

GUJARAT TECHNOLOGICAL UNIVERSITY

Subject Name: MACHINE DESIGN & DRAWING
(Code: 3351802)

Diploma Programme in which this course is offered	Semester in which offered
Marine Engineering	5 th Semester

1. RATIONALE

A marine engineer must be capable of machine designing and to draw specific parts with its preferred number and selection. A marine engineer has to understand to read the drawings so as to understand about the machinery in case of ordering spares or to design a new one.

2. COMPETENCY

At the end of the study of Vth Semester the student will be able to

- Understand the selection of materials.
- Know about machine designing
- Study about stress and strain w.r.to machine design.
- Acquire broader ideas about designing types of keys.
- Understand the plans, elevations, views of different marine machineries and its orthographic projections.

3. TEACHING AND EXAMINATION SCHEME

Teaching Scheme (In Hours)			Total Credits (L+T+P)	Examination Scheme				Total Marks
				Theory Marks		Practical Marks		
L	T	P	C	ESE	PA	ESE	PA	150
3	0	2	5	70	30*	20	30	

Legends: L -Lecture; T -Tutorial/Teacher Guided Student Activity; P -Practical; C - Credit; ESE-End Semester Examination; PA -Progressive Assessment.

4. COURSE DETAILS

Unit	Major Learning Outcomes	Topics and Sub-topics
Unit – I Introduction to machine design.	1.a Machine designing. 1.b Application & selection of engineering materials	1.1 Meaning of Design, Introduction to machine design, Phases in design, Preferred Numbers & Standard codes for materials properties. 1.2 Application of engineering materials and their selection. Factor of Safety and factors influencing it.
Unit – II Design considerations	2.a Stress & Strain. 2.b Stress analysis	2.1 Direct stresses (Tensile and Compressive), stress-strain diagram, Bending stresses, Bearing stresses, torsion stresses, Eccentric loading, Principal stresses, Contact stresses. 2.2 Castiglione's theory for determining deflections. Theories of failures. Limits, Tolerances and Type of fits. 2.3 Study of stress analysis on various components & assemblies of Marine Diesel Engine, Marine Steam turbine, Marine Gas turbine, Marine Boiler.
Unit – III Design of Shaft, Keys & Couplings.	3.a Shaft design. 3.b Types of keys. 3.c Types of muff & coupling. 3.d Jacks & its working of its different types.	3.1 Design of shaft & axles on basis of bending, torsion & combined loading, Shaft design on the basis of rigidity, Effect of keyways. 3.2 Design of Square key, Rectangular key, Kennedy key, Splines. 3.3 Design of Muff or Sleeve coupling, Clamp coupling, Flange coupling, Pin-bushed coupling, Universal Joint. 3.4 Working of various types of jacks i.e screw jack, toggle jack, hydraulic jack etc.
Unit – IV Design of bolt and riveted joints.	4.a Rivets, Joints and its types 4.b Screws, Threads, and equipment used for fastening purpose 4.c Stresses in screw fastenings with respect to its axis.	4.1 Riveted joints: Types of riveted joints. 4.2 Design of double and triple riveted butt joint - with equal and unequal cover plates, Design of riveted joint as per IBR, Design of lap joint, Lozenge joint, Bolted joints. 4.3 Definitions types of threads, screw fastenings, locking devices for nuts, washers, eye bolts, Efficiency of threads. 4.4 Static stresses in screw fastenings Eccentric loading in riveted and bolted joints: a) Loading parallel to axis of bolts b) Loading perpendicular to axis of bolts c) Eccentric loading on circular base
Unit – V Principles of Machine drawing.	5.a Plans, elevation, views of a machine drawing	5.1 Plans, elevation, views of machine drawing. First angle and Third angle projection and its correct symbols for both first and third angle.

	5.b Orthographic projection . 5.c Interpretations of notations of machine drawing.	Various views of machine drawing ,orthographic projection 5.2 Dimensioning in different views and to indicate materials of different components in Tabular form 5.3 Clearances & clearness in working drawings, tolerances & curves of intersection. 5.4 Interpretation of drawing notations and symbols of machine drawing, Free hand sketches of machinery parts. 5.5 Machinery components and assembly drawing , Isometric views and assembly drawings of various machinery parts and components on board.
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5. SUGGESTED SPECIFICATION TABLE WITH HOURS & MARKS(THEORY)

Unit	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
I	Introduction to machine design:	06	02	03	03	10
II	Design considerations:	08	04	03	05	12
III	Design of Shaft, Keys & Couplings:	06	04	04	05	14
IV	Design of bolt and riveted joints:	10	03	06	08	16
V	Principles of Machine Drawing	12	06	08	05	18
Total		42	19	24	26	70

Legends: R = Remember; U = Understand; A = Apply and above levels (Bloom's revised taxonomy)

Notes:

1. This specification table shall be treated as a general guideline for students and Teachers. The actual distribution of marks in the question paper may slightly vary from above Table.
2. If mid sem test is part of continuous evaluation, unit numbers I, II and unit III up to 3 are to be considered.
3. Ask the questions from each topic as per marks weightage. Numerical questions are to be asked only if it is specified. Optional questions must be asked from the same topic.

6. SUGGESTED LIST OF PRACTICAL/EXERCISES

LIST OF EXPERIMENTS:

1. Solve problems related to coupling, also prepare detailed drawings of Different couplings (Muff coupling, flange coupling)
2. Design of shafts, keys and Couplings. Design of Screw jack and Toggle jack
3. Problems for design of joints using welding, riveting and fasteners.
4. Problems related to Limits, fits and tolerances.
5. Assembly Drawings of marine components in Orthographic projection from Isometric

views:

- Cylinder Relief Valve
- . Hydraulic Steering Gear
- Starting Air Pilot Valve
- Gear Pump
- Control Valve
- Fuel Valve
- Parallel Slide Stop Valve
- 8. Feed Check Valve
- 9. Starting Air Valve .
- 10. Fuel injector

7. SUGGESTED LIST OF STUDENT ACTIVITIES

Perform the tasks mentioned in above Practical/Exercise.

NOTE: Students must draw the assembly of marine components as given in the 6.5 table and must get assessed by the concerned faculty at the completion of each component. Students will have to draw any of those 10 marine components which will be counted in internal marks . Students must be able to draw any one of those 10 marine components by himself/ herself.

8. SPECIAL INSTRUCTIONAL STRATEGIES (If Any)

Sr. No.	Unit Title	Strategies
1	Introduction to machine design	Real life examples. Demonstration of real systems. Movies/Animations. Numerical.
2	Design considerations	
3	Design of Shaft, Keys & Couplings	
4	Design of Bolt and Riveted joints	
5	Principles of Machine Drawing	

9. SUGGESTED LEARNING RESOURCES

List of Books:

(A) Text Book :

1. Machine design - By R.S. Khurmi

(B) Reference Book :

1. Mechanical Engg Design - Joseph Shigley & Charles Michele from Tata McGraw-Hill
2. Design of Machine Elements - V.B. Bhandari from Tata McGraw-Hill, 2nd Edition
3. Machine Drawing -N.D. Bhatta.

10. COURSE CURRICULUM DEVELOPMENT COMMITTEE

FACULTY MEMBERS FROM POLYTECHNIC

- **Prof Nair Gopikrishnan**
(Lecturer in Marine engineering Govt Polytechnic Diu)
- **Prof Devanshu Trivedi**
(Lecturer in Marine engineering Govt Polytechnic Diu)
