



INSTITUTE OF AERONAUTICAL ENGINEERING

Dundigal, Hyderabad - 500 043

MECHANICAL ENGINEERING

COURSE DESCRIPTION

Course Title	MACHINE DRAWING			
Course Code	A40310			
Regulation	R13			
Course Structure	Lectures	Tutorials	Practicals	Credits
	-	-	6	4
Course Coordinator	Professor B.V.S. N. RAO.			
Team of Instructors	Mr. B.V. S. N. RAO, Professor, Mr. Mahidhar Reddy Assistant Professor, Mr. M. Sunil Kumar, Assistant Professor, Ms. E. Sanjana, Assistant Professor.			

I. COURSE OVERVIEW:

Machine Drawing gives representation of a machine component or machine by lines according to certain set rules. Machine drawing generally gives all the external and internal details of the machine components from which it can be manufactured. When the machining symbols, tolerances, bill of material, etc. are specified on the drawing when it is being manufactured, then it is called production drawing.

The knowledge of machine drawing helps us in designing the various parts of machine elements. The course content is designed in such a way so as to balance part drawings (machine components) and assembly drawings.

II. PREREQUISITE(S):

Level	Credits	Periods / Week	Prerequisite(s)
UG	4	6	Thorough knowledge of Engineering Drawing

III. MARKS DISTRIBUTION:

Sessional Marks	University End Exam Marks	Total Marks
Mid Semester Test There shall be 2 mid-term examinations in a semester. Each mid-term examination consists of one subjective paper for 10 marks and 15 marks for day to day work. The average of the two shall be considered for the award of marks for internal test. Subjective paper contains of 4 full questions of which, the student has to answer 2 questions, each question carrying 5 marks. The second mid exams consists of two questions, with first question with internal choice of attempting one out of two for 3 marks and second one is compulsory for 7marks. Exam duration is 90 min.	75	100

IV. EVALUATION SCHEME:

S. No.	Component	Duration	Marks
1	I Mid Examination	1 hour and 30 min	10
2	Day to Day Work		15
TOTAL			25
3	II Mid Examination	1 hour and 30 min	20
4	Day to Day Work		15
TOTAL			25
MID Examination marks to be considered as average of above 2 MID's TOTAL			
5	EXTERNAL Examination	3 hours	75
GRAND TOTAL			100

V. COURSE OBJECTIVES:

Student will study methodology and well thought out presentation that covers fundamental issues common to almost all areas of machine drawing.

- I. Students have an ability to apply knowledge of modeling, science and engineering.
- II. Student can model this drawing even in CAD/CAM software by applying the basic knowledge of machine drawing.
- III. Students will be able to demonstrate an ability to design and draw the assembly and disassembly.

VI. COURSE OUTCOMES:

The student will be able to

1. Understand and apply the knowledge of machine drawing as a system of communication in which ideas are expressed clearly.
2. Understand the design of a system, component or process to meet desired needs within realistic constraints such as manufacturability, economic, environmental, safety & sustainability to represent a part drawing and assembly drawings.
3. Identify, draw and create drawings to solve engineering problems in optimum time.
4. Recognize the use of modern engineering tools, software and equipment to analyze different drawings for design and manufacturing.
5. Visualize the techniques, skills and modern engineering tools necessary for engineering practice.
6. Recognize the need for, and an ability to engage in self education and life-long learning.

VII. HOW COURSE OUTCOMES ARE ASSESSED:

Program Outcomes		Level	Proficiency assessed by
a	Graduates will demonstrate the ability to use basic knowledge in engineering drawing and apply them to solve problems specific to mechanical engineering (Fundamental engineering analysis skills).	H	Assignments, Tutorials & Exams
b	Graduates will demonstrate the ability to design and draw machine components, and report results (Information retrieval skills).	S	Assignments, Tutorials & Exams
c	Graduates will demonstrate the ability to draw any mechanical part that meets desired specifications and requirements (Creative skills).	S	Tutorials

Program Outcomes		Level	Proficiency assessed by
d	Graduates will demonstrate the ability to function as a coherent unit in multidisciplinary drawing teams, and deliver results through collaborative research (Teamwork).	N	-----
e	Graduates will demonstrate the ability to identify, draw mechanical engineering components of a complex kind (Engineering problem solving skills).	H	Assignments, Tutorials & Exams
f	Graduates will demonstrate an understanding of their professional and ethical responsibilities, and use technology for the benefit of mankind (Professional integrity).	S	Assignments
g	Graduates will be able to communicate effectively in both verbal and written forms (Speaking / writing skills).	S	Assignments, Tutorials & Exams
h	Graduates will have the confidence to apply engineering solutions in global and national contexts (Engineering impact assessment skills).	S	Tutorials
i	Graduates should be capable of self-education and clearly understand the value of life-long learning (Continuing education awareness).	S	Assignments, Tutorials & Exams
j	Graduates will develop an open mind and have an understanding of the impact of engineering on society and demonstrate awareness of contemporary issues (Social awareness).	S	Tutorials
k	Graduates will be familiar with applying software methods and modern computer tools to analyze mechanical engineering problems (Software hardware interface).	S	Assignments
l	Graduates will have the ability to recognize the importance of professional development by pursuing post graduate studies or face competitive examinations that offer challenging and rewarding careers in Mechanical Engineering (Successful career and immediate employment).	S	Tutorials
m	Graduates will be able to design and draw a system to meet desired needs within environmental, economic, political, ethical, health, safety, manufacturability, management knowledge and techniques to estimate time, resources to complete project (Practical engineering analysis skills).	N	-----

N = None

S = Supportive

H = Highly Relate

VIII.

SYLLABUS:

Part A: Machine Drawing Conventions:

- i). Need for drawing conventions – introduction to BIS conventions
 - a) Conventional representation of materials, common machine elements and parts such as screws, nuts, bolts, keys, gears, webs, ribs.
 - b) Methods of dimensioning, general rules for sizes and placement of dimensions for holes, centers, curved and tapered features.
 - c) Title boxes, their size, location and details - common abbreviations and their liberal usage
 - d) Types of Drawings – working drawings for machine parts.

ii). Drawing of Machine Elements and Simple Parts:

Selection of views, additional views for the following machine elements and parts with drawing proportions:

- a) Popular forms of Screw threads, bolts, nuts, stud bolts, tap bolts, set screws.
- b) Keys, cotter joints and knuckle joint.
- c) Riveted joints for plates.
- d) Shaft couplings, spigot and socket pipe joint.
- e) Journal, pivot, collar and foot step bearings.

Part B: Assembly Drawings:

Drawing of assembled views for the part drawings of the following using conventions and proportions:

- a) Engine parts—stuffing boxes, cross heads, eccentrics, petrol engine connecting rod, piston assembly.
- b) Other machine parts – screw jack, machine vice, Plummer block and Tailstock.
- c) Valves: steam stop valve, spring loaded safety valve, feed check valve and air cock.

NOTE: First angle projection to be adopted. The student should be able to provide working drawings of actual parts.

TEXT BOOKS:

1. Machine Drawing- K. L. Narayana, P. Kannaiah, K.Venkata Reddy, (2012), New Age Publishers , 4th Edition. (T1)
2. Text book of Machine drawing- K.C.John, PHI, 1st Edition, (2009).(T2)

REFERENCE BOOKS:

- 1 Machine Drawing – P.S Gill, S.K. Kataria & sons, 1st Edition, 2013.
- 2 Machine Drawing – Junnarkar N.D, Pearson Edu, 1st Edition, 2007.
- 3 Machine Drawing – Bhattacharya, Oxford University Press, 1st Edition, 2013.
- 4 Machine Drawing – N. D. Bhatt, Panchal/Charotar, 1st Edition, 2014.
- 5 Text book of Machine drawing- R. K. Dhavan/S. Chand, 1st Edition, 2012.

IX. COURSE PLAN:

The course plan is meant as a guideline. There may probably be changes.

Lecture No.	Course Learning Outcomes	Topics to be covered	Refer to	Topic No./ Page No.
5- Dec 9-Dec	Explain the importance of machine drawing, common machine elements and their conventional representations.	PART- A Machine drawing- Conventional representation of materials, common machine elements and parts such as screws, nuts, bolts, keys, gears, webs and ribs.	T1	1.1 to 1.2.4.10/1.2 Pg.01 to 05
16-Dec	Discuss various forms of machine elements and their	i). Conventional representation of common machine elements.		2.26 to 2.27/ Pg.25 - 28.

Lecture No.	Course Learning Outcomes	Topics to be covered	Refer to	Topic No./ Page No.
	conventional representations.	Methods of dimensioning.		
19-Dec	Relate various types of form of threads.	Selection of views of Popular forms of Screw threads.	T1	5.1,5.3,5.26/ Pg.79, Pg.94.
23-Dec	Discuss various types of bolts, nuts, stud bolts, tap bolts, set screws and their representations.	Selection of views for bolts, nuts, stud bolts, tap bolts, set screws.	T1	5.13,5.14,5.1 5,5.16,5.2/ Pg.86 to Pg.90
30-Dec	Explain various types of foundation bolts and their applications	Selection of views for foundation bolts.	T1	5.13,5.14,5.1 5,5.16,5.2/ Pg.86 to Pg.90
02-Jan	Discuss various types of keys related to applications	Types of keys: Flat Saddle key, Hollow saddle key, Gib Head key, Splined shaft key.	T1	5.13,5.14,5.1 5,5.16,5.2/ Pg.86 to Pg.90
06-Jan	Compare various cotter joints	Cotter joint with sleeve, Cotter joint with Gib head		6.3,6.2,6.3,6. 7/Pg.104 to pg.107.
09-Jan	Explain various pin joints related to applications	. Cotter joint with Socket and spigot, knuckle joint.	T1	6.3.2,6.4.1/Pg .111 to pg.113
16-Jan	. Discuss various methods of riveted joints related to applications	Single Riveted Lap joint, Double Riveted chain Lap joint, Double Riveted Zigzag Lap joint.	T1	6.3.2,6.4.1 / Pg.111 to pg.113
20-Jan	Explain various methods of riveting.	Single Riveted-Single strap butt joint. Single Riveted-double strap butt joint.	T1	10.5 to10.5.2.2 / Pg.157 to Pg.159
23-Jan	Review applications and techniques of various riveted joints	Double Riveted Zigzag Lap joint. Double Riveted-double strap chain butt joint, Double Riveted-double strap Zigzag butt joint.	T1	10.5 to10.5.2.2 / Pg.157 to Pg.159
27-Jan	. Describe principle, working procedure and applications	Flange Coupling, Protected Flange Coupling.	T1	10.5 to10.5.2.2 / Pg.157 to Pg.159
20-Feb	Explain principle, working procedure and applications	Spigot and socket pipe joint. Universal coupling, Old ham coupling.	T1	7.1 to 7.2.2.2 / Pg.115 to Pg.119, Pg.123, Pg124
27-Feb	Discuss various types of bearings and their applications	Journal, pivot and collar bearing.	T1	7.1 to 7.2.2.2 / Pg.115 to Pg.119,pg.123,p g124
03-Mar	Bearings	Foot step bearing	T1	12.1,12.2/pg. 178,pg.182,p g.186.
06-Mar	Discuss applications and assembly of machine components.	. PART- B: Assembly Drawings: Engine parts - stuffing box.	T1	12.1,12.2/pg. 178,pg.182,p g.186.

Lecture No.	Course Learning Outcomes	Topics to be covered	Refer to	Topic No./ Page No.
10-Mar	Applications and assembly of machine components.	Cross head	T1	18.1/pg.266
17-Mar	Applications and assembly of machine components	Eccentric.	T1	18.3/pg.268 18.8(a, b)/pg.273-274
20-Mar	Applications and assembly of machine components.	Petrol Engine connecting rod, piston assembly	T1	19.1,18.6/pg. 356, pg.271
24-Mar	Explain principles of other machine parts used in daily life.	Machine parts - Screw jack.	T1	18.51/pg.336
27-Mar	Explain principles of other machine parts used in daily life	Machine Vice,Plummer block,	T1	18.45/pg. 328 18.22,18.41/pg. 295
31-Mar	Explain principles of other machine parts used in daily life	Tailstock.	T1	18.18/pg.290
03-Apr	Discuss the principle and construction of valves used in industries.	Valves: (i). Steam stop valve	T1	18.30,18.37/p g.308,pg.319
07-Apr	Discuss the principle and construction of valves used in industries.	(ii). Spring loaded safety valve,	T1	18.30,18.37/p g.308,pg.319
10-Apr	Discuss the principle and construction of valves used in industries.	(iii).Feed check valve and air cock.	T1	18.32,18.34/p g.311,pg.313

X. MAPPING COURSE OBJECTIVES LEADING TO THE ACHIEVEMENT OF COURSE OUTCOMES:

Course Objectives	Program Outcomes												
	A	b	c	d	e	f	g	h	i	j	k	l	m
I	H		S		H		S	S					
II	S								S		S		
III	H	S			H				S		S		
IV	S				S				S			S	
V			S		H								

S = Supportive

H = Highly Related

XI. MAPPING COURSE OBJECTIVES LEADING TO THE ACHIEVEMENT OF COURSE OUTCOMES:

Course Outcomes	Program Outcomes												
	a	b	c	d	e	f	g	h	i	j	k	l	m
1	S												
2									S			S	
3	H				H		S						
4			S						S				
5	H				H								
6			S				S		S				

S = Supportive

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Prepared By: Mr. B. V. S. N. Rao, Professor

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