

LESSON PLAN FOR ACADEMIC SESSION: 2025-26 (Winter)

Discipline: Metallurgical Engineering	Semester : 3rd	Name of the Teaching Faculty : Arpita Jena
Subject : Material Testing	No. of days / week class allotted	Semester From : 15/07/2025 to 15/11/2025 Nos. of Weeks per semester : 15
Week	Class Day	Theory Topics
1 ST	1 st	Introduction to Material Testing
	2 nd	Importance & objectives of material testing
	3 rd	Classification of materials: Metals, ceramics, polymers, composites
2 ND	1 st	Standard organizations: ASTM, ISO, IS, DIN
	2 nd	Mechanical Properties of Materials
	3 rd	Elastic and Plastic Deformation
3 RD	1 st	Stress-strain behavior, Hooke's Law
	2 nd	Yield strength, ultimate tensile strength (UTS), fracture strength
	3 rd	Fatigue and creep
4 TH	1 st	Ductility, brittleness, toughness, and resilience
	2 nd	Destructive Testing (DT) Methods
	3 rd	Tensile Test: stress-strain behavior, yield strength, tensile strength
5 TH	1 st	Ductility, and toughness , stress-strain curve,
	2 nd	Modulus of elasticity, proof stress, true stress and true strain curve
	3 rd	Relationship between True stress vs Engineering Stress
6 TH	1 st	True Strain vs Engineering Strain.
	2 nd	Compression Test: Compressive strength and plastic deformation
	3 rd	Brinell Hardness Test (BHN)
7 TH	1 st	Rockwell Hardness Test (RHN)
	2 nd	Vickers Hardness Test (VHN)
	3 rd	Mohs Hardness Test

8 TH	1 st	Impact Testing: Charpy and Izod tests
	2 nd	Discuss about transition temperature, factors affecting transition temperature, ductility, brittle fracture
	3 rd	Fatigue Testing: Different stress cycles
9 TH	1 st	S-N curves
	2 nd	Endurance limit, procedure of fatigue testing and fatigue testing machine
	3 rd	Mention different metallurgical factors that affect fatigue behavior
10 TH	1 st	Creep Testing: Stages of creep, effect of temperature and stress creep rate, creep rupture strength, engineering creep curve constant stress creep curve and Andrade concept equi-cohesive temperature
	2 nd	State various factors that affect creep, creep testing machine, stress rupture test
	3 rd	Fracture mechanics: Types of fractures Ductile, brittle, fatigue
11 TH	1 st	Crack initiation and modes of Crack Propagation
	2 nd	Case studies of real-world material failures
	3 rd	Visual Inspection: Surface defects, cracks, surface roughness
12 th	1 st	Liquid Penetrant Test (LPT): Surface crack detection
	2 nd	Magnetic Particle Testing (MPT): Detection of surface & subsurface defects
	3 rd	Ultrasonic Testing (UT): Internal defect detection using high-frequency waves
13 th	1 st	Radiographic Testing (RT): X-ray and gamma-ray testing for welds and castings
	2 nd	Eddy Current Testing (ECT): Conductivity & defect detection in metals
	3 rd	Class Test
14 th	1 st	Advanced Material Testing Techniques & Industrial Applications & Case Studies
	2 nd	Nanoindentation

	3 rd	Advanced NDT techniques (phased array ultrasound technique)
15 th	1 st	Quality control and material selection
	2 nd	Class Test
	3 rd	Revision

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