



**C. U. SHAH UNIVERSITY**  
**Wadhwan City**

**FACULTY OF:-** Technology and Engineering  
**DEPARTMENT OF:-** Mechanical Engineering  
**SEMESTER:-** VI  
**CODE:-** 4TE06MDE1  
**NAME:-** Machine Design-1(MD-I)

**Teaching & Evaluation Scheme:-**

Subject Code	Name of the Subject	Teaching Scheme (Hours)				Credits	Evaluation Scheme							
		Th	Tu	Pr	Total		Theory				Practical (Marks)			Total
							Sessional Exam		University Exam		Internal		University	
							Marks	Hrs	Marks	Hrs	Pr/Viva	TW	Pr	
4TE06MDE1	Machine Design-I	4	0	2	6	5	30	1.5	70	3	---	20	30	150

**Objectives**

- The aim of this course is to design and development of machinery utilizing advances in the field of material & manufacturing technology.
- Student should able to analyze the loads, types of induced stresses, resisting areas and hence the modes of failure
- Identify the modes of failure and relevant theory for problem solving.
- Analyze the practical problem and make use of materials, strength equations, factor of safety etc.
- To learn systematic approach to Basic Fundamentals and Component Design of the machine elements.
- To teach students mechanical engineering design theory to identify and quantify machine elements in the design of commonly used mechanical systems
- To develop analytical abilities for providing solutions to engineering design problems.
- To recognize those factors constituting a practical, functional, efficient, and safe mechanical design.
- Use design data book to standardize component dimensions and select dimensional tolerances.

**Prerequisites**

- Basic and Analytical Knowledge of Strength of materials,
- Basic and Analytical Knowledge of Machine Design and Industrial Drafting
- They must know the derivatives and integration.

**Course Outline**

Sr. No.	Course Contents	Hours
1	<b>Design Strategy and Considerations:</b> General design considerations and approaches, design strategies, material selection, Manufacturing and assembly considerations, Design of components for casting, Welding, Forging, Machining, Welding, Press working, Multi slide press, Transfer Press, Fine Blanking-Double action etc. Reliability, Thermal considerations, Wear considerations in design, Contact Stresses, Standardization and preferred numbers.	<b>06</b>
2	<b>Fluctuations and Fatigue Stresses:</b> Design for fluctuating stresses, Endurance limit, Estimation of Endurance strength, Soderberg, Goodman and modified Goodman diagrams, fatigue failure, design consideration in fatigue, Design for creep	<b>06</b>



## C. U. SHAH UNIVERSITY Wadhwan City

3	<b>Design of Springs:</b> Types, applications and materials of spring, stress and deflection equation for helical springs, Wahl's stress factor and its use in spring design, bulking and surge, design of compression, tension, spiral, helical and flat spiral springs, Design of leaf springs, material and construction, Nipping and shot pinning.	<b>09</b>
4	<b>Design of Power Transmission Elements:</b> Material Selection, Design of belt drives – Flat & V-belt drives, Condition for Transmission of max. Power, Selection of belt, Design of pulley, Wire rope and design of rope drives, design of chain drives with sprockets, Timer Belt.	<b>10</b>
5	<b>Design of Brakes and Clutches:</b> <b>Brakes:</b> Various types of Brakes, function, material selection, Self energizing condition of brakes, Design of shoe brakes – Internal & external expanding, band brakes, Disc Brake, Thermal Considerations in brake designing. <b>Clutches:</b> Various types of clutches in use, function and material selection, Design of friction clutches – Disc. Multidisc, Cone & Centrifugal, Torque transmitting capacity.	<b>09</b>
6	<b>Design of Pressure Vessels:</b> Classification of pressure vessels, materials for pressure vessel , Modes of failures in pressure vessels Thick and thin cylinders, Design of thick cylindrical and spherical shells subjected to internal pressure and external pressure, Lamé's equation, Clavarino's and Birnie's equations, Auto frettage and compound cylinders, Gasketed joints in cylindrical vessels (No derivation). Design of cylinder covers, Cover plates, pipes and pipe flanges for pipe joints.	<b>10</b>
7	<b>Design of Sliding Contact and Rolling Contact Bearings:</b> <b>Sliding Contact Bearing:</b> Bearing and Lubrication, types of lubrication and lubricants, viscosity, Design of hydrodynamic journal bearings. Classification, material selection, Sommerfeld number and use of charts for the estimation of minimum film thickness, temperature rise, L/D Ratio, Clearance ratio, flow quantity etc.,Hydrostatic bearing, <b>Rolling Contact Bearings:</b> Rolling contact bearings, Classification and selection, stribeck's equation, static and dynamic load capacity, equivalent dynamic load, Bearing under variable loading, Bearing life, factors affecting bearing life.	<b>10</b>

### Learning Outcomes:-

- The students will develop the ability to make proper assumptions, perform correct analysis while designing specific mechanical components.
- Ability to estimate the fatigue strength and estimate the fluctuating loads that will cause failure in real parts using the Soderberg and Goodman techniques.
- At the end of this course, students will be able to analyze and design mechanical springs, Bearings, Pressure Vessels, brakes and clutches and power transmission elements.
- Able to use design data books and different codes of design.

### Books Recommended:-

- 1 Design of Machine Elements by **V. B. Bhandari** ,Tata McGraw Hill Publishing Co.1994
- 2 Machine Design by **P.C Sharma and D. K. Aggarwal** S.K. Kataria & Sons 2009
- 3 Machine Design by **R.C.Patel and A.D.Pandya**, Vol-1 and Vol-2,C.Jamnadas & Co.1992
- 4 Mechanical Engineering Design by **Joseph Edward Shigley and Charles R. Mischke**, McGraw Hill International Editor
- 5 P.S.G Design data book (PSG college of engg. & Tech.).DPV Printers,Coimbatore,2000
- 6 Design of Machine Elements by **C.S.Sharma & Kamlesh Purohit**, Prentice Hall of India Pvt. Ltd.
- 7 Production Technology by **R.K.Jain** ,Khanna Publishers,Delhi,
- 8 Tool Design by **C.Donaldson** ,Tata McGRAW Hill ,New Delhi,2005



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## Wadhwan City

### Research References:

- 1 Machine Design – An Integrated Approach by **Robert L Norton**, Pearson Education.2005
- 2 Machine Design by **R.K.Jain** ,Khanna publications.
- 3 Design of Machine elements Part-I and Part-II by **Prof.J.S.Soni**, Nirav and Roopal prakashan, Educational Publishers.
- 4 Mechanical System Design by **Farazdak haideri** Nirali Prakashan.