Govt. Polytechnic, Jagatsinghpur		
Lesson Plan		
Session-2026-27/01.07.2026-05.11.2026		
Branch	**Mechanical Engineering**	
Semester	**3rd**	
Subject	**TH:1- MANUFACTURING PROCESSES**	
Name of the faculty	**Litu Behera (Lecturer Stage-I)**	
Course Outcomes (Cos)		
COs	**Statement:After the completion of the course, the student shall be able to**	
CO-1	Study various types of basic production processes. To select, operate and control the appropriate processe	
CO-2	Define the concept of gear making and list various gear materials.	
CO-3	Describe the importance of press tools and various die operations.	
CO-4	Explain grinding and finishing processes.	
Week	**Class of the Week**	**Topic to be covered**
1st	1st	Cutting Fluids & Lubricants: Introduction; Types of cutting fluids
	2nd	Fluids and coolants required in turning, drilling, shaping, sawing & broaching
	3rd	Selection of cutting fluids, methods of application of cutting fluid
2nd	1st	Classification of lubricants (solid, liquid, gaseous), Properties and applications of lubricants
	2nd	Lathe Operations: Types of lathes – light duty, medium duty and heavy duty geared lathe
	3rd	, CNC lathe; Specifications; Basic parts and their functions
3rd	1st	Operations and tools – Turning, parting off, Knurling
	2nd	facing, Boring, drilling, threading
	3rd	step turning, taper turning
4th	1st	Nomenclature of single point cutting tool of lathe
	2nd	Broaching Machines: Introduction to broaching; Types of broaching machines – Horizontal type (Single ram & duplex ram)
	3rd	Vertical type, pull up, pull down, and push down
5th	1st	Elements of broach tool; broach teeth details; Nomenclature
	2nd	Tool materials. Drilling: Classification
	3rd	Basic parts and their functions
6th	1st	Radial drilling machine
	2nd	Types of operations
	3rd	Specifications of drilling machine
7th	1st	Types of drills and reamers
	2nd	Welding: Classification; Gas welding techniques
	3rd	Types of welding flames; Arc Welding – Principle, Equipment, Applications
8th	1st	Shielded metal arc welding; Submerged arc welding; TIG / MIG welding
	2nd	Resistance welding - Spot welding, Seam welding, Projection welding; Welding defects

	3rd	Brazing and soldering: Types, Principles, Applications
9th	1st	Milling: Introduction; Types of milling machines: plain, Universal, vertical
	2nd	constructional details – specifications
	3rd	Milling operations: simple, compound and differential indexing
10th	1th	Milling cutters – types; Nomenclature of teeth; Teeth materials; Tool signature of milling cutter; Tool & work holding devices
	2nd	Gear Making: Manufacture of gears – by Casting, Moulding, Stamping, Coining Extruding, Rolling, Machining
	3rd	Gear generating methods: Gear Shaping with pinion cutter & rack cutter; Gear hobbing
11th	1st	Description of gear hob; Operation of gear hobbing machine; Gear finishing processes
	2nd	Gear materials and specification; Heat treatment processes applied to gears
	3rd	Press working: Types of presses and Specifications
12th	1st	Press working operations - Cutting, bending, Drawing, punching
	2nd	blanking, notching, lancing
	3rd	Die set components- punch and die shoe, guide pin, bolster plate, stripper, stock guide, feed stock, pilot
13th	1st	Punch and die clearances for blanking and piercing, effect of clearance.
	2nd	Grinding and finishing processes: Principles of metal removal by Grinding; Abrasives – Natural & Artificial
	3rd	Bonds and binding processes: Vitrified, silicate, shellac, rubber, Bakelite; Factors affecting the selection of grind wheels
14th	1st	size and shape of wheel, kind of abrasive, grain size, grade and strength of bond, structure of grain, spacing, kinds of bind material
	2nd	Standard marking systems: Meaning of letters & numbers sequence of marking, Grades of letters; Grinding machines classification-: Cylindrical, Surface, Tool & Cutter grinding machines
	3rd	Construction details; Principle of centerless grinding; Advantages & limitations of centerless grinding; Finishing by grinding: Honing, Lapping, Super finishing
15th	1st	Electroplating: Basic principles, Plating metals, applications; Hot dipping: Galvanizing, Tin coating, Parkerizing, Anodizing
	2nd	Metal spraying: wire process, powder process and applications
	3rd	Organic coatings: Oil base Paint, Lacquer base, Enamels, Bituminous paints, rubber base coating; Finishing specifications

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Branch	**Mechanical Engineering**	
Semester	**3rd**	
Subject	**TH:2- STRENGTH OF MATERIALS**	
Name of the faculty	**Litu Behera (Lecturer Stage-I)**	
Course Outcomes (Cos)		
COs	**Statement: After the completion of the course, the student shall be able to**	
CO-1	Apply the concept of Simple Stresses and Strains	
CO-2	Describe the concept of Strain Energy.	
CO-3	Define the concept of Shear Force and Bending Moment Diagrams.	
CO-4	Apply the concept of Theory of Simple Bending and Deflection of Beams.	
Week	**Class of the Week**	**Topic to be covered**
1st	1st	Simple Stresses and Strains: Types of forces; Stress, Strain and their nature
	2nd	Mechanical properties of common engineering materials
	3rd	Significance of various points on stress – strain diagram for M.S. and C.I. specimens; Significance of factor of safety
2nd	1st	Relation between elastic constants
	2nd	Stress and strain values in bodies of uniform section and of composite section under the influence of normal forces
	3rd	Thermal stresses in bodies of uniform section and composite sections; Related numerical problems on the above topics
3rd	1st	Strain Energy: Strain energy or resilience, proof resilience and modulus of resilience
	2nd	Derivation of strain energy for the following cases: i) Gradually applied load
	3rd	ii) Suddenly applied load, iii) Impact/ shock load
4th	1st	Related numerical problems
	2nd	Shear Force & Bending Moment Diagrams: Types of beams with examples: a) Cantilever beam, b) Simply supported beam
	3rd	c) Over hanging beam, d) Continuous beam, e) Fixed beam
5th	1st	Types of Loads – Point load, UDL and UVL; Definition and explanation of shear force and bending moment
	2nd	Calculation of shear force and bending moment and drawing the S.F and B.M. diagrams by the analytical method only for the following cases: a) Cantilever with point loads, b) Cantilever with uniformly distributed load
	3rd	c) Simply supported beam with point loads, d) Simply supported beam with UDL
6th	1st	e) Over hanging beam with point loads, at the center and at free ends
	2nd	f) Over hanging beam with UDL throughout
	3rd	g) Combination of point and UDL for the above

7th	1st	Related numerical problems
	2nd	Theory of Simple Bending and Deflection of Beams
	3rd	Explanation of terms: Neutral layer, Neutral Axis, Modulus of Section, Moment of Resistance, Bending stress, Radius of curvature
8th	1st	Assumptions in theory of simple bending; Bending Equation $M/I = \sigma/Y = E/R$ with derivation;
	2nd	Problems involving calculations of bending stress, modulus of section and moment of resistance
	3rd	Calculation of safe loads and safe span and dimensions of cross- section;
9th	1st	Definition and explanation of deflection as applied to beams
	2nd	Deflection formulae without proof for cantilever beams with point load and UDL only (Standard cases only);
	3rd	Deflection formulae without proof for simply supported beams with point load and UDL only (Standard cases only)
10th	1th	Related numerical problems
	2nd	Definition of Torsion in Shafts
	3rd	Definition and function of shaft; Calculation of polar M.I. for solid shafts
11th	1st	Calculation of polar M.I. for hollow shafts
	2nd	Assumptions in simple torsion; Derivation of the equation $T/J=fs/R=G\theta/L$
	3rd	Problems on design of shaft based on strength and rigidity
12th	1st	Numerical Problems related to comparison of strength and weight of solid and hollow shafts
	2nd	Classification of springs, Nomenclature of closed coil helical spring
	3rd	Deflection formula for closed coil helical spring (without derivation),stiffness of spring
13th	1st	Numerical problems on closed coil helical spring to find safe load, deflection, size of coil and number of coils
	2nd	Thin Cylindrical Shells
	3rd	Explanation of longitudinal in the light of longitudinal failure of shell
14th	1st	Explanation of longitudinal in the light of circumferential failure of shell
	2nd	Explanation of hoop stresses in the light of circumferential failure of shell
	3rd	Explanation of hoop stresses in the light of longitudinal failure of shell
15th	1st	Derivation of expressions for the longitudinal and hoop stress for seamless and seam shells
	2nd	Related numerical Problems for safe thickness
	3rd	Related numerical Problems for safe working pressure

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Session-2026-27/01.07.2026-05.11.2026		
Branch	**Mechanical Engineering**	
Semester	**5th**	
Subject	**TH:2- DESIGN OF MACHINE ELEMENTS**	
Name of the faculty	**Litu Behera (Lecturer Stage-I)**	
Course Outcomes (Cos)		
COs	**Statement: After the completion of the course, the student shall be able to**	
CO-1	Use design data books and relevant design codes effectively in component design.	
CO-2	Analyze various modes of failure of machine components under different loading conditions.	
CO-3	Design and prepare detailed part and assembly drawings of mechanical components.	
CO-4	Create component and assembly drawings using CAD software.	
Week	**Class of the Week**	**Topic to be covered**
1st	1st	Introduction to Design: Machine Design philosophy and Procedures
	2nd	General Considerations in Machine Design; Fundamentals: Types of loads, concepts of stress, Strain
	3rd	Types of Stresses; Bearing pressure Intensity; Crushing; Bending and Torsion; Principal Stresses
2nd	1st	Stress – Strain Diagram for Ductile and Brittle Materials
	2nd	Simple Numericals
	3rd	Creep strain and Creep Curve; Fatigue; S-N curve
3rd	1st	Endurance Limit; Factor of Safety, Stress Concentration
	2nd	Properties of Engineering materials; Designation of materials as per IS
	3rd	introduction to International standards & advantages of standardization
4th	1st	Use of design data book
	2nd	Use of standards in design and preferred numbers series Theories of Elastic Failures
	3rd	Principal normal stress theory; Maximum shear stress theory & Maximum distortion energy theory
5th	1st	Design of simple machine parts: Cotter Joint; Knuckle Joint
	2nd	Turnbuckle; Design of Levers: Hand/Foot Lever & Bell Crank Lever
	3rd	Design of C–Clamp; Off-set links; Overhang Crank; Arm of Pulley
6th	1st	Antifriction Bearings: Classification of Bearings; Sliding contact & Rolling contact
	2nd	Terminology of Ball bearings Life Load relationship
	3rd	Basic static load rating
7th	1st	Basic dynamic load rating
	2nd	Selection of ball bearings using manufacturer's catalogue
	3rd	Types of Shafts; Shaft materials; Standard Sizes
	1st	Design of Shafts (Hollow and Solid) using strength and rigidity criteria

8th	2nd	ASME code of design for line shafts supported between bearings with one or two pulleys in between or one overhung pulley
	3rd	Design of Sunk Keys; Effect of Key-ways on strength of shaft
9th	1st	Design of Couplings – Muff Coupling, Protected type Flange Coupling, Bush-pin type flexible coupling
	2nd	Spur gear design considerations
	3rd	Lewis equation for static beam strength of spur gear teeth
10th	1th	Power transmission capacity of spur gears in bending
	2nd	Thread Profiles used for power Screws - Relative merits and demerits of each
	3rd	Torque required to overcome thread friction
11th	1st	Self-locking and overhauling property
	2nd	Efficiency of power screws; Types of stresses induced
	3rd	Design of Screw Jack; Toggle Jack
12th	1st	Classification and Applications of Springs; Spring terminology
	2nd	Materials and Specifications; Stresses in springs; Wahl's correction factor; Deflection of springs
	3rd	Energy stored in springs; Design of Helical, Tension and Compression springs subjected to uniform applied loads like I.C. engine valves, Weighing balance
13th	1st	Railway buffers and Governor springs
	2nd	Leaf springs: Construction and Application
	3rd	Stresses in Screwed fasteners; Bolts of Uniform Strength
14th	1st	Design of Bolted Joints subjected to eccentric loading
	2nd	Design of Parallel and Transverse fillet welds; Axially loaded symmetrical section
	3rd	Merits and demerits of screwed and welded joints
15th	1st	Ergonomics of Design: Man–Machine relationship; Design of Equipment for control
	2nd	Environment & safety
	3rd	Aesthetic considerations regarding shape, size, color & surface finish.