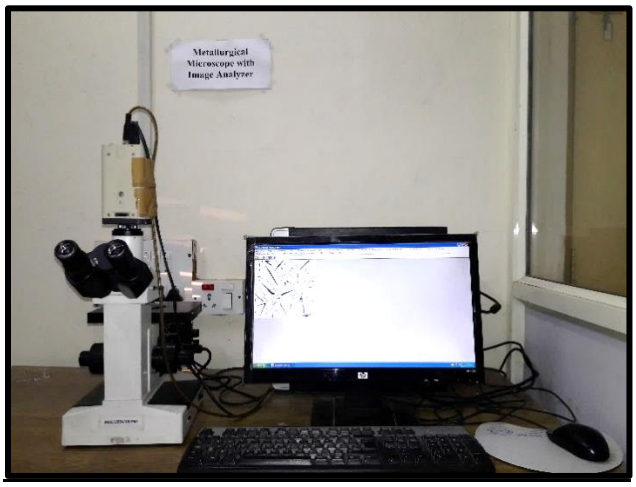
DEPARTMENT OF MECHANICAL ENGINEERING

Laboratory Name and Location: Materials Science and Metallurgy (Room No-G4)

Lab In-charge: Mr. G. M. Kotiye (Assistant Professor)

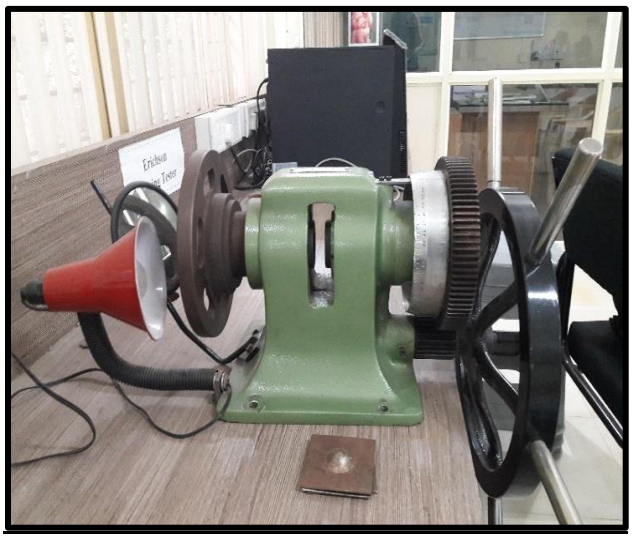
Lab Area: 122.70 Sq.m. **Total Investment (INR): 35,53,039 /-**

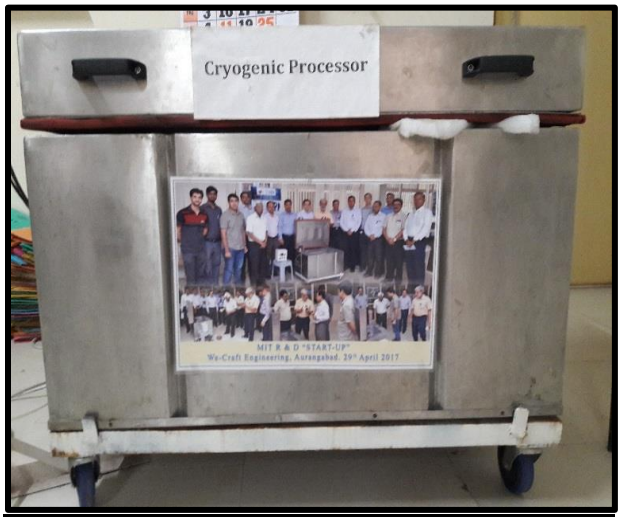
List of Major Equipments:

Sr. No.	Name & Specifications of the Equipment	Photograph of the Equipment
1.	**Metallurgical Microscope with image analyzer** • Image Analyzer software • 10X, 20X, 40X Objectives • Magnification - 100 x to 1000x • Bright field illumination, polarizer. • Mechanical stage 150 X 150 mm	
2.	**Rockwell Hardness Tester SE-RAS** • Ball and Diamond indentor • Test block HRC/HRB • Load- 60,100,150 Kg • Dial Indicator • Lever for load adjustment • Depth of throat -200 mm • Size of Base-370-670 mm	

3.	**Computerized Microhardness Tester** Model MVH-V • Load range – 10 gms to 2000gms • Duel time 5 – 99 sec • Automatic loading and releasing • Microscope Magnification – 100 x , 400 x • Measurement of indentation – Digital Fillar eyepiece Max. measurement length – 175 microns • Max. Height of specimen – 65 mm • Max. Depth of specimen – 85 mm • LCD touch screen • Power Supply - AC 230 V	
4.	**Metallography Belt Grinder CBG-I** **HSN CODE-84603910** • Motor - 1 HP motor, Speed - 1400 RPM approx • Grinding Belt - Continuous type, 915mm X 100mm • Power Transmission - By Al drum Pulley, Belt alignment - By settable allen screws • Sample Cooling - Separate SS wash bowl with water tap arrangement	

5.	**Double Disc Polishing Machine** **CPM -II** **HSN CODE-84609010** • Motors - 0.5 HP separate motors for independent discs • Pump - 0.5 HP, 3 phase • Polishing Discs - 2 Nos., Made of Aluminum and dynamically balanced, Disc dia – 200 mm • Speed - 100-1200 RPM, Speed Variation and Indication - DC drive for speed variation • LED RPM indicator	
6.	**Horizontal Muffle Furnace** **MTI-1200** • Chamber- 6 x 6 x 12 Inch.Ceramic Lined. • Max.Temp.1200℃, 3 KW, Heating Element- Kanthal A1 (15 swg). • Control Panel - Digital controller, Ammeter, Contactor etc.	

7.	**Jominy End Quench Test Equipment** Model-MT-JEQF Vertical Muffle Furnace – 1200°C • Special Furnace with of 1200°C, Thyristor controlled panel to avoids temp overshooting. • Special tong for handling. • Quenching Fixture jet stopper release just before quenching etc. • Motorised Water Circulation with storage & test tank	
8.	**Erichson Cupping Tester SE ET 20** • Direct depth indication on the dial gauge. • Resolution of 0.1mm. • Capacity: 2mm. thick sheet of ferrous & 2.8 mm. thick sheet of non-ferrous material.	

9.	**Cryogenic Processor Equipment** • Cryogenic stainless-steel tank • Internal chamber size 300x300x600 (LBH) mm and insulation 150mm • Base frame with wheel • Cryogenic hose-2m • Cryogenic valve • Temperature controller • Control panel • Temperature sensor	
10.	**Pin-on Disc Wear Testing Machine** • Normal load range – Up to 200N • Frictional force range – Up to 200N • Disc speed – 100 to 2000 rpm • Preset timer range – up to 99hrs:59min:59sec • Wear disc diameter – 165 mm , 8mm Thickness (EN 31 Mtrl, Disc 58 – 60 HRC) • Wear disc track diameter – 10 to 120 mm • Specimen pin diameter/ diagonal – dia. 3mm to 12mm • Pin Length – 25 to 30mm	

11.	**Electrical Conductivity Meter** • Motorized rotating probes 12mm • Reference sample 1 Plate • Power cord • Allen key for dial knob	
12.	**Weighing balance** • Weighing range-0-200 gm • Weighing pan-stainless steel • Display- LCD display	

LIST OF EXPERIMENTS

Significance of the course: This course is intended to give students a distinct understanding of material structures, phases, physical properties, heat treatment and characterization.

List of Experiments	COs
Experiment No.1: Rockwell Hardness test. Aim & Objective: To determine the rockwell hardness of ferrous and nonferrous meterial. Outcomes: Understanding of material behaviour against abrasion, indentation. Experimentation: Perform the test on various metal as per the standard procedure using Rockwell hardness testing machine. Results & Discussions: Hardness of metals is calculated.	CO1, CO2
Experiment No.2: Erichson Cupping Test. Aim & Objective: To determine the formability of sheet metal. Outcomes: Understanding of formability of sheet metal. Experimentation: Use of erichson cupping tester for finding the ability of material to form. Results & Discussions: Formability of mild steel of various thickness is calculated.	CO1, CO2
Experiment No.3: Dye Penetrant Test Aim & Objective: To study the dye penetration test. Outcomes: Understanding of NDT by dye penetrant test. Experimentation: Observe the surface crack after applying the liquid penetrant. Results & Discussions: Surface cracks are observed by necked eye.	CO1, CO2
Experiment No.4: Specimen Preparation for Microscopy. Aim & Objective: To prepare the specimen for microscopic examination. Outcomes: Able to understand the surface preparation procedure. Experimentation: To prepare the samples by using various tools involved in the process. Results & Discussions: Actual sample is prepared for microscopic examination.	CO1, CO4
Experiment No.5: Study and drawing of microstructures of plain carbon steels of varying carbon percentage Aim & Objective: To study and drawing of microstructures of plain carbon steels of varying carbon percentage. Outcomes: Understand the microstructure of plain carbon steels of various carbon percentage Experimentation: Draw a microstructures of plain carbon steel of various carbon percentage Results & Discussions: Drawing of microstructures of plain carbon steel of various carbon percentage is studied	CO1, CO4

Experiment No.6: Study and drawing of microstructures of heat treated steels. Aim & Objective: To understand the heat treatment process and study the microstructures of steel Outcomes: To understand the steel heat treatment process Experimentation: Steel material is heated at austenitic temperature and then cool at different conditions. Results & Discussions: The microstructure of heat treated steel is studied.	CO1, CO4, CO6
Experiment No.7: Study and drawing of microstructures of cast irons. Aim & Objective: Study and drawing of microstructures of cast irons Outcomes: To understand the cast iron microstructure Experimentation: Study and draw the microstructures of cast iron Results & Discussions: The microstructure of cast iron is studied.	CO1, CO4,
Experiment No.8: Study and drawing of microstructures of non-ferrous alloys. Aim & Objective: To study and drawing of microstructures of non-ferrous alloys. Outcomes: To understand the microstructures of nonferrous alloy. Experimentation: Study and draw the microstructures of nonferrous alloy. Results & Discussions: The microstructure of nonferrous alloys is studied	CO1, CO4
Experiment No.9: Hardening of steels of varying carbon percentage. Aim & Objective: To perform a hardening on steel of varying carbon percentage Outcomes: To understand the material properties and microstructures Experimentation: Perform hardening on steels of varying carbon percentage. Results & Discussions: Microstructure and steel property after hardening is studied	CO1, CO4, CO6
Experiment No.10: Jominy End Quench Test. Aim & Objective: To determine the hardenability of steel by jominy end quench test setup Outcomes: To determine the material hardenability Experimentation: Material is heated up to recrystallization temperature and then quenched at the end by applying the jet of water from bottom in jominy end quench setup Results & Discussions: Hardenability of steel is determined.	CO1, CO2, CO4, CO6