25MESE208: GEOMETRIC DIMENSIONING & TOLERANCING

w. e. f. Academic Year:	**2025-26**
Semester:	**3**
Category of the Course:	Professional Core Course (PCC)
Prerequisite:	Engineering Drawing/Graphics
Rationale:	The rationale behind a Geometric Dimensioning and Tolerancing (GD&T) training syllabus is to move beyond traditional coordinate ("plus-minus") dimensioning to a, standardized, symbolic language that clearly defines the **functional intent**, **form**, **fit**, and **location** of parts. The syllabus is structured to reduce manufacturing costs, improve part interchangeability, and standardize inspection methods.

Course Outcomes:

After Completion of the Course, Student will able to:

	Course Outcome (CO)	RBT Level (Cognitive Domain)
CO1	Understand and interpret engineering drawings, dimensioning practices, limits, fits, tolerances, and GD&T symbols as per ASME standards considering sustainability through efficient design and optimal resource utilization.	Understand
CO2	Analyze and decode Feature Control Frames (FCF), datum reference frames (DRF), and applies MMC, LMC, and RFS concepts in engineering drawings.	Analyze
CO3	Apply measurement and inspection techniques to evaluate form, orientation, and run-out tolerances using precision instruments, ensuring sustainability through efficient resource utilization and reduction of material wastage.	Apply
CO4	Perform tolerance analysis including true position calculation, profile tolerance, and tolerance stack-up in assemblies, considering sustainability, optimized material usage, and improved product lifecycle performance	Analyze
CO5	Develop CAD models incorporating GD&T and Model-Based Definition (MBD) as per ASME standards for real-world engineering applications emphasizing sustainable design, reduced resource consumption, and lifecycle efficiency.	Analyze

Teaching and Evaluation Scheme:

Teaching Scheme					Examination Scheme				
L	T	P	C	Hrs/Week	IE	Theory	CIA	Practical	Total Marks
0	0	2	1	2	0	0	30	20	50

IE: Internal Evaluation Theory: Theory Exam (End Semester)

CIA: Continuous Internal Assessment Practical: Practical Exam (End Semester)

List of Practical:

Topic	Hrs
Introduction to machine drafting standards, drawing sheet setup, line types, scales, title block and BIS/ISO conventions. Standard symol thread, bolt, rivet & weld)	2
Sketch book practice of fasteners and weld symbol	2
Preparation of orthographic views of simple machine components	2
Drafting of sectional views (full section, half section, offset section) of machine elements	4
2D CAD drafting using basic drawing and modification commands (line, circle, trim, offset, fillet, mirror, hatch)	4
Sketch book practice of Preparation of shaft-hole assembly drawing with limits, fits, and tolerances	2
Sketch book practice of Application of surface roughness symbols, machining symbols, and welding symbols in machine drawings.	2
Sketch book practice Introduction to GD&T symbols, feature control frame, and datum selection	2
Application of **Form Tolerances** (straightness, flatness, circularity, cylindricity) and **Orientation Tolerances** (parallelism, perpendicularity, angularity) on drawing	2
Application of **Location Tolerances** (position, concentricity/symmetry) using datum reference system	2
Application of **Runout Tolerances** (circular and total runout) on rotating components	2
Detail drawing of machine elements such as flange coupling, bearing block, knuckle joint, or machine vice component with Identification of 14 major GD&T symbols and decoding Feature Control Frames on industrial drawings. ASME Y14.5-2018. Practice Project	4
	30

Suggested Specification table with Marks (Practical):

Distribution of Practical Marks in Percentage					
Remember	Understand	Apply	Analyze	Evaluate	Create
12	25	28	20	7	8

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the practical examination may vary slightly from above table.

Reference Books:

1. James DMeadows, “Geometric Dimensioning andTolerancing”, Marcel Dekker,Inc
2. James DMeadows, “Measurement ofGeometricTolerances in Manufacturing”MarcelDekker,Inc
3. PSGill, “Geometric Dimensioningand Tolerancing”, SK Kataria&sons, 2005-6
4. Dr.K.L.Narayana, "Machine Drawing" (Third Edition), New Age International Publisher

Teaching Learning Method

- Interactive Laboratory session
- Hands on practical with measurement & CAD tool
- Mini project as per ASME Y14.41 standard

Course Outcomes Mapping:

CO No.	Course Outcome (CO)	POs/ PSOs Mapped	Cognitive Level (RBT)	Knowledge Category	Laboratory Sessions
CO1	Understand and interpret engineering drawings, dimensioning practices, limits, fits, tolerances, and GD&T symbols as per ASME standards considering sustainability through efficient design and optimal resource utilization.	PO1, PO2, PO3, PO9, PSO1, PSO2	Understand	Conceptual Procedural	6
CO2	Analyze and decode Feature Control Frames (FCF), datum reference frames (DRF), and applies MMC, LMC, and RFS concepts in engineering drawings.	PO1, PO2, PO3, PO9, PSO1, PSO2	Analyze	Conceptual Procedural	7
CO3	Apply measurement and inspection techniques to evaluate form, orientation, and run-out tolerances using precision instruments, ensuring sustainability through efficient resource utilization and reduction of material wastage.	PO1, PO2, PO4, PO5, PO9, PSO1, PSO2	Apply	Conceptual Procedural	5
CO4	Perform tolerance analysis including true position calculation, profile tolerance, and tolerance stack-up in assemblies, considering sustainability, optimized material usage, and improved product lifecycle performance	PO1, PO2, PO3, PO4, PO5, PO9, PSO1, PSO2	Analyze	Conceptual Procedural	6
CO5	Develop CAD models incorporating GD&T and Model-Based Definition (MBD) as per ASME standards for real-world engineering applications emphasizing sustainable design, reduced resource consumption, and lifecycle efficiency.	PO1, PO2, PO3, PO4, PO5, PO8, PO9, PO10, PO11 PSO1, PSO2,	Analyze	Procedural	6

Mapping of COs with POs & PSOs:

CO	PO											PSO	
	1	2	3	4	5	6	7	8	9	10	11	1	2
CO1	3	3	3	-	-	-	-	-	3	-	-	3	3
CO2	3	3	3	-	-	-	-	-	3	-	-	3	3
CO3	3	3	-	3	3	-	-	-	3	-	-	3	3
CO4	3	3	3	3	3	-	-	-	3	-	-	3	3
CO5	3	3	3	3	3	-	-	1	3	1	1	3	3

3: High, 2: Medium, 1: Low

Sustainable Development Goals (SDG) Integration

This course integrates sustainability by promoting precise measurement, efficient material utilization, and quality control practices that reduce waste and improve product lifecycle, aligning with SDG 4, SDG 9, and SDG 12.

SDG Mapping with Course Outcomes

CO	Course Outcome	Relevant SDGs	Justification
CO1	Understand and interpret engineering drawings, dimensioning practices, limits, fits, tolerances, and GD&T symbols as per ASME standards.	SDG 4	Develops fundamental knowledge and standard engineering practices
CO2	Analyze and decode Feature Control Frames (FCF), datum reference frames (DRF), and applies MMC, LMC, and RFS concepts in engineering drawings.	SDG 9	Enhances precision and innovation in engineering design and manufacturing
CO3	Apply measurement and inspection techniques to evaluate form, orientation, and run-out tolerances using precision instruments, ensuring sustainability through efficient resource utilization and reduction of material wastage.	SDG 9, SDG 12	Promotes quality control, minimizes defects, and supports resource efficiency
CO4	Perform tolerance analysis including true position calculation, profile tolerance, and tolerance stack-up in assemblies, considering sustainability, optimized material usage, and improved product lifecycle performance	SDG 12	Optimizes material usage and improves product lifecycle sustainability
CO5	Develop CAD models incorporating GD&T and Model-Based Definition (MBD) as per ASME standards for real-world engineering applications.	SDG 9, SDG 11	Supports advanced digital design and sustainable industrial development