B.E Semester: 4 Mechanical Engineering
Subject Name: Industrial Drafting & Machine Design (MA404-N)

A. Course Objective:
• To present a problem oriented in depth knowledge of Industrial Drafting And Machine Design • To address the underlying concepts and methods behind Industrial Drafting And Machine Design

B. Teaching / Examination Scheme:

Teaching Scheme				Total Credit	Evaluation Scheme					
L	T	P	Total		Theory		Mid Sem Exam	CIA	Pract.	Total
Hrs	Hrs	Hrs	Hrs		Hrs	Marks	Marks	Marks	Marks	Marks
3	1#	2	5+1#	4	3	70	30	20	30	150

Note- #Represents Non Credit Tutorial hours for given subject

C. Detailed Syllabus:

Unit No.	Details
Part A: Machine Design	
1	Design consideration of machine parts: Loads, different types, factor of safety, stress, design stress factors affecting its selection, tensile, compressive, shear, bending, bearing, crushing stresses, bending and torsional shear stress, transverse shear, principle stress determination, eccentric loading, bearing pressure.
2	Theories of Failure : Maximum principal stress theory, maximum shear stress theory, Total strain energy theory, shear strain energy theory, graphical representation and derivation of equation for each and their application to problems relating to two dimensional stress systems only
3	Cotter and Knuckle joints: Design of simple cotter joint, cotter joint with a sleeve, cotter foundation bolt, Gib and cotter joint, design of knuckle joint, applications.
4	Welded, Bolted and Riveted Joints: Welded joints: stress relieving of welded joints, Strength of butt and fillet joint, Eccentric load in the plane of weld, Welded joint subjected to bending and torsion. Riveted joints: rivet materials, types of failure, strength and efficiency of joint, Caulking and Fullering, Longitudinal and Circumferential lap joint, Eccentrically loaded riveted and bolted joints when (a) load is parallel to the bolt axis (b) perpendicular to bolt axis.

5	Beams and Columns: Types of loads, Types of supports, Types of beams; Determination of support reactions, Relationship between loading, shear force & bending moment, Bending moment and shear force diagrams. End conditions of supports, Effect of Section, Orientation, and type of loading; Deflection of beams for different loading conditions. Compressive axial loading of columns and struts, Slenderness ratio, Compressive stress and Buckling of members, Effect of end conditions; Euler's Formula, Applications, validity and limitations; Rankine's Formula, Johnson's equation; Eccentric loading of long columns.
6	Shafts, Keys and Couplings: Design of solid and hollow circular shaft subjected to torque and combined loading; Design of shaft for rigidity and stiffness; Design of Keys: Saddle, Sunk, Woodruff, Square, Flat, Kennedy key and Splines. Design of Couplings: Concept of rigid and flexible couplings, Design of: Clamp, Rigid flange and Flexible couplings.

Part B: Industrial Drafting

1	Assembly drawing, standard drawing, machine shop drawing, pattern shop, sheet metal drawing.
2	Production drawing elements of production drawing. Information on drawing, tolerances, Mfg. methods
3	Limits, tolerances& fits indicating geometrical tolerances on the drawing, standard followed in industry.
4	Surface roughness, roughness and machining symbols, indication on drawing.

Part C:Computer Aided Drafting

1	Introduction, computer graphics, getting started with Auto-CAD, Command Entry , saving the drawing, Exploring draw commands, drawing space, units, drawing limits & scales, Exploring Modify Commands, Object Properties Tool bar, Working with layers, dimensions using auto CAD , creating isometric Drawing, introduction to 3D features of Auto-CAD.

Total hours (Theory):48
Total hours (Practical):32
Total hours:80

D. Lesson Planning:

Sr. No.	Date/Week	Unit	Weight age	Topic No
1	1st ,2nd ,3rd	Unit 1	20%	1,2
2	4th .5th ,6th	Unit 2	20%	3
3	7th , 8th ,9th	Unit 3	20%	4
4	10th . 11th . 12th	Unit 4	20%	5
5	13th , 14th ,15th ,16th	Unit 5	20%	6

E. Instructional Method & Pedagogy

1	At the start of course, the course delivery pattern , prerequisite of the subject will be discussed
2	Lecture may be conducted with the aid of multi-media projector, black board, OHP etc. & equal Weight age should be given to all topics while teaching and conduction of all examinations.
3	Attendance is compulsory in lectures and laboratory, which may carries five marks in overall

	evaluation.
4	One/Two internal exams may be conducted and total/average/best of the same may be converted to equivalent of 30 marks as a part of internal theory evaluation.
5	Assignment based on course content will be given to the student for each unit/topic and will be evaluated at regular interval. It may carry an importance of ten marks in the overall internal evaluation.
6	Surprise tests/Quizzes/Seminar/Tutorial may be conducted and having share of five marks in the overall internal evaluation.
7	The course includes a laboratory, where students have an opportunity to build an appreciation for the concept being taught in lectures. Suggested list of experiment is given below

F. List of Practical:

Part A: Machine Design	
Design of machine elements and preparation of report:	
1	Design Consideration (one problem)
2	Design of riveted joint (one problem)
3	Design of welded joint (one problem)
4	Design of column (one problem)
5	Study of Theories of failure (one problem)
6	Design of shaft (one problem)
PART B Industrial drafting	
Design an assembly and detailed drawing of	
1	Cotter/ Knuckle joint (one sheet)
2	Coupling (one sheet)
PART C Computer Aided Drafting	
1	preparation of assembly and detail drawing of machine components assembly using AUTOCAD/any other 2D/3D Drafting Package

NOTE:
Part B/Part C be taught in laboratory and be tested only in oral examination as under
a) A Sketch be given of any parts design by them on Part A. Students are required to indicate and explain various symbols in drawing as studied in part B
b) Students are required to work on computer for testing their knowledge in AUTOCAD/Any other 2D/3D Drafting Package -----
c) Oral examination based on Part A report prepared

G. Students Learning Outcomes:

1	The student can identify different areas of Industrial Drafting And Machine Design
2	Can find the applications of all the areas in day to day life.
3	Can understand the basic of mechanical design process and design of simple machine components like shaft, key and coupling.
4	Can apply the knowledge of computer aided drafting tools to prepare production drawings of machine components.
5	Can determine tolerances for proper fit to achieve functional requirements of assembly.
6	Will be able to analyse components subjected to various mechanical loads.
7	Will be able to analyse beams and columns for stresses and deflection.

8	Will be able to select fasteners and design welded / riveted joints.
9	Will be able to generate and interpret assembly and production drawings.

H. Text Books & Reference Books:

1	Elements of Machine Design by Pandya & Shah
2	Machine Design Vol I & II by Patel and Pandya.
3	Machine Design by R.K. Jain.
4	Machine Design by Sharma & Agrarval
5	Machine design by R.B. Gupta.
6	Mechanical engg. design by Dr. Sadhu singh.
7	Machine design by A.Sherif.
8	A text book on production drawing by Narayana & Reddy.
9	Computer aided drafting- Auto cad-ISTE Nomogram.
10	Instant refernce for Auto CAD'2000 by George Omura, BPB Pub. Co.
11	Inside AUTO CAD by Racker & Rice. Pub. Co.
12	Machine Design Vol.-I by F.H.Haideri, Nirali Prakashan, Pune
13	AutoCAD 2000 reference manual