LESSON PLAN: TH-1 – METROLOGY AND MEASUREMENT (MEPC301)

Academic Session: 2026 - ~~27~~

Department	Mechanical Engineering	**Name of the Teaching Faculty**	SATYANARAYAN TRIPATHY	**Semester**	5TH
No. of Week	15	**Total Classes**	45	**No. of Days/Week Class Allotted**	3
Subject (TH1)	METROLOGY AND MEASUREMENT	**Course Code**	MEPC301	**Theory Hours**	45
Academic Period	13-07-2026 to 05-11-2026	**Class Pattern**	Monday, Thursday & Friday – 1 period each	**Credit**	3

WEEK	DAYS / WEEK	CLASS / DATE	THEORY TOPICS / ASSESSMENT
Week 1	3		
		1st	[Unit I] Introduction to measurements: definition of measurement; significance of measurement.
		2nd	[Unit I] MAKE-UP CLASS: Methods of measurements: direct and indirect measurement; generalized measuring system.
		3rd	[Unit I] Standards of measurement: primary and secondary; factors influencing selection of measuring instruments.
Week 2	3		
		4th	[Unit I] Terms applicable to measuring instruments: precision and accuracy; sensitivity and repeatability.
		5th	[Unit I] Range, threshold, hysteresis and calibration; errors in measurements.
		6th	[Unit I] Classification of errors: systematic and random errors.
Week 3	3		
		7th	[Unit I] Measuring instruments: introduction; thread measurements and thread gauge micrometer.
		8th	[Unit I] Angle measurements: bevel protractor; sine bar; gauges—plain plug gauge, ring gauge, snap gauge and limit gauge.
		9th	[Unit I] Comparators: characteristics and types; surface finish—definition and terminology.
Week 4	3		
		10th	[Unit I] Taylor's surface roughness tester; co-ordinate measuring machine (CMM); Unit-I revision.
		11th	[Unit II] Transducers: introduction, characteristics and classification.
		12th	[Unit II] Two-coil self-inductance transducer; piezoelectric transducer.
Week 5	3		
		13th	[Unit II] Strain measurement: strain gauge; classification and mounting of strain gauges.
		14th	[Unit II] Strain gauge rosettes: two-element and three-element arrangements.
		15th	[Unit II] Measurement of force, torque and pressure: introduction.
Week 6	3		
		16th	[Unit II] Force measurement: spring balance, proving ring and load cell.
		17th	[Unit II] Torque measurement: Prony brake.
		18th	[Unit II] MAKE-UP CLASS: Torque measurement: eddy-current and hydraulic dynamometer.
Week 7	3		
		19th	[Unit II] Pressure measurement: McLeod gauge; applications and comparison.
		20th	[Unit II] Unit-II revision and numerical/application-based questions.
		21st	[Unit III] Applied mechanical measurements: speed measurement; classification of tachometers.
Week 8	3		
		22nd	[Unit III] Revolution counters; eddy-current tachometers.
		23rd	[Unit III] Displacement measurement: linear variable differential transformer (LVDT).
		24th	[Unit III] MAKE-UP CLASS: Flow measurement: rotameters and turbine meter.
Week 9	3		
		25th	[Unit III] Temperature measurement: resistance thermometers.
		26th	[Unit III] Temperature measurement: optical pyrometer.
		27th	[Unit III] Miscellaneous measurements: humidity measurement; hair hygrometer.
Week 10	3		
		28th	[Unit III] Density measurement: hydrometer; liquid-level measurement—sight glass and float gauge; biomedical measurement—sphygmomanometer.
		29th	[Unit IV] Limits, fits and tolerances: concept of limits, fits and tolerances; selective assembly.
		30th	[Unit IV] Interchangeability; hole and shaft basis system; Taylor's principle.
Week 11	3		

		31st	[Unit IV] Design of plug, ring and snap gauges; IS 9199/IS 3477 concepts and inspection.
		32nd	[Unit IV] Angular measurement: concept; instruments for angular measurements.
		33rd	[Unit IV] Universal bevel protractor; sine bar; spirit level; clinometers.
Week 12	3		
		34th	[Unit IV] Angle gauges: numerical setting and applications.
		35th	[Unit IV] Screw thread measurements: ISO grade and fits of thread; errors in thread pitch.
		36th	[Unit IV] Measurement of thread elements: major diameter, minor diameter and effective diameter.
Week 13	3		
		37th	[Unit IV] Pitch measurement; thread gauge micrometer; working principle of floating carriage dial micrometer.
		38th	[Unit IV] Unit-IV revision and problem-solving/application questions.
		39th	[Unit V] MAKE-UP CLASS: Gear measurement and testing: analytical and functional inspection; rolling test.
Week 14	3		
		40th	[Unit V] Measurement of tooth thickness: constant chord method.
		41st	[Unit V] Gear tooth vernier; errors in gears such as backlash, runout and composite errors.
		42nd	[Unit V] Machine tool testing: straightness and squareness; coaxiality.
Week 15	3		
		43rd	[Unit V] Machine tool testing: roundness and runout; alignment testing of machine tools.
		44th	[Unit V] Alignment testing of machine tools as per IS standard procedure; Unit-V revision.
		45th	[Unit V] Gear measurement: selection of suitable gear-measuring instruments; review of analytical and functional inspection.

SIGNATURE OF FACULTY
SATYANARAYAN TRIPATHY

Department: Mechanical Engineering		Name of the Teaching Faculty: DEBASHISH BISI	
No of Week: 15 (1st July to 5th November 2026)	No of Days/Week Class Allotted	Semester : 5th	Subject (Th-2): DESIGN OF MACHINE ELEMENTS
WEEK		CLASS	THEORY TOPICS
Week 1	3	1st	**UNIT.1** Introduction to Design: Machine Design philosophy and Procedures
		2nd	General Considerations in Machine Design
		3rd	Fundamentals: Types of loads, concepts of stress, Strain,
Week 2	3	4th	Stress – Strain Diagram for Ductile and Brittle Materials,
		5th	Types of Stresses; Bearing pressure Intensity; Crushing; Bending and Torsion Principal Stresses; Simple Numericals;
		6th	Creep strain and Creep Curve;
Week 3	3	7th	Fatigue; S-N curve; Endurance Limit; Factor of Safety, Stress Concentration
		8th	Properties of Engineering materials; Designation of materials as per IS and introduction to International standards & advantages of standardization;
		9th	Use of design data book; Use of standards in design and preferred numbers series
Week 4	3	10th	Theories of Elastic Failures; Principal normal stress theory; Maximum shear stress theory & Maximum distortion energy theory.
		11th	**UNIT.2** Design of simple machine parts: Cotter Joint
		12th	Knuckle Joint;
Week 5	3	13th	Turnbuckle;
		14th	Design of Levers: Hand/Foot Lever &
		15th	Bell Crank Lever;
Week 6	3	16th	Design of C–Clamp;
		17th	Off-set links;
		18th	Overhang Crank;
Week 7	3	19th	Arm of Pulley.
		20th	Antifriction Bearings: Classification of Bearings; Sliding contact & Rolling contact;
		21st	Terminology of Ball bearings: Life Load relationship, Basic static load rating and Basic dynamic load rating, limiting speed;
Week 8	3	22nd	Selection of ball bearings using manufacturer's catalogue.
		23rd	**CH.3.** Design of Shafts, Keys, Couplings and Spur Gears:
		24th	Types of Shafts; Shaft materials; Standard Sizes;
Week 9	3	25th	Design of Shafts (Hollow and Solid) using strength and rigidity criteria;
		26th	ASME code of design for line shafts supported between bearings with one or two pulleys in between or one overhung pulley;
		27th	Design of Sunk Keys;
Week10	3	28th	Effect of Key-ways on strength of shaft
		29th	Design of Couplings – Muff Coupling, Protected type Flange Coupling, Bush-pin type flexible coupling;
		30th	Spur gear design considerations; Lewis equation for static beam strength of spur gear teeth; Power transmission capacity of spur gears in bending

Week11	3	31st	**Ch iv.** Design of Power Screws:
		32nd	Thread Profiles used for power Screws - Relative merits and demerits of each;
		33rd	Torque required to overcome thread friction; Self-locking and overhauling property;
Week12	3	34th	Efficiency of power screws; Types of stresses induced;
		35th	Design of Screw Jack;
		36th	Toggle Jack.
Week13	3	37th	Design of springs: Classification and Applications of Springs;
		38th	Spring terminology; Materials and Specifications; Stresses in springs; Wahl's correction factor;
		39th	Deflection of springs; Energy stored in springs;
Week14	3	40th	Design of Helical, Tension and Compression springs subjected to uniform applied loads like I.C. engine valves, Weighing balance, Railway buffers and Governor springs;
		41st	Design of Helical, Tension and Compression springs subjected to uniform applied loads like I.C. engine valves, Weighing balance, Railway buffers and Governor springs;
		42nd	Leaf springs: Construction and Application.
Week15	3	43rd	**Unit-V:** Design of Fasteners: Stresses in Screwed fasteners; Bolts of Uniform Strength; Design of Bolted Joints subjected to eccentric loading;
		44th	Design of Parallel and Transverse fillet welds; Axially loaded symmetrical section; Merits and demerits of screwed and welded joints.
		45th	Ergonomics & Aesthetic consideration in design: Ergonomics of Design: Man–Machine relationship; Design of Equipment for control, environment & safety; Aesthetic considerations regarding shape, size, color & surface finish.
Total class =		45	

23/06/26

Debashish Bisi
Senior Lecturer (Mech.)
ICPES, Berhampur

LESSON PLAN OF MECHANICAL ENGINEERING DEPARTMENT WINTER 2026

Discipline: Mechanical		Semester: 5TH	Name of Faculty: Sushri Priyanka Panigrahi	
Subject: TH:3(B)-Production and Operation		No of Days per week class allotted	Semester From: 1st July 2026 to 5th November 2026	
Week	Class No	Class days	Chapter	Theory Topic
1st	1	1st	II	Production Forecasting: Introduction of production forecasting,
	2	2nd		The strategic role of forecasting in supply chain
	3	3rd		Time frame, Demand behavior.
2nd	4	4th		Forecasting methods- Qualitative Methods
	5	5th		Forecasting methods- Quantitative Methods
	6	6th		Forecast accuracy
3rd	7	7th		**Scheduling:** Introduction, Objectives in scheduling, Loading, Sequencing, Monitoring,
	8	8th		Advanced Planning and Scheduling Systems, Theory of Constraints, Employee scheduling.
	9	9th	III	**Break-Even Analysis:** Introduction, Break-even analysis charts,
4th	10	10th		Break-even analysis for process, plant and equipment selection.
	11	11th		Aggregate Operations Planning: Aggregate production planning,
	12	12th		Adjusting capacity to meet the demand,
5th	13	13th		Demand management
	14	14th		Hierarchical and collaborative planning
	15	15th		Hierarchical and collaborative planning
6th	16	16th		Aggregate planning for services
	17	17th	IV	Assembly Line Balancing: Assembly lines,
	18	18th		Assembly line balancing,
7th	19	19th		Splitting tasks
	20	20th		Flexible line layouts
	21	21st		U-shaped line layouts
8th	22	22nd		Mixed model line balancing,
	23	23rd		Current thoughts on assembly lines,
	24	24th		Computerized assembly line balancing.
9th	25	25th	V	**Material Management:** Introduction
	26	26th		Importance and objectives,
	27	27th		Purchasing and Stores: policies
10th	28	28th		Purchasing and Stores: policies
	29	29th		Purchasing and Stores: procedures,
	30	30th		Vendor development, selection
11th	31	31st		analysis and rating
	32	32nd		**Process Planning and Process Engineering:** Process Planning: Introduction, Function
	33	33rd		Factors affecting process planning,

12th	34	34th		Make or buy decision,
	35	35th		plant capacity and machine capacity
	36	36th		Process Engineering: Preliminary Part Print Analysis: Introduction, Establishing the General Characteristics of work piece,
13th	37	37th		determining the principal Process, Functional surfaces of the work piece,
	38	38th	I	Nature of the work to be Performed, Finishing and identifying operations.
	39	39th		Dimensional Analysis: Introduction, types of dimensions, measuring the Geometry of form
14th	40	40th		Baselines, Direction of specific dimensions
	41	41st		Tolerance Analysis: Causes of work piece variation
	42	42nd		Terms used in work piece dimensions, Tolerance stacks
15th	43	43rd		Work piece Control: Introduction, Equilibrium Theories, Concept of location Control
	44	44th		Geometric control, Dimensional control, Mechanical control.
	45	45th		revision

Panigrahi
23/08/26

Sushri Priyanka Panigrahi
Sr. Lect, Mechanical

LESSON PLAN FOR ADVANCE MANUFACTURING PROCESS FOR AY -2026-2027 UNDER 5TH SEMESTER (3RD YEAR)

Discipline: **MECHANICAL ENGG.**	Semester:**5th**	Name of the Teaching Faculty : **SRI PRIYABRATA PANDA**
Subject: **ADVANCE MANUFACTURING PROCESS MEPE303(B)**	No. of Days/per week, class allotted:3P/ W	Semester From Date:**01.07.2026** To Date:**05.11.2026** No. of Weeks:15 Weeks
Week	**ClassDay**	**Theory /Topics**
1ST	1st	**Introduction:** Unconventional machining Process – Need – classification – Brief overview
	2nd	**Additive Manufacturing Process:** Introduction, Need for Additive Manufacturing
	3rd	Fundamentals of Additive, Manufacturing, AM Process Chain
2ND	1st	Advantages and Limitations of AM
	2nd	**Reviews , question answering, discussion of questions from semester point of view**
	3rd	**Mechanical Energy Based Processes:** **Abrasive Jet Machining (AJM):** Working Principles – equipment used –Process parameters – MRR- Applications.
3RD	1st	**Abrasive Jet Machining (AJM):** Working Principles – equipment used –Process parameters – MRR- Applications
	2nd	**Water Jet Machining (WJM)**Working Principles – equipment used –Process parameters – MRR- Applications
	3rd	**Water Jet Machining (WJM):**Working Principles – equipment used –Process parameters – MRR- Applications
4TH	1st	**Abrasive Water Jet Machining (AWJM):** Working Principles – equipment used –Process parameters – MRR- Applications
	2nd	**Abrasive Water Jet Machining (AWJM):** Working Principles – equipment used –Process parameters – MRR- Applications
	3rd	**Ultrasonic Machining (USM):** Working Principles – equipment used –Process parameters – MRR- Applications
5TH	1st	**Ultrasonic Machining (USM):** Working Principles – equipment used –Process parameters – MRR- Applications
	2nd	**Electrical Energy Based Processes:** **Electric Discharge Machining (EDM)**:working Principle – equipment – Process Parameters
	3rd	**Electric Discharge Machining (EDM)**:working Principle – equipment – Process Parameters
6TH	1st	**Electric Discharge Machining (EDM)**:Surface Finish and MRR- electrode / Tool
	2nd	**Electric Discharge Machining (EDM)**: Surface Finish and MRR-

		electrode / Tool
	3rd	**Electric Discharge Machining (EDM)**: Power and control Circuits– Tool Wear – Dielectric – Flushing
7TH	1st	**Electric Discharge Machining (EDM)**: Power and control Circuits – Tool Wear – Dielectric – Flushing
	2nd	**Electric Discharge Machining (EDM)**: Wire cut EDM – Applications.
	3rd	**Electric Discharge Machining (EDM)**: Wire cut EDM – Applications.
8TH	1st 3rd	**Chemical and Electro-Chemical Energy Based Processes: Chemical machining:** working Principle – equipment – Process Parameters
7TH	2nd 1st	**Chemical and Electro-Chemical Energy Based Processes: Chemical machining:** working Principle – equipment – Process Parameters
	3rd	**Chemical and Electro-Chemical Energy Based Processes: Electro chemical machining:** working Principle – equipment – Process Parameters
9TH	1st	**Chemical and Electro-Chemical Energy Based Processes: Electro chemical machining:** working Principle – equipment – Process Parameters
	2nd	**Chemical and Electro-Chemical Energy Based Processes: Electro chemical machining:** working Principle – equipment – Process Parameters
	3rd	**Chemical and Electro-Chemical Energy Based Processes: Electro chemical machining:** working Principle – equipment – Process Parameters
10TH	1st	**Reviews , question answering, discussion of questions from semester point of view**
	2nd	**Thermal Energy Based Processes:** **Laser Beam machining and drilling (LBM):** Principles – Equipment –Types - Beam control techniques –Applications
	3rd	**Laser Beam machining and drilling (LBM):** Principles – Equipment –Types - Beam control techniques –Applications
11TH	1st	**plasma Arc machining (PAM):** Principles – Equipment –Types - Beam control techniques –Applications
	2nd	**plasma Arc machining (PAM):** Principles – Equipment –Types - Beam control techniques –Applications
	3rd	**Electron Beam Machining (EBM):** Principles – Equipment – Types - Beam control techniques –Applications
12TH	1st	**Electron Beam Machining (EBM):** Principles – Equipment – Types - Beam control techniques –Applications

	2nd	**Introduction to manufacturing;** Fundamental properties of **metals**
	3rd	Fundamental properties of **polymers**
13TH	1st	Fundamental properties of **polymers**
	2nd	Fundamental properties of **ceramics**
	3rd	Fundamental properties of **composites**
14TH	1st	Fundamental properties of **composites**
	2nd	**Reviews , question answering, discussion of questions from semester point of view, previous year question discussion**
	3rd	**Reviews , question answering, discussion of questions from semester point of view, previous year question discussion**
15TH	1st	**Reviews , question answering, discussion of questions from semester point of view, previous year question discussion**
	2nd	**Reviews , question answering, discussion of questions from semester point of view, previous year question discussion**
	3rd	**Reviews , question answering, discussion of questions from semester point of view, previous year question discussion**

PRIYABRATA PANDA

Priyabrata Panda

LECTURER ST.II

MECHANICAL ENG. DEPT.