ACADEMIC LESSION PLAN OF WINTER 2025

Discipline: MECHANICAL	**Semester:5th**	**Name of the Teaching Faculty:** **Sabitarani Sahoo** **(Sr. Lecturer)**
Subject **Mechatronics**	**No. of days/perweek class allotted: 4**	**Semester From Date: 14/07/2025 To date:15-11-2025** **No of weeks: 15**
Week	**Class Day**	**Theory Topics:**
1st	1st	**1.0 INTRODUCTION TO MECHATRONICS:** Definition of Mechatronics
	2nd	Advantages & disadvantages of Mechatronics, Application of Mechatronics
	3rd	Scope of Mechatronics in Industrial Sector
	4th	Components of a Mechatronics System
2nd	1st	Importance of mechatronics in automation
	2nd	**2.0 SENSORS & TRANSDUCERS** Definition of Transducers
	3rd	Classification of Transducers
	4th	Classification of Transducers
3rd	1st	Classification of Transducers
	2nd	Electromechanical Transducers
	3rd	Electromechanical Transducers
	4th	Transducers Actuating Mechanisms
4th	1st	Displacement &Positions Sensors.
	2nd	Velocity, motion, force and pressure sensors. Temperature and light sensors.
	3rd	CLASS TEST - 1
	4th	**3.0 ACTUATORS-MECHANICAL,ELECTRICAL** Introduction to Mechanical Actuators
5th	1st	Machine, Kinematic Link.
	2nd	Kinematic Pair
	3rd	Mechanism, Slider crank Mechanism
	4th	Gear Drive, Spur gear, Bevel gear, Helical gear, worm gear

6th	1st	Belt & Belt drive
	2nd	Bearings
	3rd	Introduction to electrical Actuator
	4th	Switches and relay , Solenoid , D.C Motors,A.C motor & stepper motor
7th	1st	Specification and control of stepper motors Servo Motors D.C & A.C.
	2nd	**4.0 PROGRAMMABLE LOGIC CONTROLLERS (PLC)** Introduction to PLC
	3rd	Advantages of PLC
	4th	Selection and uses of PLC.
8th	1st	Selection and uses of PLC.
	2nd	Architecture basic internal structures.
	3rd	Architecture basic internal structures.
	4th	Input/output Processing and Programming.
9th	1st	Input/output Processing and Programming.
	2nd	CLASS TEST - 2
	3rd	Input/output Processing and Programming.
	4th	Mnemonics .
10th	1st	Mnemonics .
	2nd	Master and Jump Controllers
	3rd	Master and Jump Controllers
	4th	Master and Jump Controllers

11th	1st	**5.0 ELEMENTS OF CNC MACHINES** Introduction to Numerical Control of machines and CAD/CAM
	2nd	NC machines.
	3rd	CNC machines
	4th	CAD
12th	1st	CAM.
	2nd	Software and hardware for CAD/CAM
	3rd	Software and hardware for CAD/CAM
	4th	Functioning of CAD/CAM system
13th	1st	Features and characteristics of CAD/CAM system
	2nd	Application areas for CAD/CAM
	3rd	Elements of CNC machines, Machine Structure
	4th	Guideways/Slide ways. Introduction and Types of Guideways,
14th	1st	Factors of design of guideways
	2nd	Spindle drives, Feed drive
	3rd	Spindle and Spindle Bearings
	4th	**6.0 ROBOTICS** Definition, Function and laws of robotics
15th	1st	Definition, Function and laws of robotics
	2nd	Types of industrial robots.
	3rd	Robotic systems
	4th	Advantages and Disadvantages of robots & Discussion of PYQ

Sabitarani Sahoo.
Signature of the Teaching Faculty

Academic Lesson Plan of STRENGTH OF MATERIALS (WINTER-2025)

Discipline: MECHANICAL ENGINEERING	Semester: 3RD	Name of the teaching faculty: Er. Sabitarani Sahoo
Subject: STRENGTH OF MATERIALS	No. of days/per week Class Allotted: 3	Semester from: 14/07/2025-15/11/2025
		No. of weeks:15th

week	Class /week	Theory Topics
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;
3rd	1st	Related numerical problems on the above topics.
	2nd	Strain Energy: Strain energy or resilience proof resilience and modulus of resilience;
	3rd	Derivation of strain energy for the following cases: i) Gradually applied load, ii) Suddenly applied load, iii) Impact/ shock load;
4th	1st	Related numerical problems on the above topics
	2nd	. Shear Force & Bending Moment Diagrams: Types of beams with examples: a) Cantilever beam, b) Simply supported beam, c) Over hanging beam, d) Continuous beam, e) Fixed beam; Types of Loads – Point load, UDL and UVL;
	3rd	Definition and explanation of shear force and bending moment;
5th	1st	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
	2nd	b) Cantilever with uniformly distributed load related numerical
	3rd	c) Simply supported beam with point loads related numerical
6th	1st	d) Simply supported beam with UDL, related numerical
	2nd	e) Over hanging beam with point loads, at the center and at free ends, related numerical
	3rd	f) Over hanging beam with UDL throughout,related numerical
7th	1st	g) Combination of point and UDL related numerical
	2nd	Theory of Simple Bending and Deflection of Beams: Explanation of terms: Neutral layer, Neutral Axis, Modulus of Section, Moment of Resistance
	3rd	Bending stress, Radius of curvature; Assumptions in theory of simple bending;
08th	1st	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
09th	1st	Definition and explanation of deflection as applied to beams;
	2nd	Related numerical problems.
	3rd	Deflection formulae without proof for cantilever and simply supported beams with point load and UDL only (Standard cases only);
10th	1st	Related numerical problems
	2nd	Torsion in Shafts and Springs: Definition and function of shaft; Calculation of polar M.I. for solid and hollow shafts;
	3rd	Assumptions in simple torsion; Derivation of the equation $T/J=fs/R=G\theta/L$;
11th	1st	Problems on design of shaft based on strength and rigidity;
	2nd	Problems on design of shaft based on strength and rigidity

		3rd	Numerical Problems related to comparison of strength and weight of solid and hollow shafts
12th		**1st**	Classification of springs; Nomenclature of closed coil helical spring;
		2nd	Deflection formula for closed coil helical spring (without derivation); stiffness of spring;
		3rd	Numerical problems on closed coil helical spring to find safe load, deflection, size of coil and number of coils
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: Explanation of longitudinal and hoop stresses in the light of circumferential
		3rd	Explanation longitudinal failure of shell;
14th		**1st**	Explanation longitudinal failure of shell;
		2nd	Derivation of expressions for the longitudinal and hoop stress for seamless and seam shells;
		3rd	Derivation of expressions for the longitudinal and hoop stress for seamless and seam shells;
15TH		**1st**	Related numerical Problems for safe thickness and safe working pressure
		2nd	Related numerical Problems for safe thickness and safe working pressure
		3rd	Related numerical Problems for safe thickness and safe working pressure

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Discipline: MECHANICAL	Semester:5th	Name of the Teaching Faculty Sabita rani sahoo Sr. lecturer Mechanical
Subject: DESIGN OF MACHINE ELEMENTS	No. of days/perweek class allotted: 4	Semester From Date: 01/07/2024 To date:08/11/24 No of weeks: 15
Week	**Class Day**	**Theory Topics:**
1st	1st	**Chapter – 1 Introduction** Introduction to Machine Design and Classify it.
	2nd	Different mechanical engineering materials used in design.
	3rd	Their mechanical and physical properties.
	4th	Define working stress, yield stress
2nd	1st	Define ultimate stress & factor of safety. stress –strain curve for M.S & C.I.
	2nd	Modes of Failure (By elastic deflection, general yielding & fracture)
	3rd	State the factors governing the design of machine elements.
	4th	Describe design procedure.
3rd	1st	**Chapter – 2 Design of fastening elements** Joints and their classification.
	2nd	State types of welded joints .
	3rd	State advantages of welded joints over other joints.
	4th	State advantages of welded joints over other joints.
4th	1st	Design of welded joints for eccentric loads.
	2nd	Design of welded joints for eccentric loads.
	3rd	State types of riveted joints and types of rivets.
	4th	State types of riveted joints and types of rivets.
5th	1st	Describe failure of riveted joints.
	2nd	Describe failure of riveted joints.
	3rd	Determine strength
	4th	Efficiency of riveted joints.

6th	1st	Design riveted joints for pressure vessel.
	2nd	Design riveted joints for pressure vessel.
	3rd	Solve numerical on Welded Joint
	4th	Solve numerical on Riveted Joints.
7th	1st	**Chapter – 3 Design of shafts and keys** State function of shafts.
	2nd	State materials for shafts.
	3rd	Design solid & hollow shafts to transmit a given power at given rpm based .
	4th	Strength: (i) Shear stress, (ii) Combined bending tension; Rigidity: (i) Angle of twist, (ii) Deflection, (iii) Modulus of rigidity
8th	1st	State standard size of shaft as per I.S.
	2nd	State function of keys, types of keys & material of keys.
	3rd	Describe failure of key, effect of key way.
	4th	Design rectangular sunk key considering its failure against shear & crushing.
9th	1st	Design rectangular sunk key by using empirical relation for given diameter of shaft.
	2nd	State specification of parallel key, gib-head key, taper key as per I.S.
	3rd	Solve numerical on Design of Shaft
	4th	Solve numerical on Design of Key
10th	1st	**Chapter – 4 Design of coupling** Design of Shaft coupling
	2nd	Design of Shaft coupling
	3rd	Requirements of a good shaft coupling
	4th	Requirements of a good shaft coupling

11th	1st	Types of Coupling.
	2nd	Types of Coupling.
	3rd	Design of Sleeve or Muff-Coupling.
	4th	Design of Sleeve or Muff-Coupling.
12th	1st	Design of Clamp or Compression Coupling.
	2nd	Design of Clamp or Compression Coupling.
	3rd	Solve numerical on above
	4th	Class test-1
13th	1st	**Chapter – 5 Design a closed coil helical spring** Materials used for helical spring.
	2nd	Standard size spring wire. (SWG).
	3rd	Terms used in compression spring.
	4th	Stress in helical spring of a circular wire.
14th	1st	Deflection of helical spring of circular wire.
	2nd	Surge in spring.
	3rd	Solve numerical on design of closed coil helical compression spring.
	4th	Solve numerical on design of closed coil helical compression spring.
15th	1st	Solve numerical on design of closed coil helical compression spring.
	2nd	Solve numerical on design of closed coil helical compression spring.
	3rd	Solve numerical on design of closed coil helical compression spring.
	4th	Class test-2

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