

B.E Semester: 5 Automobile Engineering
Subject Name: Automobile Component Design (AE503-N)

A. Course Objective:

- To focus on the study of Automobile component design.
- To present a problem oriented introductory knowledge of component design.
- To address the under lying concepts & methods behind Automobile component design.
- To focus on drafting of components using cad software.
- To present application oriented approach to the students in the field of 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 |
| 4 | 0 | 2 | 6 | 5 | 3 | 70 | 30 | 20 | 30 | 150 |

C. Detailed Syllabus:

| Unit No. | Details |
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| 1 | Design Considerations 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. |
| 2 | Fatigue Loading 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 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 | Design of Bearings Types of rolling contact bearings, 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. |
| 4 | Design of I.C. Engine Components Design of cylinder: 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. Types of liner – Dry & Wet type liners. Valve mechanism Design: Valve, rocker arm. |

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| 5 | <p>Design of Spur and Helical Gears Spur Gears: 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. Helical Gears: 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> |
| 6 | <p>Design of Bevel Gears and Worm Gear Bevel Gears: 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. Worm Gears: Force analysis, Friction in worm gear, Vector method, Strength rating of worm gears, Wear rating of worm gear.</p> |

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| Total hours (Theory):64 |
| Total hours (Practical):32 |
| Total hours:96 |

D. Lesson Planning:

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

E. Instructional Method & Pedagogy

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| 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:

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| 1 | Solve minor problems of fatigue load. |
| 2 | Solve minor problems of Bearings. |
| 3 | Solve minor problems of IC Engine Components. |
| 4 | Solve minor problems of Spur and Helical Gears. |
| 5 | Solve minor problems of Bevel and Worm Gears. |
| 6 | Practice basics sketch commands of CAD software. |
| 7 | Practice basics 3-D commands of CAD software. |
| 8 | Practice advanced 3-D commands of CAD software. |
| 9 | Practice surface modelling of CAD software. |
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G. Text Books & Reference Books:

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| 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 | "Machine Design Vol-II & III" by F.Haideri, Nirali Prakashan, Pune. |
| 7 | PSG Design Data Book And Bearing Manufacturers Catalogues. |