Course Code	Course Name	Credits
PEL301	**Computer Aided Machine Drawing**	**02**

Objectives:

1. To prepare the students gain the insight of visualizing an object and converting it into a production drawing.
2. To impart the knowledge of conventional representation of various mechanical details.
3. To prepare the students to be conversant with 2-D and 3-D drafting using a CAD Software.

Outcomes: Learner will be able to…

1. Prepare drawings depicting interpenetration of simple solids and auxiliary views of machine parts.
2. Read and interpret detailed drawings from assembly drawings.
3. Prepare assembly drawings from detailed drawings of machine subassemblies.
4. Prepare production drawings.
5. Develop 3D models of machine parts using various CAD software's.
6. Convert 3D models to 2D drawings using various CAD software's.

Module	Contents	Hrs
01	1.1 **Solid Geometry:** Intersection of surfaces and interpenetration of solids- Intersection of prism or cylinder with prism; cylinder or cone, both solids in simple position only. Primary auxiliary views and auxiliary projections of simple machine parts. 1.2 **Machine Elements:** Preparation of 2-D drawings of standard machine elements (nuts, bolts, keys, cotter, screws, spring etc.). 1.3 **Conventional representation** of assembly of threaded parts in external and sectional views, Types of threads; thread designation, Conventional representation of machine components and materials, Designation of standard components.	**10**
02	**Detailed and assembly drawings**: 2.1 Introduction to the unit assembly drawing, steps involved in preparing assembly drawing from details and vice-versa, Sequence in assembly. 2.2 Preparation of details and assembly drawings of: Clapper block, Single tool post, square tool post, Lathe Tailstock.	**10**
03	**Preparation of detailed and assembly drawings of Bearings:** 3.1 Simple, solid, Bushed bearing. I.S. conventional representation of ball & roller bearing. 3.2 Pedestal bearing & footstep bearing.	**10**
04	**Preparation of detailed and assembly drawings of pulleys, Pipe Joints. Limits, Fits & Tolerances** - 4.1 Classification of Pulleys, pipe joints 4.2 Pulleys: Flat belt, V-belt, rope belt, Fast and loose pulleys. 4.3 Pipe joints: Flanged joints, Socket and spigot joint, Gland and stuffing box, expansion joint.	**04**

05	**Preparation of detailed and assembly drawings of Valves, I.C. Engine parts:** 5.1 Types of Valves, introduction to I.C. Engine	08
	5.2 Preparation of detailed and assembly drawings of Stop valve, Non return Valve, I.C. Engine parts: Piston, Connecting rod, Cross head, Crankshaft and Spark plug.	
06	**Preparation of detailed and assembly drawings of Jigs and Fixtures:** 6.1 Introduction to Jigs and fixtures, 6.2 Jigs and Fixtures 6.3 Reverse Engineering of a physical model: disassembling of any Physical model having not less than five parts, sketch the minimum views required for each component, measure all the required dimensions of each component, convert these sketches into 3-D model and create an assembly drawing with actual dimensions	10

Term work:

A. Questions from theory part of each module should be solved as home work in A-3 size sketch book, as follows :-

1. Minimum 4 questions from module 1.
2. Minimum 3 questions from module 2.
3. Minimum 1 question/module from module 3 to 6.

B. Printouts/plots of the problems solved in practical class from the practical part of each module, as follows :-

1. 5 two dimensional detailed drawings: - Preparation of 3-D models of parts from given 2-D assembly drawing. Converting the 3-D parts into 2-D detailed drawings.
2. 5 two dimensional Assembly drawings: - Preparation of 3-D models of parts, from given 2-D detailed drawings. Assembling the 3-D parts and Converting the 3-D
3. Assembly into 2-D assembly drawing.

Problems from practical parts of each module should be solved using standard CAD packages like IDEAS, PRO-E, CATIA, Solid Works and Inventor etc.

The distribution of marks for Term work shall be as follows:

Homework: sketch book	..... 20 marks
Printouts/Plots	..... 20 marks
Attendance (theory and practical)	..... 10 marks

Practical/Oral examination:

1. Practical examination duration is of three hours, based on Part-B of the Term work, and should contain two sessions as follows:
   Session-I: Preparation of 3-D models of parts, assembling parts and preparing production drawings of these parts and assembly with appropriate tolerancing from given 2-D detailed drawings.
   Session-II: Preparation of minimum five detailed 3-D part drawings from given 2-D assembly drawing.
   Oral examination should also be conducted to check the knowledge of conventional and CAD drawing.
2. Questions provided for practical examination should contain minimum five and not more than ten parts.

3. The distribution of marks for practical examination shall be as follows:
   Session-I ..... 25 marks
   Session-II ..... 15 marks
   Oral ..... 10 marks
4. Evaluation of practical examination to be done based on the printout of students work.
5. Students work along with evaluation report to be preserved till the next examination.

Reference Books:

1. *Machine Drawing*, N.D. Bhatt.
2. *Machine Drawing* by P. S. Gill
3. *A text book of Machine Drawing*, Laxminarayan & M.L.Mathur (Jain brothers, Delhi).
4. *Machine Drawing*, Kamat & Rao.
5. *Machine Drawing,* M.B. Shah
6. *A text book of Machine Drawing,* R.B.Gupta (Satyaprakashan, Tech. Publication)
7. *Machine Drawing*, K.I.Narayana, P.Kannaiah and K.Venkata Reddy.
8. Machine Drawing, Sidheshwar and Kanheya
9. *Autodesk Inventor 2011 for Engineers and Designers*, Sham Tickoo, S. Raina (dreamtech Press).

2. CO Statements.

Outcomes: Learner will be able to…

1. Prepare drawings depicting interpenetration of simple solids and auxiliary views of machine parts.
2. Read and interpret detailed drawings from assembly drawings.
3. Prepare assembly drawings from detailed drawings of machine subassemblies.
4. Prepare production drawings.
5. Develop 3D models of machine parts using various CAD software's.
6. Convert 3D models to 2D drawings using various CAD software's.

3. CO-PO-PSO Mapping.

Relationship of course outcomes with program outcomes:

Indicate LI (low importance), MI (Moderate Importance) or HI (High Importance) in respective mapping cell.

MAP PO-CO	CO1	CO2	CO3	CO4	CO5	C06
PO1	LI	HI	HI	HI	HI	HI
PO2	LI	HI	HI	HI	HI	HI
PO3	HI	HI	HI	HI	HI	HI
PO4	LI	LI	LI	LI	LI	LI
PO5	LI	LI	LI	HI	HI	HI
PO6	LI	LI	LI	LI	LI	LI
PO7	LI	LI	LI	LI	LI	LI
PO8	LI	LI	LI	LI	LI	LI
PO9	HI	HI	HI	HI	HI	HI
PO10	MI	LI	LI	LI	MI	MI
PO11	LI	LI	LI	LI	LI	LI

Program Outcomes

1. **Engineering Knowledge:** An ability to apply knowledge of mathematics, basic sciences and engineering fundamentals to the solution of manufacturing engineering problem
2. **Problem analysis:** An ability to identify, formulate and analyse production engineering problems to create useful and viable conclusions.
3. **Design / Development of solutions:** An ability to design simplified solution of manufacturing engineering problems to meet the desired needs.
4. **Conduct investigation of complex problems:** An ability to apply basic engineering knowledge for design and analysis of manufacturing problem
5. **Modern tool usage**: An ability to use the techniques, skills and modern engineering tools necessary for manufacturing engineering practice.
6. **Engineer and society:** An ability to develop a feasible and economical solution relevant to social, environmental and safety for sustainable development
7. **Ethics :** An understanding of professional ethical responsibility.
8. **Individual and team work:** An ability to work as an individual and as a member / leader in diverse teams.
9. **Communication:** An ability to communicate effectively with people at large.
10. **Project management and Finance:** An ability to manage engineering projects with techo-socio-economic feasibilities.
11. **Life-long Learning:** An ability to engage in continuous learning in the context of technological change.

4. CO Assessment tools with target.

a) **Student Study effort required (Total Hours/ Sem)**

Total Contact Lectures (as per syllabus)	**Total Contact Practicals & Tutorials (Per Batch)**	**Home Work Assignment (4 hrs / Assignment)**	**Self Study**	**Presen -tation**
2 hrs /week x 12 = 36	**2hrs / week x 12 = 48**	**4 x 9 = 36**	NIL	**Nil**
Note: Plan of student study effort should be prepared on actual period available, provided semester is 14 week long				

Assessment Tool:

1. For course outcome no. 1 , assignment will be given and performance will be evaluated.
2. Assignments no. 2 to 5 and printout[by using CAD software] 1 to 5 will be course outcome 2 and 5
3. Assignments no. 6 to 8 and [by using CAD software] printout no.6 to 10 will be course outcome 3,4 and6.
4. Course exit survey will be used to measure course 1 to 6

Measurement Formula- 1.

b)

COURSE OUTCOME	MEASUREMENT FORMULA
1.	(A1)*0.8+ CES1*0.2
2.	(A2+A3+A4+A5)*0.2+CES2*0.2
3.	(A6+A7+A8)*0.3+CES3*0.1
4.	P8*0.8+CES4*1
5	P1*0.1+[P2+P3+P4+P5]*0.2+CES5*0.1
6	[P6+P7]*0.3+CES6*0.1

Note:

- A= Assignment(1.....8),CES= Survey, P= Printouts
- Maximum value for each course outcome is 5 and minimum value is 0.
- Calculation of Individual student will be in Excel sheet

5. Curriculum Gap/Content beyond syllabus (if any).

Lesson Plan

Semester III Year: 2018-2019

Course Title: Computer Aided Machine Drawing	SEE: 3 Hours – Practical Examination
Total Contact Hours: 48Hours	Duration of SEE: 3 Hrs
SEE Marks: 50 (Practical) + 50 (Term work)	
Lesson Plan Author: Anant. N. Tarase	Checked By:
Credits assigned :3	

Lecture No.	Portion to be covered per hour
1	Interpenetration of Solids Cylinder to cylinder,
2	Interpenetration of cylinder to cone
3	Interpenetration of prism to prism,
4	Interpenetration of prism to cylinder
5	pyramid to prism,
6	pyramid to cylinder
7	Auxiliary projections of solids
8	Auxiliary projections of solids

9	Conventional representation of assembly of threaded parts in external and sectional views, Types of threads; thread designation, Conventional representation of machine components and materials, Designation of standard components.
10	Dimensioning with tolerances indicating various types of fits in detail and assembly drawings
11	Types of assembly drawings, part drawings
12	Drawings for catalogues and instruction manuals
13	Patent drawings, drawing standards
14	Details and assembly drawings: Introduction to unit assembly drawings
15	Steps involved in preparing assembly drawings from details vice-versa. Sequence in assembly
19	Assembly and Detail Drawings
20	tailstock
21	Clapper Block
22	Simple drill jig and milling fixture
23	Bearings : Plummer block,
24	footstep bearing
25	bracket with pedestal bearing footstep bearing with radial and trust ball bearings.
26	IC Engine parts
27	Valves: Non Return valve, stop valve