

B. Tech. IVth Semester Mechanical Engineering

LECTURE PLAN

Materials Engineering

ES-204

Month	Class	Topic/Chapter Covered	Academic Activity	Test/Assignment
Jan.	4th Semester	Crystallography: Review of crystal structure	Teaching	
Jan.	4th Semester	Space lattice ,Coordination no.	Teaching	
Jan.	4th Semester	No. of atoms per unit cell	Teaching	Assignment
Jan.	4th Semester	Atomic packing Factor	Teaching	
Jan.	4th Semester		Teaching	
Jan.	4th Semester	Numerical problem related to crystallography	Teaching	
Jan.	4th Semester		Teaching	
Jan.	4th Semester		Teaching	
Jan.	4th Semester	Imperfection in metal crystals: Crystal imperfections and their classification	Teaching	
Jan.	4th Semester	Point defects	Teaching	
Jan.	4th Semester		Teaching	
Jan	4th Semester	line defects	Teaching	
Jan.	4th Semester	Edge and screw dislocations	Teaching	
Jan	4th Semester	Surface defects	Teaching	
Jan	4th Semester	Volume defects	Teaching	
Jan.	4th Semester		Teaching	
Jan	4th Semester	Introduction to Engineering Materials and standard Materials Designation: Steel Terminology and Introduction to Engineering materials	Teaching	
Jan	4th Semester	Standard Designation system for steels	Teaching	

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Jan	4 th Semester	Indian Standard specifications for steels as per BIS: Based on Ultimate Tensile Strength and based on Composition	Teaching	
Jan	4 th Semester	AISI-SAE standard designation for Steels and Aluminum Alloys	Teaching	
feb	4 th Semester	Alloy systems: Alloy Systems, Solid solutions	Teaching	
feb	4 th Semester		Teaching	
feb	4 th Semester		Teaching	
feb	4 th Semester	Hume Rothery's	Teaching	Assignment
feb	4 th Semester	Phase Diagrams, Intermediate phases	Teaching	
feb	4 th Semester	Gibbs Phase Rule, Cooling curves	Teaching	
feb	4 th Semester	The Lever Rule, binary phase diagrams	Teaching	
feb	4 th Semester	Application of phase diagram	Teaching	
feb	4 th Semester		Teaching	
feb	4 th Semester	Micro constituents of Fe-C system And Allotropic forms of iron	Teaching	
feb	4 th Semester		Teaching	
feb	4 th Semester	Iron-iron carbide phase diagram, Modified Iron Carbon Phase Diagrams	Teaching	
feb	4 th Semester		Teaching	
feb	4 th Semester		Teaching	
feb	4 th Semester	TTT Curve	Teaching	
feb	4 th Semester	Heat treatment of steels, Annealising, Normalising,	Teaching	
feb	4 th Semester	Hardening, Tempering	Teaching	
feb	4 th Semester	Case Hardening, Ageing	Teaching	

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feb	4 th Semester	Surface hardening, Mass effect	Teaching	
feb	4 th Semester	Equipments for Heat Treatment, Major Defects in Metals or Alloys due to faulty Heat treatment.	Teaching	
feb	4 th Semester		Teaching	
feb	4 th Semester		Teaching	Assignment
March	4 th Semester	Deformation of Metal: Elastic and Plastic Deformation, Mechanism of Plastic Deformation	Teaching	
March	4 th Semester	Slip; Critical Resolved Shear Stress	Teaching	
March	4 th Semester	Twinning, Conventional and True Stress Strain Curves for Polycrystalline Materials	Teaching	Assignment

March	4 th Semester	Yield Point Phenomena, Bauschinger Effect	Teaching	
March	4 th Semester	directional and progressive solidification, centerline feeding resistance,	Teaching	
March	4 th Semester	Failure of Materials: Introduction to fatigue	Teaching	
March	4 th Semester	Theory about fatigue fracture and some practical examples	Teaching	
March	4 th Semester	Mechanism of Fatigue Failure	Teaching	
March	4 th Semester	Fatigue Life calculations	Teaching	
March	4 th Semester	Fatigue Tests	Teaching	
March	4 th Semester	Theory of fatigue	Teaching	
March	4 th Semester	An over view of the whole unit	Teaching	
March	4 th Semester		Teaching	
March	4 th Semester	Creep: Creep curve	Teaching	
March	4 th Semester	Factors affecting Creep, Mechanism of Creep	Teaching	
	4 th	Creep Resistant Material, Creep	Teaching	

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March	Semester	Fracture and doubts		
March	4 th Semester		Teaching	
March	4 th Semester		Teaching	
March	4 th Semester	Creep Test, Stress Rupture test	Teaching	
April	4 th Semester		Teaching	
April	4 th Semester	Casting defects, their causes and remedies	Teaching	Assignment
April	4 th Semester	Introduction to metallograhy: Metallography, Phase analysis	Teaching	
April	4 th Semester		Teaching	
April	4 th Semester	Dendritic growth, Cracks and other defects	Teaching	Assignment
April	4 th Semester	Corrosion analysis, Intergranular attack (IGA)	Teaching	
April	4 th Semester	Coating thickness and integrity, Inclusion size, shape and distribution	Teaching	
April	4 th Semester	Weld and heat-affected zones (HAZ), Distribution and orientation of composite fillers		
April	4 th Semester	Graphite nodularity, Intergranular fracturing		
April	4 th Semester	Material characterization techniques: Characterization techniques suchas X-Ray Diffraction (XRD)		
April	4 th Semester	Scanning Electron Microscopy, transmission electron microscopy		
April	4 th Semester	atomic force microscopy		Assignment
April	4 th Semester	scanning tunneling microscopy,		
April	4 th Semester	Atomic absorption spectroscopy		
April	4 th Semester	Discussion and Revision till end of the Semester		

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LECTURE PLAN

Fluid Mechanics & Fluid Machines

MEC-201A

Month	Class	Topic/Chapter Covered	Academic Activity	Test/ Assignment
Jan.	4 th Semester	Fluid Properties: Definition of fluid, Newton's law of viscosity.	Teaching	
Jan.	4 th Semester	Units and dimensions-Properties of fluids, mass density, weight density, specific volume, specific gravity.	Teaching	
Jan.	4 th Semester	Viscosity, Compressibility.	Teaching	
Jan.	4 th Semester	Surface tension and Capillarity.	Teaching	
Jan.	4 th Semester	Fluid Kinematics: Types of fluid flows, Stream, Streak and Path lines.	Teaching	
Jan.	4 th Semester	Flow rate and continuity equation.	Teaching	
Feb.	4 th Semester	Differential equation of continuity in cartesian and polar coordinates.	Teaching	
Feb.	4 th Semester	Rotation and Vorticity, Circulation.	Teaching	
Feb.	4 th Semester	Stream and Potential functions, Flow Net. Problems.	Teaching	Assignment
Feb.	4 th Semester	Fluid Dynamics: Concept of system and control volume, Euler's equation.	Teaching	
Feb.	4 th Semester	Navier-Stokes equation.	Teaching	
Feb.	4 th Semester	Bernoulli's equation and its practical applications.	Teaching	
Feb.	4 th Semester	Impulse momentum equation. Problems.	Teaching	
Feb.	4 th Semester	Dimensional Analysis: Need for dimensional analysis – methods of dimension analysis	Teaching	
Feb.	4 th Semester	Dimensionless parameters – application of dimensionless parameters. Problems.	Teaching	Assignment
Feb.	4 th Semester	Hydraulic Pumps: Introduction, theory of Rotodynamic machines.	Teaching	
March	4 th Semester	Classification, various efficiencies.	Teaching	
March	4 th Semester	Velocity components at entry and exit of the rotor, velocity triangles.	Teaching	
March	4 th Semester	Centrifugal pumps, working principle, work done by the impeller.	Teaching	
March	4 th Semester	Minimum starting speed, performance curves, Cavitation in pumps.	Teaching	
March	4 th Semester	Reciprocating pumps, working principle, Indicator diagram.	Teaching	
March	4 th Semester	Effect of friction and acceleration, air vessels, Problems.	Teaching	Assignment
March	4 th Semester	Hydraulic Turbines: Introduction, Classification of water turbines, heads and efficiencies, velocity triangles.	Teaching	

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March	4 th Semester	Axial, radial and mixed flow turbines.	Teaching	
March	4 th Semester	Pelton wheel, working principles, work done.	Teaching	
March	4 th Semester	Francis turbine, working principles, work done.	Teaching	
April	4 th Semester	Kaplan turbines, working principles, work done.	Teaching	
April	4 th Semester	Design of turbines, draft tube and types.	Teaching	
April	4 th Semester	Specific speed, unit quantities.	Teaching	
April	4 th Semester	Performance curves for turbines.	Teaching	
April	4 th Semester	Governing of turbines. Problems.	Teaching	Assignment
April	4 th Semester	Turbulent Flow Through Pipes: Darcy Weisbach equation, friction factor.	Teaching	
April	4 th Semester	Moody's diagram, minor losses in pipes.	Teaching	
April	4 th Semester	Hydraulic gradient and total energy lines.	Teaching	
April	4 th Semester	Series and parallel connection of pipes, branched pipes; equivalent pipe.	Teaching	
April	4 th Semester	Power transmission through pipes. Problems.	Teaching	
April	4 th Semester	Boundary Layer Flow: Concept of boundary layer, measures of boundary layer thickness.	Teaching	
May	4 th Semester	Blasius solution, von-Karman momentum integral equation.	Teaching	
May	4 th Semester	Laminar and turbulent boundary layer flows.	Teaching	
May	4 th Semester	Separation of boundary layer and its control. Problems.	Teaching	Assignment

B. Tech. IVth Semester Mechanical Engineering**LECTURE PLAN****Instrumentation & Control****MEC-208A**

Month	Class	Topic/Chapter Covered	Academic Activity	Test/Assignment
Jan	4 th Sem.	Introduction, typical applications of instrument systems, functional elements of a measurement system.	Teaching	
Jan	4 th Sem.	Classification of instruments, standards and calibration.	Teaching	
Jan	4 th Sem.	Static and dynamic characteristics of measurement systems.	Teaching	
Jan	4 th Sem.	Static and dynamic characteristics of measurement systems.	Teaching	Assignment
Jan	4 th Sem.	Statistical analysis of data and measurement of uncertainty	Teaching	
Jan	4 th Sem.	Statistical analysis of data and measurement of uncertainty	Teaching	
Jan	4 th Sem.	Statistical analysis of data and measurement of uncertainty	Teaching	Assignment
Jan	4 th Sem.	Statistical analysis of data and measurement of uncertainty	Teaching	Assignment
Feb.	4 th Sem.	Introduction and classification,	Teaching	Assignment
Feb.	4 th Sem.	transducer selection and specifications,	Teaching	
Feb.	4 th Sem.	Primary sensing elements, resistance transducers,	Teaching	
Feb.	4 th Sem.	Variable inductance type transducers, capacitive transducers	Teaching	

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Feb.	4 th Sem.	Piezo-electric transducers, strain gauges.	Teaching	
Feb.	4 th Sem.	Smart Sensors: Introduction, architecture of smart sensor, bio sensor and physical sensor.	Teaching	
Feb.	4 th Sem.	Piezo-resistive pressure sensor, microelectronic sensor.	Teaching	
Feb.	4 th Sem.	Force and weight measurement system,	Teaching	Assignment
Feb.	4 th Sem.	Measurement of torque, shaft power	Teaching	
Feb.	4 th Sem.	Speed and velocity: electrical and contactless tachometers.	Teaching	
Feb.	4 th Sem.	Acceleration: vibrometers, seismic and piezo-electric accelerometer.	Teaching	Assignment
Feb.	4 th Sem.	Basic terms, Pressure: Liquid column manometers	Teaching	
Feb.	4 th Sem.	Elastic type pressure gauges, electrical types for pressure and vacuum.	Teaching	
March	4 th Sem.	14. Temperature measuring instruments: RTD sensors, NTC thermistor, thermocouples	Teaching	Assignment
March	4 th Sem.	Semiconductor based sensors.	Teaching	
March	4 th Sem.	Flow Measurement: drag force flow meter, turbine flow meter, electronic flow meter, electromagnetic flow meter, hot-wire anemometer.	Teaching	
March	4 th Sem.	Flow Measurement: drag force flow meter, turbine flow meter,	Teaching	Assignment

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		electronic flow meter, electromagnetic flow meter, hot-wire anemometer.		
March	4 th Sem.	Humidity definitions, Humidity measuring devices.	Teaching	
March	4 th Sem.	Density and Specific Gravity, Basic terms	Teaching	
March	4 th Sem.	Density measuring devices, Density application considerations, Viscosity.	Teaching	Assignment
March	4 th Sem.	Viscosity measuring instruments.	Teaching	
March	4 th Sem.	16. Basic terms used in pH, pH measuring devices, pH application considerations. Problems.	Teaching	
April	4 th Sem.	Introduction, basic components of control system.	Teaching	
April	4 th Sem.	Classification : closed loop and open loop control system, transfer function, block diagram representation of closed loop system	Teaching	Assignment
April	4 th Sem.	Reduction techniques, mathematical modelling of various mechanical systems and their analogy with electrical systems, signal flow graph and its representation.	Teaching	
April	4 th Sem.	Mathematical modelling of various mechanical systems and their analogy with	Teaching	

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		electrical systems, signal flow graph and its representation.		
April	4 th Sem.	Mathematical modelling of various mechanical systems and their analogy with electrical systems, signal flow graph and its representation.	Teaching	Assignment
April	4 th Sem.		Teaching	
April	4 th Sem.	Basics of actuators pneumatic controller, hydraulic controller and their comparison	Teaching	
May	4 th Sem.	Actuators pneumatic controller	Teaching	
May	4 th Sem.	Hydraulic controller and their comparison	Teaching	