

B.E Semester: V
Automobile Engineering
Subject Name: Automobile engine component design (AE502)

Course Objective:

- To present a problem oriented in depth knowledge of automobile engine component design.
- To address the underlying concepts and methods behind automobile engine component design.

Teaching / Examination Scheme:

SUBJECT		Teaching Scheme				Total Credit	Evaluation Scheme					Total Marks
		L	T	P	Total		THEORY		IE	CIA	PR. / VIVO	
CODE	NAME	Hrs	Hrs	Hrs	Hrs		Hrs	Marks	Marks	Marks	Marks	
AE502	Automobile engine component design	4	0	2	6	5	3	70	30	20	30	150

Detailed Syllabus:

Topic no	Details
1.	<p>Design Considerations:</p> <p>Manufacturing and assembly considerations, Design of components for casting, welding, forging, hot and cold working, machining, welding etc. assembly considerations in design. Design for creep – thermal considerations – wear considerations in design, Contact Stresses, stress concentration in machine elements. Application of Standardization Machine design preferred numbers – preferred series – derived series- limits fits and tolerances and their applications in design.</p>
2.	<p>Fatigue Loading</p> <p>Completely reversed or cyclic stresses – stress – cycle (S-N) curves – fatigue and endurance limit – effect of surface finish, size and loading etc. on endurance strength, Finite and infinite life – design for finite and infinite life, stress concentration, notch sensitivity and fatigue stress concentration factor – factor of safety for fatigue loading –</p>

	Gerber, Goodman and Soderberg criteria for design of parts subjected to variable loading. Combined variable normal and shear stresses – applications of fatigue loading for design of shafts, axles etc.
3.	<p>Design of Bearings:</p> <p>Types of rolling contact bearings and sliding contact bearing, static and dynamic load capacities, Equivalent bearing load, load life relationship, Bearing life, Load factor, Selection of bearings from manufacturers catalogue. Lubrication and mountings/dismounting of bearings, Oil seals and packing.</p>
4.	<p>Design of Gears:</p> <p>Design consideration of gears, material selection and Gear lubrication.</p> <p>Spur Gears:</p> <p>Force analysis, Number of teeth, Face width & Beam strength of gear tooth. Dynamic tooth load. Effective load on gear tooth. Estimation of module based on beam strength. Wear strength of gear tooth. Estimation of module based on wears strength. Spur gear design for maximum power transmission.</p> <p>Helical Gears:</p> <p>Virtual number of teeth, Tooth proportions, Force analysis, Beam strength & Wear strength of helical gears, Effective load on gear tooth, Design of helical gears.</p> <p>Bevel Gears:</p> <p>Terminology of bevel gears, Force analysis, Beam strength of bevel gears, Wear strength of bevel gear, Effective load on gear tooth, Design of bevel gear.</p> <p>Worm Gears:</p> <p>Force analysis, Friction in worm gear, Vector method, Strength rating of worm gears, Wear rating of worm gear.</p>
5.	<p>Design of I.C. Engine Components :</p> <p>Design of cylinder and cylinder head: Stresses, materials, Combustion chamber design. Design of Piston & Piston pin: Materials used, design of piston crown, pin dimensions. Design of Crankshaft & Connecting Rod - Forces, material, types, design criteria, dimensions etc. Valve mechanism Design: Valve, rocker arm, Push rod, cam shaft and cam follower etc. Design Criteria of intake manifold and exhaust manifold.</p>

Lesson Planning:

Sr.No.	Date/Week	Unit No.	% Weightage	Topic No:
1	1 st , 2 ^{ed} , 3 ^{ed}	Unit 1	20 % .	1
2	4 th , 5 th , 6 th	Unit 2	20 %	2
3	7 th , 8 th , 9 th	Unit 3	20 %	3
4	10 th , 11 th , 12 th	Unit 4	20 %	4
5	13 th , 14 th , 15 th	Unit 5	20 %	5

Instructional Method & Pedagogy:

- At the start of course, the course delivery pattern , prerequisite of the subject will be discussed.
- Lecture may be conducted with the aid of multi-media projector, black board, OHP etc. & equal weightage should be given to all topics while teaching and conduction of all examinations.
- Attendance is compulsory in lectures and laboratory, which may carries five marks in overall evaluation.
- 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.
- 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.
- Surprise tests/Quizzes/Seminar/Tutorial may be conducted and having share of five marks in the overall internal evaluation.
- The course includes a laboratory, where students have an opportunity to build an appreciation for the concept being taught in lectures.
- Experiments shall be performed in the laboratory related to course contents.
 - Design of different parts/components for different manufacturing methods.
 - Standards for machine design.
 - Design of bearings.
 - Design of spur gear.
 - Design of helical gear.
 - Design of bevel gear.
 - Design of worm gear.
 - Design of different engine components (piston, crankshaft, connecting rod...etc.)

Practical / Oral: The candidate shall be examined on the basis of term-work.

Students Learning Outcomes

- The student can identify different areas of automobile engine component design.
- Can find the applications of all the areas in day to day life.

Recommended Study Materials

- **Text & Reference Books:**

1. Joseph E. Shigley & Larry D. Mitchell, "Mechanical Engineering Design", Fourth Edition, McGraw-Hill International Book Company
2. Machine Design by R.S.Khurmi & J.K.Gupta, S.Chand & Co
3. Design of machine Elements by Bhandari , Tata McGraw-Hill Publishing Company Ltd
4. Machine Design by Sharma-Agarwal, S.K.Kataria & Sons
5. Machine Design by Sadhusingh, Khanna Publishers,
6. Transmission System Design by R.B.Patil, TechMax Pub., Pune.
7. Machine Design Vol-II & III by F.Haideri, Nirali Prakashan, Pune.
8. Bearing Manufacturers Catalogues
9. PSG Design Data Book.

