

Govt. Polytechnic, Jagatsinghpur	
Lesson Plan	
Session: 2026-27	
Branch	Mechanical
Semester	3rd
Subject	Fluid Mechanics and Fluid Power
Name of the faculty member	Samir Ranjan Behera

Course Outcome (CO)

The students will be able to

CO No.	CO	
1	Identify the properties of a fluid and hydrostatics.	
2	Explain the basic kinematics and dynamics of fluid mechanics.	
3	Describe the flow through orifices, notches and pipes.	
4	Classify different types of turbines and pumps.	
5	Apply the knowledge of fluid power.	
Week	Class of the Week	Topic to be covered
1st	1st	Properties of Fluid & Hydrostatics Definition of a fluid, classification of fluids, and introduction to basic fluid concepts.
	2nd	Fluid properties: density, specific weight, and specific gravity with definitions, units, and examples.
	3rd	Viscosity and surface tension, their physical meaning, units, and engineering applications.
2nd	1st	Fluid pressure and pressure variation in a static fluid; simple numerical examples.
	2nd	Total pressure (hydrostatic force) on vertical and horizontal submerged surfaces and centre of pressure.
	3rd	Hydrostatic force and centre of pressure on inclined and curved surfaces.
3rd	1st	Pressure measuring devices and working principle of simple, differential, and inverted manometers.
	2nd	Principle of buoyancy and flotation with practical examples.
	3rd	Simple numerical problems on manometers and overall revision of the unit.
4th	1st	Kinematics and Dynamics of Fluid Mechanics Various types of fluid flow, circulation and vorticity, and basic concepts of fluid motion.
	2nd	Streamline, path line, and streak line with diagrams and practical significance.
	3rd	Various forms of energy of a fluid and law of conservation of mass (continuity equation).
5th	1st	Bernoulli's theorem, energy equation, assumptions, limitations, and engineering applications.
	2nd	Working principle of venturimeter and pitot tube with derivation of discharge and velocity equations.
	3rd	Working of current meter, simple numerical problems on Bernoulli's equation, venturimeter, and pitot tube, and unit revision.
6th	1st	Flow Through Orifices, Notches and Pipes Definition of orifice, classification of orifices, and introduction to orifice coefficients.
	2nd	Coefficients of orifice: coefficient of contraction (C_c), velocity (C_v), discharge (C_d), and relationship between them.
	3rd	Definition of weir and notch and discharge over rectangular notch and rectangular weir.
7th	1st	Discharge over triangular (V-notch) notch with simple numerical problems.
	2nd	Definition of a pipe, types of pipes, and laws of fluid friction.
	3rd	Loss of head due to friction in pipes, Darcy's formula and Chezy's formula with applications.
8th	1st	Hydraulic Gradient Line (HGL) and Total Energy Line (TEL) with neat sketches and explanation.
	2nd	Nozzle: definition, working, applications, and power transmission through a nozzle.
	3rd	Condition for maximum power transmission through a nozzle, expression for nozzle diameter, and simple numerical problems with unit revision.
9th	1st	Turbines and Pumps Introduction and classification of hydraulic turbines; selection of turbines based on head and discharge.
	2nd	Construction and working principle of Pelton wheel turbine with neat sketches.
	3rd	Construction and working principle of Francis turbine with applications.
10th	1st	Construction and working principle of Kaplan turbine and comparison with other turbines.
	2nd	Draft tube: purpose, types, construction, and role in improving turbine efficiency.
	3rd	Concept of cavitation in turbines; work done, power, and efficiency of turbines with simple numericals.
11th	1st	Introduction to centrifugal pumps, principle of working, and applications.
	2nd	Types of casings and impellers; concept of multistage centrifugal pumps.
	3rd	Priming of centrifugal pump and its methods; manometric head.

12th	1st	Work done, manometric efficiency, overall efficiency of centrifugal pumps with simple numericals.
	2nd	Reciprocating pumps: construction, working of single and double acting pumps, and applications.
	3rd	Concept of slip, negative slip, cavitation and separation in reciprocating pumps; simple numericals and revision.
13th	1st	Fluid Power Definition of fluid power, classification into hydraulic and pneumatic power, and applications.
	2nd	Basic principle of enclosed hydraulic system and Pascal's law with practical examples.
	3rd	Oil hydraulic system components: reservoir, filters, pipes, and fittings.
14th	1st	Hydraulic valves: pressure limiting valves, direction control valves, and flow control valves.
	2nd	Hydraulic actuators: linear and rotary actuators and their applications.
	3rd	Hydraulic accumulators: purpose, types, and advantages in hydraulic systems.
15th	1st	Positive displacement pumps: gear pump, vane pump, and piston pump.
	2nd	Drawing of hydraulic circuits for extension and retraction of linear actuator and motion of rotary actuator.
	3rd	Hydraulic circuits for holding a job and hydraulic press, and overall revision.



Govt. Polytechnic, Jagatsinghpur
Lesson Plan
Session- 2026 -27

Branch	Mechanical
Semester	3rd
Subject	Material Science and Engineering
Name of the faculty member	Samir Ranjan Behera

Course Outcome (CO)

The students will be able to

The students will be able to		
CO No.	CO	
1	Explain about crystal structures and atomic bonds	
2	Describe about classification of ferrous metals and their properties.	
3	Explain about non-ferrous metals, cutting tool materials and composites along with their properties.	
4	Describe about the various metallic failures and knowledge in testing of materials.	
5	Explain the principle of corrosion, their types, its prevention methods along with the various surface engineering processes.	
Week	Class of the Week	Topic to be covered
1st	1st	Crystal structures and Bonds: Introduction to Crystal Structure, Crystalline and Amorphous Solids, Space Lattice and Unit Cell
	2nd	Crystal Systems: Lattice Parameters and Seven Basic Crystal Systems
	3rd	Metallic Crystal Structures: BCC, FCC and HCP Structures
2nd	1st	Number of Atoms per Unit Cell in Simple Cubic, BCC and FCC Structures
	2nd	Coordination Number of Simple Cubic, BCC and FCC Structures
	3rd	Atomic Radius: Definition and Relation with Lattice Parameter for SC, BCC and FCC
3rd	1st	Atomic Packing Factor (APF) of SC and BCC Structures
	2nd	Atomic Packing Factor (APF) of FCC and HCP Structures; Simple Numerical Problems
	3rd	Bonds in Solids: Classification of Primary (Chemical) and Secondary (Molecular) Bonds
4th	1st	Primary Bonds (Ionic, Covalent and Metallic Bonds) and Secondary Bonds (Dispersion, Dipole and Hydrogen Bonds)
	2nd	Unit-II: Phase diagrams, Ferrous metals and its Alloys: Phase Diagrams: Introduction, Definitions and Importance; Isomorphous System
	3rd	Eutectic and Eutectoid Systems with Typical Phase Diagrams
5th	1st	Iron-Carbon Binary Equilibrium Diagram: Construction and Important Points
	2nd	Iron-Carbon Binary Diagram: Phase Transformations and Microstructures
	3rd	Iron Ores, Pig Iron: Classification, Composition and Effects of Impurities
6th	1st	Flow Sheet for Production of Iron and Steel; Iron and Carbon Steels
	2nd	Cast Iron: Classification, Composition, Properties and Uses
	3rd	Wrought Iron: Properties, Uses; Comparison of Cast Iron, Wrought Iron, Mild Steel and High Carbon Steel
7th	1st	Standard Commercial Grades of Steel as per BIS and AISI; Alloy Steels—Purpose of Alloying, Effects of Alloying Elements, Silicon Steel, HSS, Heat Resisting Steel, Spring Steel, Stainless Steel (Types and Applications) and Magnet Steel (Composition, Properties and Uses)
	2nd	Non-ferrous metals and its Alloys: Properties and Uses of Non-Ferrous Metals: Aluminium, Copper, Tin and Lead
	3rd	Properties and Uses of Non-Ferrous Metals: Zinc, Magnesium and Nickel
8th	1st	Copper Alloys: Brasses – Composition, Properties and Uses
	2nd	Copper Alloys: Bronzes – Composition, Properties and Uses
	3rd	Aluminium Alloys: Duralumin and Hindalium – Composition, Properties and Uses
9th	1st	Aluminium Alloys: Magnesium – Composition, Properties and Uses
	2nd	Nickel Alloys: Inconel, Monel and Nichrome – Composition, Properties and Uses
	3rd	Anti-Friction/Bearing Alloys: Various Types of Bearing Bronzes and Their Applications
10th	1st	Standard Commercial Grades of Non-Ferrous Metals and Alloys as per BIS/ASME
	2nd	Failure analysis & Testing of Materials: Introduction to Failure Analysis; Types of Engineering Failures; Ductile and Brittle Fracture
	3rd	Cleavage Fracture, Notch Sensitivity and Factors Affecting Fracture Behaviour
11th	1st	Fatigue Failure: Mechanism, Endurance Limit and Characteristics of Fatigue Fracture
	2nd	Variables Affecting Fatigue Life and Introduction to Creep
	3rd	Creep Curve, Stages of Creep and Creep Fracture

12th	1st	Destructive Testing: Tensile Test and Compression Test
	2nd	Destructive Testing: Hardness Testing (Brinell and Rockwell), Bend Test and Torsion Test
	3rd	Destructive Testing: Fatigue Test and Creep Test
13th	1st	Non-Destructive Testing (NDT): Visual Inspection, Magnetic Particle Inspection, Liquid Penetrant Test, Ultrasonic Inspection and Radiographic Inspection
	2nd	Corrosion & Surface Engineering: Introduction to Corrosion: Nature of Corrosion, Causes of Corrosion, Electrochemical Reactions and Electrolytes
	3rd	Factors Affecting Corrosion: Environmental Factors, Material Properties and Physical Conditions
14th	1st	Types of Corrosion and Their Mechanisms
	2nd	Corrosion Control: Material Selection, Environmental Control and Design Considerations
	3rd	Surface Engineering Processes: Coatings, Surface Treatments, Cleaning and Mechanical Finishing of Surfaces
15th	1st	Organic Coatings, Electroplating, Special Metallic Plating, Electropolishing and Photo-Etching
	2nd	Conversion Coatings (Oxide, Phosphate and Chromate Coatings) and Thin Film Coatings (PVD and CVD)
	3rd	Surface Analysis, Hard-Facing, Thermal Spraying, High-Energy Processes, Process/Material Selection and Pollution Norms for Treating Effluents as per Standards



Branch	Mechanical
Semester	5th
Subject	Industrial Engineering and Management
Name of the faculty member	Samir Ranjan Behera

Course Outcome (CO)

The students will be able to

CO No.	CO	
1	Explain the different types of lay out and plant maintenance with safety.	
2	List and explain the need for method study and work measurements.	
3	Describe production planning and quality control, and its functions.	
4	Define the principles of personnel management and organizational behavior.	
5	List and explain the different financial and material management.	
Week	Class of the Week	Topic to be covered
1st	1st	Plant Engineering: Plant Engineering Basics; Plant concept; Selection of site of industry
	2nd	Plant Layout Fundamentals; Principles of good layout; Types of layout (Process, Product, Fixed position)
	3rd	Techniques to improve layout; Principles of material handling equipment
2nd	1st	Plant Maintenance; Importance; Breakdown maintenance; Preventive maintenance; Scheduled maintenance
	2nd	Plant Safety: Plant Safety Basics; Importance; Accident causes; Cost of accident; Accident proneness
	3rd	Accident prevention; Industrial disputes; Causes of industrial disputes
3rd	1st	Settlement of industrial disputes; Collective bargaining; Conciliation; Mediation; Arbitration
	2nd	Factories Act 1948; Provisions related to health, welfare and safety; Revision
	3rd	Work Study: Productivity; Standard of living; Method of improving productivity; Objectives; Importance of good working conditions
4th	1st	Method Study: Definition; Objectives; Selection of job for method study; Basic procedure of method study; Tools used
	2nd	Operation Process Chart; Flow Process Chart; Two Handed Process Chart; Man Machine Chart
	3rd	String Diagram; Flow Diagram; Applications of process charts
5th	1st	Work Measurement: Definition; Basic procedure of time study; Employee rating factor
	2nd	Time allowances: Rest, Personal, Process, Special and Policy allowances; Calculation of standard time
	3rd	Numerical problems on standard time; Basic concept of production study
6th	1st	Techniques of Work Measurement; Ratio delay study; Synthesis from standard data
	2nd	Analytical estimating; Predetermined Motion Time System (PMTS)
	3rd	Revision of Work Study, Method Study, and Work Measurement; Problem solving practice
7th	1st	Production Planning and Control: Introduction; Major functions of PPC; Preplanning; Methods of forecasting
	2nd	Routing and Scheduling; Dispatching and Controlling; Concept of Critical Path Method (CPM)
	3rd	Types of Production: Mass Production, Batch Production, Job Order Production; Characteristics
8th	1st	Economic Batch Quantity (EBQ); Principles of Product and Process Planning; Make or Buy decision
	2nd	Numerical problems on EBQ and Make or Buy decision
	3rd	Quality Control: Definition; Objectives; Types of inspection: First piece, Floor, Centralized inspection
9th	1st	Statistical Quality Control; Types of measurements; Method of variables; Method of attributes
	2nd	Control charts: X, R, p and c charts; Uses and interpretation
	3rd	Operating Characteristics (O.C) curve; Sampling inspection; Single and Double sampling plan
	1st	ISO 9001:2008 Quality Management System: Concept; Registration/certification procedure; Benefits of ISO
	2nd	Revision: Numerical problems and overall PPC & Quality Control concepts

10th	3rd	Principles of Management: Definition of Management; Administration; Organization; F.W. Taylor's and Henry Fayol's Principles of Management; Functions of Manager
11th	1st	Types of Organization: Line, Staff, Taylor's Pure Functional type; Line and Staff and Committee type
	2nd	Directing; Leadership; Styles of Leadership; Qualities of a good leader; Motivation; Positive and Negative Motivation
	3rd	Modern Management Techniques: Just in Time (JIT); Total Quality Management (TQM); Quality Circle; Zero Defect Concept; 5S Concept; Management Information Systems (MIS)
12th	1st	Personnel Management: Responsibility of Human Resource Management; Selection Procedure; Training of Workers; Apprentice Training
	2nd	On-the-Job Training; Vestibule School Training; Job Evaluation and Merit Rating; Objectives and Importance
	3rd	Wages and Salary Administration; Components of wages; Wage fixation
13th	1st	Types of Wage Payment: Halsey's 50% Plan; Rowan's Plan; Emerson's Efficiency Plan
	2nd	Numerical Problems on wage incentive plans; Revision of Principles of Management and Personnel Management
	3rd	Financial Management: Fixed and Working Capital; Sources of Capital; Shares (Preference and Equity); Debentures and Types; Public Deposits
14th	1st	Factory Costing: Direct Cost; Indirect Cost; Factory Overhead; Selling Price; Profit; Numerical Problems
	2nd	Depreciation: Causes; Straight Line Method; Sinking Fund Method; Percentage on Diminishing Value Method; Numerical Problems
	3rd	Material Management: Objectives of good stock control system; ABC Analysis of Inventory
15th	1st	Procurement and Consumption Cycle; Minimum Stock; Lead Time; Reorder Level
	2nd	Economic Order Quantity (EOQ) Problems; Supply Chain Management Concepts
	3rd	Revision: Financial Management and Material Management; Numerical Problems Practice