

## Lesson Plan

Name of Institute	: Ambala College of Engineering and Applied Research
Name of the Faculty member	: Er. Rupen Trehan (Assistant Professor)
Discipline	: Mechanical Engineering
Semester	: 6 <sup>th</sup>
Subject	: Design of Machine Elements (MEC-304A)
Lesson Plan Duration	: 15 weeks (from Jan 2026 to May 2026)
Work Load	: L-2    T-4    P-0

Week	Theory		Tutorial	
	Lecture day	Topic (including assignment/test)	Tutorial day	Topic
1 <sup>st</sup>	1 <sup>st</sup>	<b>UNIT I</b> Introduction: Basic procedure of the design of machine elements.	1 <sup>st</sup>	Basic procedure of the design of machine elements.
	2 <sup>nd</sup>	Standards in machine design, selection of preferred sizes		Overall design considerations.
			2 <sup>nd</sup>	Standards in machine design selection of preferred sizes
2 <sup>nd</sup>	3 <sup>rd</sup>	Engineering materials, properties and selection, BIS system of designation of steels.	3 <sup>rd</sup>	Engineering materials, properties and selection
	4 <sup>th</sup>	<b>Design against static load:</b> Modes of failure, factor of safety and stress concentration: causes and mitigation.		BIS system of designation of steels.
			4 <sup>th</sup>	Stress concentration: causes Stress concentration: mitigation.
3 <sup>rd</sup>	5 <sup>th</sup>	<b>Design against fluctuating load:</b> Fluctuating stresses, endurance limit, low cycle and high cycle fatigue, and notch sensitivity.	5 <sup>th</sup>	Endurance limit, notch sensitivity.
	6 <sup>th</sup>	Endurance limit-approximate estimation, reversed stresses- design for finite and infinite life and cumulative damage in fatigue.		Design for finite and infinite life and cumulative damage in fatigue.
			6 <sup>th</sup>	Numerical on design for finite life. Numerical on design for infinite life.
4 <sup>th</sup>	7 <sup>th</sup>	Soderberg Line, Goodman Line and Modified Goodman Diagrams. Assignment.	7 <sup>th</sup>	Numerical on design for cumulative damage in fatigue.
	8 <sup>th</sup>	<b>UNIT II Riveted Joints:</b> Riveted joints for boiler shell according to I. B. R.		Numerical on Soderberg Line.
			8 <sup>th</sup>	Numerical on Goodman Line. Numerical on Modified Goodman Diagram.
5 <sup>th</sup>	9 <sup>th</sup>	Riveted structural joint, and eccentrically loaded riveted joint.	9 <sup>th</sup>	Design and numerical on Riveted joints for boiler shell according to I. B. R.
	10 <sup>th</sup>	<b>Welded Joints</b> Types of welded joints, strength of welds under axial load, welds under eccentric loading.		Design and numerical on Riveted joints for boiler shell according to I. B. R.
			10 <sup>th</sup>	Design and numerical on Riveted structural joint. Design and numerical on eccentrically loaded riveted joint.

6 <sup>th</sup>	11 <sup>th</sup>	<b>Bolted Joints:</b> Bolt of uniform strength, bolted joint-simple analysis.	11 <sup>th</sup>	Numerical on design of welds under axial load.
	12 <sup>th</sup>	Eccentrically loaded bolted joints.		Numerical on design of welds under axial load.
			12 <sup>th</sup>	Numerical on design of welds under eccentric loading. Numerical on design of welds under eccentric loading.
7 <sup>th</sup>	13 <sup>th</sup>	<b>Springs:</b> Types of springs, helical spring terminology, Design for helical springs.	13 <sup>th</sup>	Numerical on design of bolted joints.
	14 <sup>th</sup>	Spring design-trial and error method, Design against fluctuating load, surge in springs.		Numerical on design of bolted joints.
			14 <sup>th</sup>	Numerical on design of bolted joints with eccentric loads. Numerical on design of bolted joints with eccentric loads.
8 <sup>th</sup>	15 <sup>th</sup>	Design of leaf springs, rubber springs. Assignment.	15 <sup>th</sup>	Numerical on design for helical springs.
	16 <sup>th</sup>	<b>UNIT III Transmission Shafts:</b> Shaft design on strength basis and torsional rigidity basis. ASME code for shaft design.		Numerical on design for helical springs.
			16 <sup>th</sup>	Numerical on design for helical springs subjected to fluctuating loads. Numerical on design for helical springs subjected to fluctuating loads.
9 <sup>th</sup>	17 <sup>th</sup>	Design of hollow shaft on strength basis and torsional rigidity basis.	17 <sup>th</sup>	Numerical on design of leaf springs.
	18 <sup>th</sup>	<b>Keys:</b> Types of keys, design of square and flat keys.		Numerical on design of leaf springs.
			18 <sup>th</sup>	Numerical on design of leaf springs. Numerical on design of shaft.
10 <sup>th</sup>	19 <sup>th</sup>	<b>Clutches:</b> Various types of clutches, design of friction clutches namely single disc, multidisc, torque transmitting capacity, friction materials.	19 <sup>th</sup>	Numerical on design of hollow shaft on strength basis.
	20 <sup>th</sup>	Design of cone clutch and, torque transmitting capacity.		Numerical on design of hollow shaft on torsional rigidity basis.
			20 <sup>th</sup>	Numerical on design for square and flat key. Numerical on design of single disc clutch.
11 <sup>th</sup>	21 <sup>st</sup>	Design of centrifugal clutch, torque transmitting capacity. Thermal considerations.	21 <sup>st</sup>	Numerical on design of multi disc clutch.
	22 <sup>nd</sup>	<b>Brakes:</b> Energy equations, block brake with short shoe, block brake with long shoe.		Numerical on design of cone clutch.
			22 <sup>nd</sup>	Numerical on design of centrifugal clutch. Numerical on design of clutch with thermal considerations.
12 <sup>th</sup>	23 <sup>rd</sup>	Internal expanding brake, band brakes, disc brakes, thermal considerations. Assignment.	23 <sup>rd</sup>	Numerical on design of block brake with short shoe.

	24 <sup>th</sup>	<b>UNIT IV Rolling contact bearings:</b> Types of rolling contact bearing, selection of bearing-type.		Numerical on design of block brake with long shoe.
			24 <sup>th</sup>	Numerical on design of Internal expanding brake. Numerical on design of band brakes
13 <sup>th</sup>	25 <sup>th</sup>	Static and dynamic load carrying capacity, equivalent bearing load, load-life relationship.	25 <sup>th</sup>	Numerical on design of disc brakes.
	26 <sup>th</sup>	Selection of bearings from manufacturer's catalogue, selection of taper roller bearing,		Numerical on selection of bearings from manufacturer's catalogue
			26 <sup>th</sup>	Numerical on selection of bearings from manufacturer's catalogue Numerical on selection of taper roller bearing.
14 <sup>th</sup>	27 <sup>th</sup>	Design for cyclic loads and speeds, bearing failure-causes and analysis.	27 <sup>th</sup>	Numerical on selection of taper roller bearing.
	28 <sup>th</sup>	<b>Sliding contact bearings:</b> Basic modes of lubrication, Raimondi and Boyd method,		Numerical on design for cyclic loads and speeds for ball bearing.
			28 <sup>th</sup>	Numerical on design for cyclic loads and speeds for ball bearing. Numerical on design for cyclic loads and speeds for ball bearing.
15 <sup>th</sup>	29 <sup>th</sup>	Bearing design selection of parameters.	29 <sup>th</sup>	Numerical on design of journal bearings using Raimondi and Boyd's Charts.
	30 <sup>th</sup>	Bearing materials, bearings failure-causes and remedies. Assignment.		Numerical on design of journal bearings using Raimondi and Boyd's Charts.
			30 <sup>th</sup>	Numerical on design of journal bearings using Raimondi and Boyd's Charts. Numerical on design of journal bearings using Raimondi and Boyd's Charts.

(Signature of the teacher concerned with date)