GANPAT UNIVERSITY

FACULTY OF DIPLOMA ENGINEERING

Programme	Diploma in Mechanical/Mechatronics Engineering		
Semester	II	Version	1.0.0.0
Effective from Academic Year	2025-26	Effective for the batch Admitted in	JULY 2025
Course code	1ES2106	Course Name	Mechanical Drawing

I.TEACHING-LEARNING AND ASSESSMENT SCHEME

Course Type	Course Code	Learning Scheme						Assessment Scheme										
		Actual Contact Hrs./Week			SLH	NLH	Credits	Theory				Practical				Based on SL		Total Marks
		CL	TL	LL				FA-TH	SA-TH	TOTAL		FA-PR	SA-PR	TOTAL		SLA		
								MAX	MAX	MAX	MIN	MAX	MAX	MAX	MIN	MAX	MIN	
SEC	1ES2106	2	-	6	2	10	5	40	60	100	40	60	40	100	50	20	8	220

Abbreviation:	**CL-** Classroom Learning	**TL -** Tutorial Learning	**LL -** Laboratory Learning
	SLH - Self Learning Hours	**NLH** - Notional Learning Hours	**SLA -** Self Learning Assessment
	FA - Formative Assessment (Term work +Mid Sem Exam +Attendance)		**SA -** Summative Assessment

II. PRE-REQUISITES

Basic knowledge of Engineering Drawing.

III. INDUSTRY / EMPLOYER EXPECTED OUTCOMES

Industry and employers expect mechanical drafters to possess strong technical drawing skills, proficiency in CAD software, and a thorough understanding of drafting standards and geometric dimensioning and tolerancing. They should also be able to interpret and create various types of mechanical drawings, including orthographic projections, sectional views, and assembly drawings.

IV. COURSE LEARNING OUTCOMES

At the end of the course, students will be able to achieve the following course learning outcomes:

CO1. Interpret Projection and sectional views of different solids.
CO2. Develop the surface requirement of a given application.
CO3. Draw intersectional views and development of an object.
CO4. Interpret multi views drawings & sectional views.
CO5. Prepare and interpret detail and assembly drawing.
CO6. Draw & interpret weld joints, piping layout & Fasteners.

V. THEORY LEARNING OUTCOMES AND ALIGNED COURSE CONTENT:

Name of Unit	Theory Learning outcomes (TLO's) aligned to CO's	Learning Content mapped with Theory Learning outcomes (TLO's) & CO's	Marks	Hours
Unit-1 Projections of Solids	**TLO 1.1** To know about the history of mechanical drafting. **TLO 1.2** Explain Draw projection of given regular solids. **TLO 1.3** Draw projection of regular solids according to their orientation with planes.	**1.1** Explain the history of mechanical drafting. **1.2** Types and dimensional specifications of solids (Prism, Pyramid, Cylinder, Cone). Projections of solids – in various positions with respect to the reference planes. (Parallel, Perpendicular and Inclined to H.P. and / or V.P.)	**10**	**06**
Unit-2 Sections of Solids	**TLO 2.1** Draw Sectional views of different solids.	**2.1** Sectional views of different solids in given various positions.	**6**	**03**

	TLO 2.2 Draw sectioning and hatching conventions. **TLO 2.3** Interpret the given drawing.	**2.2** To construct section lines and cutting plane **2.3** To construct the True shape of Section.		
Unit-3 **Development of Surfaces**	**TLO 3.1** Draw development of the given solid. **TLO 3.2** Identify parts development of the given surfaces is required.	**3.1** Importance of development of surfaces. . **3.2** Drawing of development of surfaces of Prism, Pyramid, Cylinder and Cone – independent, sectioned and combination.	**8**	**04**
Unit-4 **Intersection of Solids**	**TLO 4.1** Importance and Field Use of Solid Intersections **TLO 4.2** Draw Intersection of various Curves.	**4.1** Importance and field use. **4.2** Intersection curve for Intersection / penetration of Prism into Prism, Cylinder into Cylinder, Prism into Cylinder, Cylinder into Prism, and Cone into Cylinder.	**6**	**03**
Unit-5 **Multi views Representation & Sectional Orthographic**	**TLO 5.1** First & Third Angle Projection Methods and Positions of Six Views **TLO 5.2** Missing View Drawings from Given Adequate Orthographic Views **TLO 5.3** Types of Sections and Sectional View Drawings from Isometric Views	**5.1** First & Third angle projection methods and positions of six views. Multi view drawings (all six views) from a given isometric drawing / physical object. **5.2** Missing view drawings from given adequate orthographic views. **5.3** Need of sections. Section lines and cutting planes. Rules for sectioning and section lines. Types of sections- full, half, revolved, removed, partial, off-set, aligned. Sectional view drawings from given isometrics drawing / physical object and cutting plane conditions.	**10**	**05**
Unit-6 **Detail & Assembly**	**TLO 6.1** To know about the Difference between Detail and Assembly Drawings. **TLO 6.2** To Preparing Detail Drawings from Given Assembly Drawing **TLO 6.3** To Preparing Assembly Drawing from Given Details.	**6.1** Importance and difference of these drawings. **6.2** Detail drawing from a given assembly. **6.3** Assembly drawings from given details. Preparing bill of material (Part List).	**10**	**04**
Unit-7 **Welded Joints, Piping Joints & Fasteners**	**TLO 7.1** To know about different types of Weld Symbols. **TLO 7.2** Draw Pipe Fittings Symbols, and Line Diagrams. **TLO 7.3** Draw Sketches of Detachable and Permanent	**7.1** Weld symbols as per BIS-813/ASME (Primary Symbols & Supplementary Symbols), Weld nomenclature and weld dimensions. **7.2** Pipe - types, standards and designation methods. Pipe line symbol as per passing fluid, air, gas,	**5**	**03**

	Fasteners (Threads, Bolts, Nuts, Rivets, Keys, etc.)	water etc. Piping fitting symbols. Pipe line diagram. **7.3** Detachable & Permanent fasteners. Sketches of Threads (Square, Acme, Knuckle, Internal - External threads, Single & Multi start threads). Sketches of Studs (Cap screws, Machine screws, Set screws). Sketches of Bolts & Nut (Hexagonal, Square). Sketches of Rivets (Snap, Pan, Countersunk, Conical), Sketches of keys.		
Unit-8 **Drafting Symbols**	**TLO 8.1** Draw Machining Symbols and Their Interpretation. **TLO 8.2** Draw Geometrical Symbols and Tolerancing. **TLO 8.3** Draw other Drafting Symbols like Threading, Dowels, Ribs, Heat Treatment, Assembly Notes, etc.	**8.1** Machining symbol and its interpretation. Geometrical symbols and its interpretation. **8.2** Other drafting symbols like threading, dowels, pins, ribs, bearings, etc. **8.3** Notes in drawing like heat treatment conditions, surface conditions, assembly notes, etc. (All symbols as per BIS).	**5**	**02**

VI. LABORATORY LEARNING OUTCOME AND ALIGNED PRACTICAL			
Sr. No.	**Practical/Laboratory Learning Outcome (LLO)**	**Practical Titles**	**Relevant COs**
1	**LLO 1.1** To construct orthographic projections of various solid geometries (prisms, pyramids, cylinders, cones, etc.	Draw Projections of Solids problems.	CO1
2	**LLO 2.1** Identify cutting planes and draw true shapes of sections of solids.	Draw Sections of Solids problems.	CO2
3	**LLO 3.1** Develop surface patterns of geometric solids (prisms, cylinders, cones, etc.) for sheet metal fabrication.	Draw Development of Surfaces problems.	CO3
4	**LLO 4.1** Construct the curves of intersection between two or more intersecting solids.	Draw Intersection of Solids problems.	CO3
5	**LLO 5.1** Create accurate multi view orthographic projections (front, top, side views). **LLO 5.2** Generate sectional views to reveal interior details of components.	Draw Multi views and Sectional orthographic problems.	CO4
6	**LLO 6.1** Interpret part drawings and generate detailed views with dimensions and annotations.	Draw Detail and Assembly Problems.	CO5
7	**LLO 7.1** Identify and represent standard welding and piping joints	Draw Welded Joints, Piping Joints, and Fasteners & Drafting Symbols.	CO6

	using symbols. **LLO 7.2** Draw label fasteners.		

VII. SUGGESTED MICRO PROJECT / ASSIGNMENTS / ACTIVITIES FOR SELF LEARNING / SKILL DEVELOPMENT (SELF LEARNING)

- Projection of solids. One problem for each type of solids.
- Section view of solids. One problem for each type of solids.
- Development of lateral surfaces of solids. One problem for each type of solids.
- Intersection of solids surfaces. One problem for each type of solids.
- Multi views and Sectional Orthographic projections. Minimum 4 problems.
- Multiple parts Details and assembly drawing. Minimum 4 problems.

Mini projects

- Each student will assess at least one sheet of other students (May be a group of students identified by teacher can be taken) and will note down the mistakes committed by them. Students will also guide the students for correcting the mistakes, if any.
- Each student should explain at least one problem for construction and method of drawing in a sheet. The teacher will assign the problem of a particular sheet to be explained to each student.

VIII. LIST OF INSTRUMENTS / EQUIPMENT / TRAINER BOARD

1	Drawing Table with Drawing Board of Full Imperial/ A1 size.
2	Drawing equipment and instruments for class room teaching-large size: T-square or drafter (Drafting Machine). Set squares (45º and 30º-60º) Protractor. Drawing instrument box (containing set of compasses and dividers). Drawing sheets, pencils, Eraser, Drawing pins/clips.
3	Set of various industrial drawings being used by industries.
4	Models of objects for sectional orthography.
5	Models/Animated video of development of lateral surfaces of various solids.
6	Models/Animated video of projections of different solids.
7	Models/charts/ animated video of intersections of various solids.

IX. LIST OF REFERENCE BOOKS

Sr.No.	Title	Author	Publication
1	A Text book of Machine Drawing	Dr. R. K. Dahwan	S.chand Publication
2	Engineering Drawing	P. J. Shah	S.chand Publication, New Delhi.
3	Engineering Graphics	Arunoday Kumar	Tech-Max Publications, Pune.
4	Elements of Engineering Drawing	N. D. Bhatt	Charotar Publishing House, Anand.

X. LINK OF LEARNING WEB RESOURCE

1	http://mvredp.blogspot.in/2010/04/sections-of-solids-introduction.html
2	http://www.youtube.com/watch?v=P5g5omLoDr8
3	http://engggraphics.wordpress.com/2012/04/10/an-advance-tamil-new-year-gift/
4	http://rgpv-ed.blogspot.in/2009/09/development-of-surfaces.html
5	https://sites.google.com/site/middleschooljghs/graphic-communication/geometric-drawingand-surface-developments 6. http://www.techdrawingtools.com/12/l1201.htm
6	http://www.wermac.org/documents/isometric.html
7	http://www.me.metu.edu.tr/courses/me114/Lectures/assembly.htm
8	http://metal.brightcookie.com/2_draw/draw_t1/htm/draw1_2_1.htm
9	http://www.ductedreversecycleairconditioning.com.au/category/37165122
10	http://www.affordablecomfort.org/images/Events/15/Courses/422/Proctor_TAM07.pdf

XI. SUGGESTED WEIGHTAGE TO LEARNING EFFORTS & ASSESSMENT PURPOSE							
Unit	**Unit Title**	**Aligned COs**	**Learning Hours**	**R-Level**	**U-Level**	**A-Level**	**Total Marks**
1	Projections of Solids	CO1	6	3	3	4	10
2	Sections of Solids	CO2	3	4	5	5	6
3	Development of Surfaces	CO3	4	2	4	2	8
4	Intersection of Solids	CO3	3	2	3	1	6
5	Multi views Representation & Sectional Orthographic	CO4	5	3	5	3	10
6	Detail & Assembly	CO5	4	3	5	3	10
7	Welded Joints, Piping Joints & Fasteners	CO6	3	3	3	1	5
8.	Drafting Symbols	CO6	2	3	3	1	5
		Grand Total	30	17	25	18	60

XII. COs AND POs AND PSOs MAPPING										
Course outcome (Cos)	**Programme Outcomes (POs)**							**Programme Specific Outcomes (PSOs)**		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3	3	2	0	0	0	1	3	2	1
CO2	3	2	3	0	0	0	2	3	3	2
CO3	3	3	2	0	0	0	1	3	2	1
CO4	3	3	2	1	0	1	2	3	2	2
CO5	3	3	3	0	1	2	2	3	3	3
Legends: - *3- High* *2-Moderate/Medium* *1-Slight/Low* *0-None*										