HEAT-TREATMENT AND MECHANICAL METALLURGY LABORATORY

Course Type	Course Code	Name of the Course	L	T	P	Credits
DP	FMC352	**Heat-treatment and Mechanical Metallurgy Laboratory**	0	0	3	3

Course Objective
To understand the basic operations involved in heat-treatment process and metallographic preparation of samples for microscopy to observe the microstructure of alloys. To conduct various mechanical tests on alloys to characterize their important mechanical properties and correlate them with the microstructure.
Learning Outcomes
Upon successful completion of this laboratory, students will be able to do the heat-treatment, optical microscopy and mechanical testing on metallic materials. Students will be able to establish the basic process-microstructure-property correlation.

Unit No.	Topics to be Covered	Lecture Hours	Learning Outcome
1.	Metallographic preparation of samples for optical microscopy	3	Students will learn different steps to prepare the metallic samples for microstructure observation under optical microscope.
2.	Quantitative metallography: Grain size and phase fraction measurement.	3	Students will be able to measure the grain size and volume fraction of different phases in a micrograph.
3.	Observation of microstructure of commonly used engineering alloys under optical microscope	3	Students will be able to recognize the different microstructures of commonly used ferrous and non-ferrous alloys.
4.	Determination of hardenability through Jominy end-quench test	3	Students will understand the concept of hardenability which is the ability of a steel alloy to form martensite after quenching treatment.
5.	Heat treatment of steels: Annealing, Normalizing and Quenching	3	Students will learn to tailor the microstructure and change the mechanical properties of steels through heat-treatment processes.
6.	Tensile Test	3	Students will understand the mechanical behavior of materials under tensile loading by analyzing the stress-strain curve.
7.	Compression Test	3	Students will understand the behaviour of materials under compressive loads.
8.	Rockwell Hardness Test	3	Students will learn to measure the bulk hardness of metals.
9.	Vickers Hardness Test	3	Students will learn to conduct micro-hardness testing of metals.
10.	Impact Toughness Test	3	Students will learn to evaluate the ability of the materials to withstand sudden loading conditions and appreciate their ductile to brittle transition behaviour.