



LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

(AUTONOMOUS)

Accredited by NAAC & NBA (CSE, IT, ECE, EEE & ME)

Approved by AICTE, New Delhi and Affiliated to JNTUK, Kakinada

L.B.Reddy Nagar, Mylavaram-521230, Krishna Dist, Andhra Pradesh, India

DEPARTMENT OF MECHANICAL ENGINEERING

METALLURGY AND MATERIAL SCIENCE LAB

LAB INTRODUCTION: Student's will be exposed to basic techniques commonly used in a Metallurgical Laboratory. Like metallography by sectioning, mounting, grinding, polishing and etching. These samples will be examined through photomicrographs obtained by using optical microscopes equipped with digital cameras. Various Micro hardness equipments will be used to demonstrate the strengths and limitations of the test samples. Tensile Testing and Impact Testing will be performed on standard samples.

Metallography is the study of the microstructure of metals and alloys by means of microscopy. It is an art and science of preparing, interpreting, and analyzing microstructures in materials, to better understand materials behaviour and performance. The method is used for the evaluation of metallic materials in the various industries, including the aerospace industry, the automotive industry and parts of the construction industry. It is also used for process control including the examination of defects that appear in finished or partly finished products, as well as the studies of parts that have failed during service. Hands on testing complimented by lectures on the basics of the tests will give a thorough overview of these procedures.

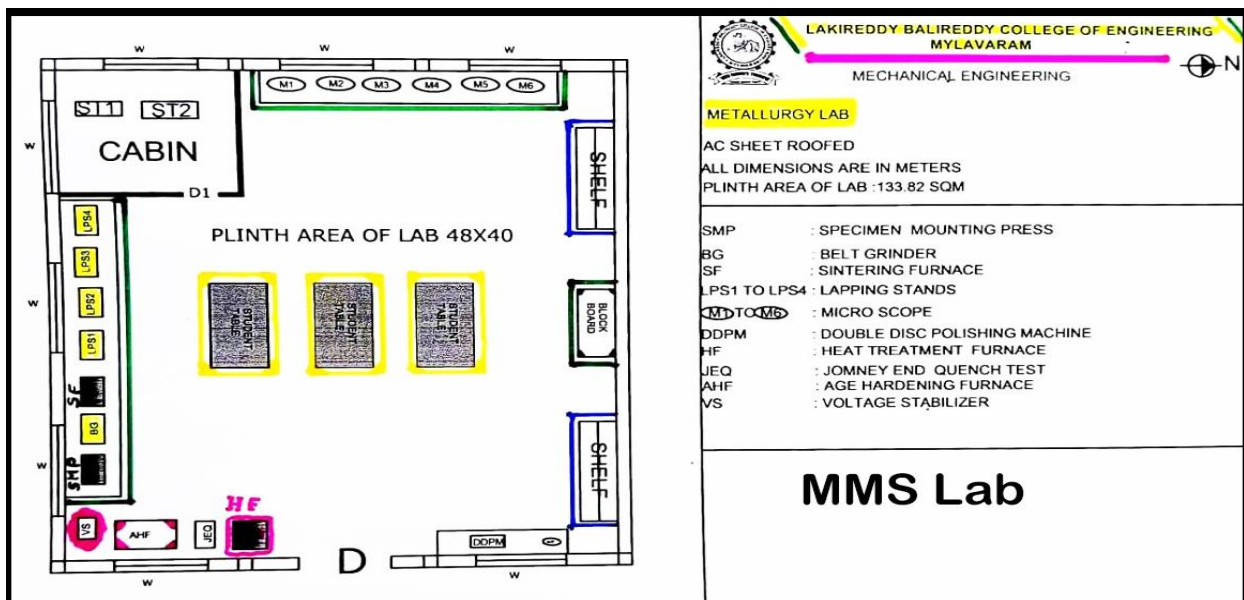
COURSE EDUCATIONAL OBJECTIVE:

The main objectives of the course are to determine the various mechanical properties of materials under different loading conditions and study the microstructure of alloys.

COURSE OUTCOMES: After completion of the course students will be able to

- CO1: Prepare the specimens as per standards.
- CO2: Observe microstructure of different materials.
- CO3: Analyze the properties of materials based on microstructure.
- CO4: Perform hardness test and heat treatment of steels.

Lab Layout:



Equipment details in Metallurgy Laboratory:

List of Equipment in Metallurgy Lab

S.No	Name of the equipment	Date of purchase	No of Available	Total cost In Rs
1	Pyromatic Jomney End Quench Apparatus	12-09-2000	01	20,352/-
2	Pyromatic Metallographic Specimen Mounting Press	12-09-2000	01	10,600/-
3	Pyromatic Double Disc Polishing machine, 10" dia	12-09-2000	01	12,508/-
4	Pyromatic Metallographic Linishiner	12-09-2000	01	6,275/-
5	Pyromatic Heat Treatment Furnace with digital temperature controller 5" x 5" x 12"	12-09-2000	01	11,024/-
6	Specimen Drier	12-09-2000	02	933/-
7	Pyromatic Specimen Leveller	12-09-2000	01	763/-
8	Metallurgical Monocular Microscope	12-09-2000	03	24,168/-
9	Metallurgical Microscope Binocular	12-09-2000	02	21,878/-
10	Metallurgical Microscope Inverted	12-09-2000	01	15,688/-
11	Pyromatic Age Hardening Furnace, 2.5 Kg	13-09-2000	01	38,160/-
12	Hand Polishing Lapping Stand	29-10-2004	04	13,740/-
13	Electric Tube Cylinder	06-06-2006	01	12,946/-
14	Argon Gas Cylinder	31-07-2006	01	13,906/-
15	Ring Timer	03-02-2007	01	572/-
16	Integrated Hardness Tester	05-12-2007	01	56,118/-
17	VFM-9100 Metzer Metavision advance Metallurgical Microscope	16-10-2009	01	76,857/-
18	Maxheat Melting Furnace	31-10-2009	01	74,768/-
19	Electronic Tensometer (Model PC-2000)	07-05-2010	01	4,60,942/-
20	Wear and Friction Monitor (TR-20LE)	09-11-2010	01	4,26,274/-
21	Titanium Coated Wear Disc	08-04-2011	01	17,843.5/-
22	Chromium Coated Wear Disc	08-04-2011	01	20,363.5/-
23	Dewinter Trinocular Inverted Metallurgical Microscope	22-12-2010	01	1,41,750/-
24	Metzer Monocular Microscope	20-09-2018	02	37,931/-
25	Single Disc Polishing Machine	20-09-2018	01	23,108/-
Total Amount				15,39,468/-

METALLURGY LAB:



Figure 1: Metallurgy Lab View



Figure 2: Specimen Mounting Press

Specifications:

	Digital Temperature controller and Timer
	Maximum Temperature range up to 600 ⁰ C
Mould Diameter	32mm
Height	20mm to 25mm
Heater	300W Band Control
Jack	From 1.5 tonn upward



Figure 3: Metallographic Linisher

Specifications:

Motor	0.25 HP
Belt Size	100 X 915mm



Figure 4: Hand Polishing Lapping Stand

Emery Paper (80,120,240,320,400,600.Grit)
Fine Polishing Emery (India Make) (1/0,2/0,3/0,4/0)



Figure 5: Double Disc Polishing Machine

Figure 6: Single Disc Polishing Machine

Specifications: Double Disk Polishing Machine (Figure 5):

1 HP Ac Motor 1440 RPM
Variable Speed 50 to 1440 RPM
1 HP Delta Make Drive

Single Disc Polishing Machine (Figure 6):

1 HP Ac Motor 1440 RPM
Variable Speed 50 to 1440 RPM
1 HP Delta Make Drive
Water inlet and outlet Provision



Figure 7: Etching Agents



Figure 8: Age Hardening Furnace

Specifications:

Temperature Range	30 to 1600 ⁰ C
Control Device	3 1/2 Digit LED
Insulating Substance	Alumina Ceramic Blanket
Size	4" X 4" X 10"



Figure 9: Metzer Monocular Microscope

Specifications: *Metzer Monocular Microscope*

Inclined Monocular tube rotatable through 360 ⁰	
150 X 150mm stage with coaxial graduated mechanical stage for X & Y movements manipulation of objects	
Coarse and fine Adjustments	
Sharp incident illumination surface studies	
Two eyepieces	10X and 15X
Three eyepieces	M5X, M10X, M45X (Spring)
Magnification	50X to 675X

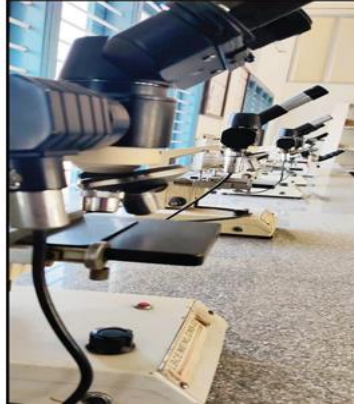


Figure 10: Metallurgical Microscopes



Figure 11: Jomney End Quench Apparatus



Figure 12: Maxheat Melting Furnace

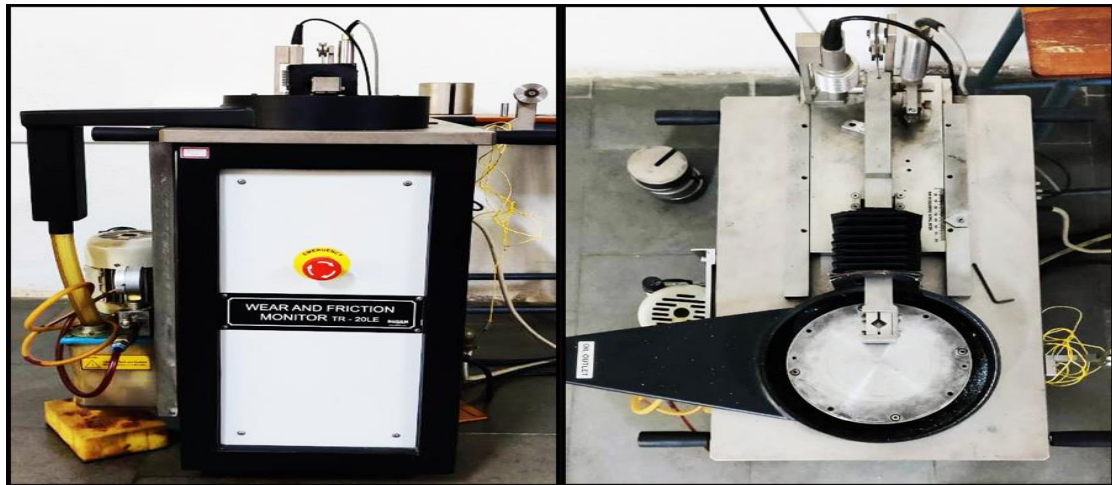


Figure 13: Wear and Friction Monitor (TR – 20LE)

Specifications:

<i>Parameter</i>	<i>MIN</i>	<i>MAX</i>
Pin Size (mm) (Round and Square)	3	12
Disc Size (dia x thick) (mm)	165 x 8	
Wear track diameter (mean) (mm)	50	100
Sliding speed range (m/sec)	0.5	10
Disc Rotation Speed (RPM)	200	2000
Normal load (N)	5	200
Frictional Force (N)	0	200
Wear measurement range (Micrometer)	0	2000
Preset timer (hr/min/sec)	99/59/59	
Power (V/A/Ph/Hz)	230/15/1/50	



Figure 14: Metzer Metavision Advance Metallurgical Microscope

Specifications:

Microscope Stand	Rigid & stable stand with well counted large modular base. Ball bearing guide ways and slides provides extra smooth movement
Viewing Head	Binocular with dioptic and inter pupillary adjustment.
Focusing	Co-axial Coarse & Fine focusing module
Stage	Large size stage with co-axial low drive, for convenient viewing of specifications
Illumination	Incident light through Epi-illuminator with field Aperture Diaphragm and filter slot, continuously variable luminosity control through built in-in electronic Transformer.
Objectives	High fidelity flat field objectives M5x, M10x, M40x, M100x oil
Eyepieces	Compensation Wide field 10x & 15x paired.
Magnification	50x - 1500x



Figure 15: Inverted Metallurgical Microscope

Specifications:

Eyepieces	Wide Field	WF 10X (Ø 18mm)
Objectives	Plan Achromatic	PL 10X
		PL 20X
		PL 40X
		PL 80X
		PL 60X ,PL 100X -Optional
Observation Head	Trinocular head, Compensation (inclination 30 ⁰)	
Focusing	Coaxial Focusing System with Slides traveling on ball bearing guide ways, for frictionless motion	
Nosepiece	Inner locating on ball bearing	
Mechanical stage	Stage Size: 150mm x 200mm	
Illumination Unit	6V 20 W halogen lamp, adjustable brightness	

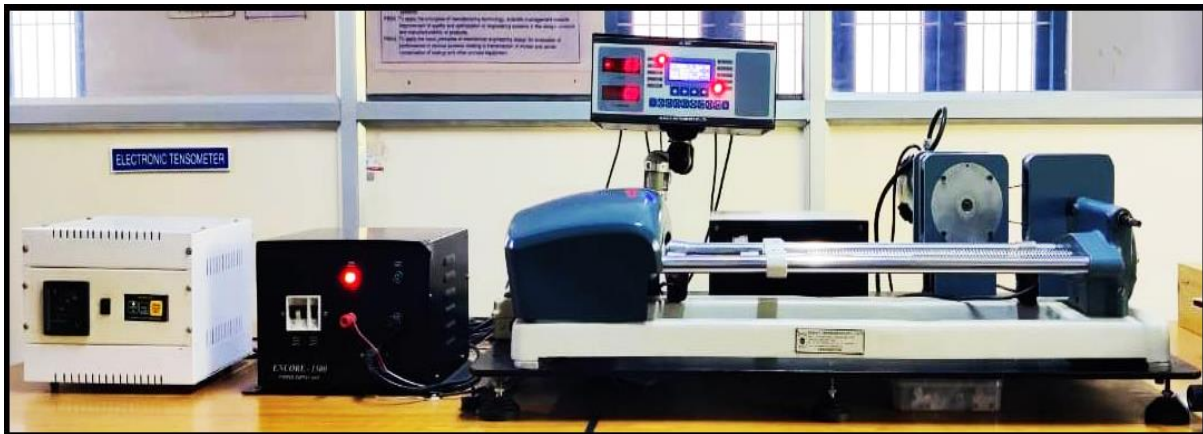


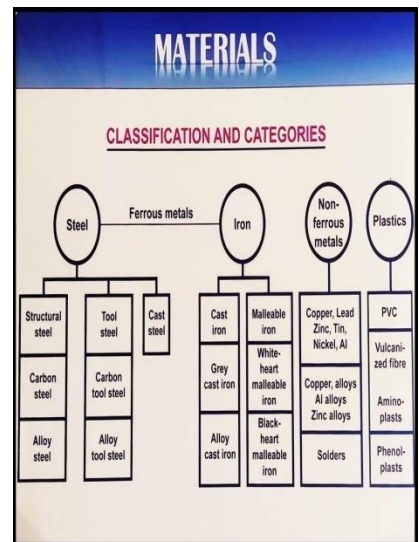
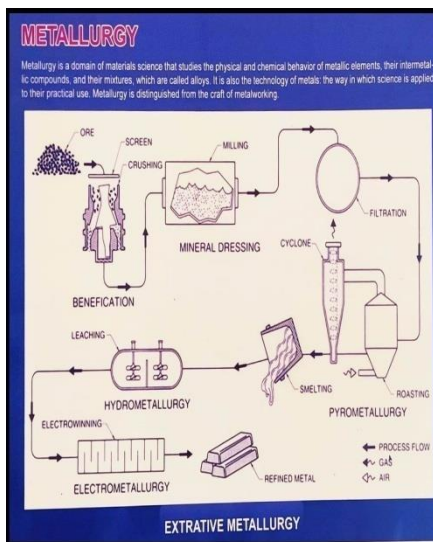
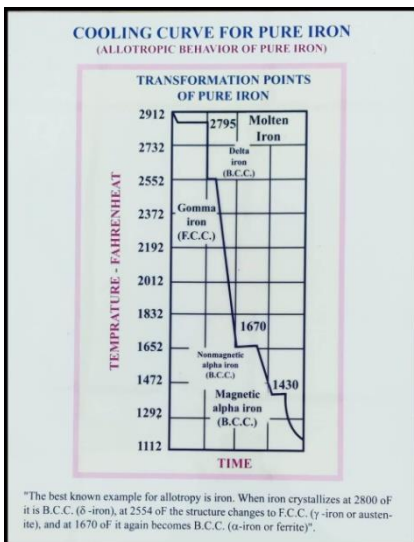
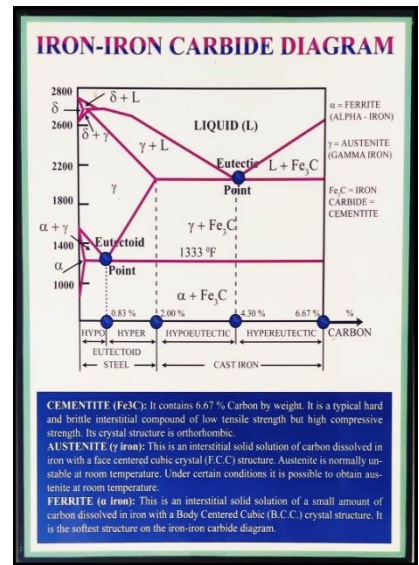
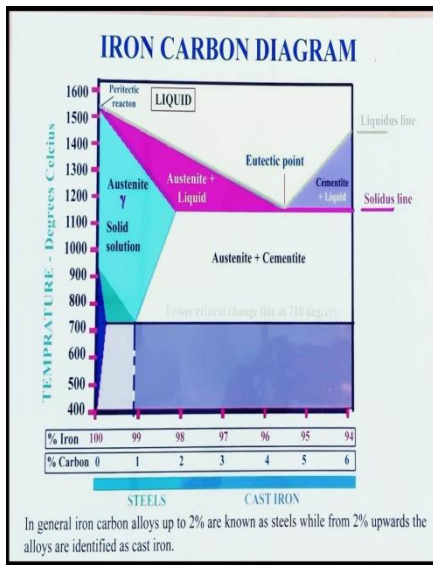
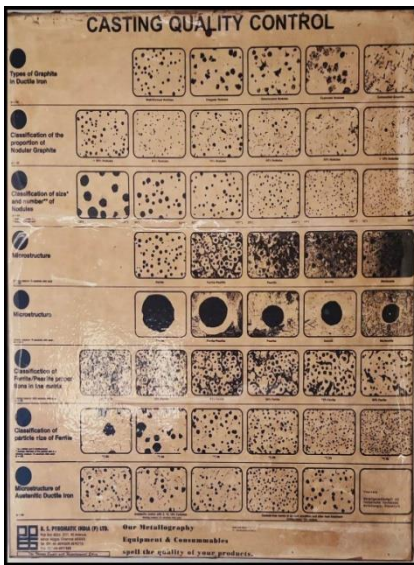
Figure 16: Electronic Tensometer (Model PC-2000)

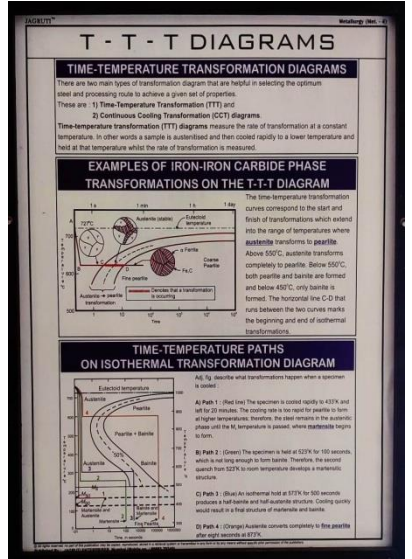
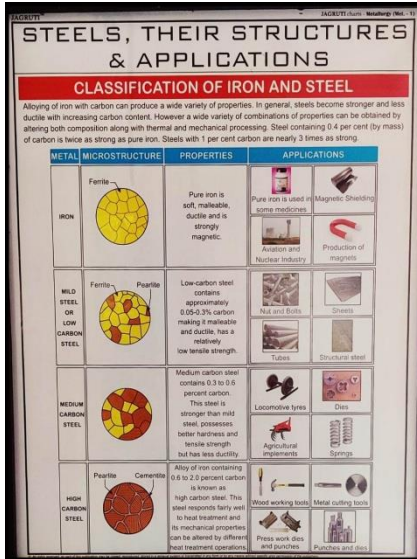
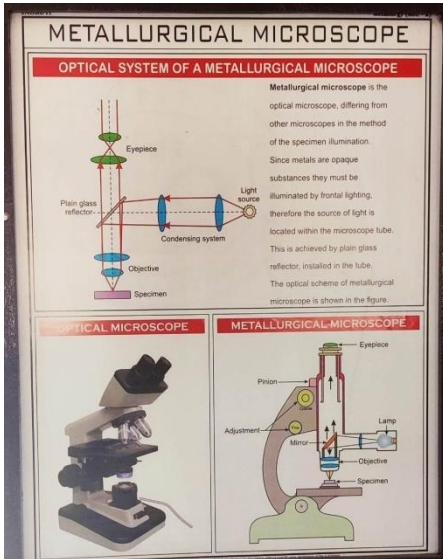
Specifications:

<i>Parameter</i>	<i>Value</i>
Capacity	20KN
Force Range	Upto 20KN
Accuracy	+/- 1%
Crosshead Travel	525 mm Approx excluding grip
Crosshead Speed	Manual with high speed return system
Testing Area	135mm approx between guide rods
Dimensions	965 x 235 x 200 mm.approx
Weight	25 Kg

Wall charts Details:

S.No	Name of the Chart	Quantity
1	Casting Quality Control	01
2	Iron – Carbon Equilibrium Diagram	01
3	Iron – Iron Carbide Diagram	01
4	Cooling Curves For Pure Iron	01
5	Extractive Metallurgy	01
6	Materials Classification	01
7	Metallurgical Microscope	01
8	Steels, Their Structures and Applications	01
9	T-T-T Diagrams	01





Laboratory Utilization:

S. No	Laboratory Name	Branch
1	Metallurgy and Material Science Lab	B.Tech III Semester (Mechanical)

Lab In-charge:

Faculty in-charge: **Bandaru Dyva Isac Premkumar M.Tech**

Sr. Technician: **Sk. Jany**