FACULTY OF ENGINEERING & TECHNOLOGY

Effective from Academic Batch: 2022-23

Programme: **Bachelor of Technology (Automobile Engineering)**

Semester: **VII**

Course Code: **202010701**

Course Title: **Automobile Component and System Design**

Course Group: **Professional Core Course**

Course Objectives: To impart knowledge to the students regarding design of different automobile components and systems in various operating conditions, constrain and its applications in automobile engineering. Students will also learn about fundamental design methods for components and systems through mathematical approach; will get solid foundation in solving analytical problems.

Teaching & Examination Scheme:

Contact hours per week			Course Credits	Examination Marks (Maximum / Passing)				
				Internal		External		Total
Lecture	Tutorial	Practical		Theory	J/V/P*	Theory	J/V/P*	
3	0	0	3	50/18	---	50/17	---	100/35

* **J**: Jury; **V**: Viva; **P**: Practical

Detailed Syllabus:

Sr.	Contents	Hours
1	**Fundamentals of Manufacturing Consideration in Design.** **Selection of manufacturing methods, design consideration of casting, design consideration of forging, design consideration of machined part, design consideration of welded assemblies, types of fits, selection fits, tolerances, mode of failure, factor of safety.**	3
2	**Design of Bearing** **Rolling Contact Bearing: Bearing Identification/Designations. Types of rolling contact bearings, static and dynamic load capacities, Stribeck's Equation, Equivalent bearing load, load life relationship, Bearing life, Load factor, Selection of bearings from manufacturers catalogue. Lubrication and mountings, dismounting and preloading of bearings, Oil seals and packing.**	5

Opp. Shastri Maidan, Beside BVM College, Vallabh Vidyanagar, Dist: Anand, Gujarat - 388120
(O): 02692-238001 | Email: adminoffice@cvmu.edu.in | www.cvmu.edu.in

3	**Design of I.C Engine Components** Design of Cylinder: Introduction of Engine power requirements, Selection of engine type, Stroke & Bore, compression ratio, clearance volume and swept volume. Design of Piston: Materials used for piston, dimensions and require parameters for piston assembly. Design of Crank Shaft: Forces analysis, material selection, types of crank shaft, design criteria, dimensions etc Valve Mechanism Design: Valve, rocker arm, Valve spring design, Push rod, cam shaft and cam follower etc.	**10**
4	**Design of Clutch System:** Types of clutch, Design of various clutch (Single plate, multiple plates, centrifugal clutch, lining material), working and principals of Hydraulic Clutch system, clutch fluid and its properties, selection considerations.	**8**
5	**Design of Brake System:** **Introduction about basic terms used in Braking system like Brake balance, Stopping distance, Brake fade, Work done in braking, Braking efficiency, Braking of vehicle, Braking of vehicle moving in a curved path, Design of internal expanding brake, Design of disc brake, working principle of hydraulic brake system, pneumatic type brake system and electric brake system.**	**6**
6	**Design of Gears** **Types of gears, Design consideration of gears, material selection, Types of gear failures, Gear lubrication.** **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 of helical gears, Effective load on gear tooth, Wear strength of helical gears, Design of helical gears.** **Introduction about Bevel gears and worm gears and its applications in automotive vehicles.**	**10**
7	**Design of Gear Box and Transmission Drive:** Introduction of Manual gearboxes for Automotive vehicle, Manual gearbox classification, Mechanical efficiency, Gear shifting mechanisms, Synchronizers, Differential drives, Automatic gearboxes, universal joint, propeller shaft, axels.	**3**
		45

Reference Books:

1	Design of Machine Elements by Bhandari, Tata McGraw-Hill Publishing Company Ltd
2	Mechanical Engineering Design, by Joseph E. Shigley & Larry D.Mitchell, McGraw-Hill International Book Company.
3	Machine Design by, Sharma and Agrawal, S. K. Kataria & Sons.

Opp. Shastri Maidan, Beside BVM College, Vallabh Vidyanagar, Dist: Anand, Gujarat - 388120
(O): 02692-238001 | Email: adminoffice@cvmu.edu.in | www.cvmu.edu.in

4	Machine Design Vol-II & III by F.Haideri, Nirali Prakashan, Pune.
5	Machine Design by Pandya and Shah, Charotar Publishing House.
6	Automotive Mechanics by N. K. Giri, Khanna Publishers.
7	Automobile Engg. Vol-I & II by Kirpal Singh, Standard Pub.
8	PSG Design Data Book.
9	Element of Machine Design Data Book, by Bhandari, Tata McGraw-Hill Publishing Company Ltd

Supplementary learning Material:	
1	NPTEL **resources**

Pedagogy:

- Direct classroom teaching
- Audio Visual presentations/demonstrations
- Assignments/Quiz

Internal Evaluation :
The internal evaluation comprised of written exam (40% weightage) along with combination of various components such as Certification courses, Assignments, Mini Project, Simulation, Model making, Case study, Group activity, Seminar, Poster Presentation, Unit test, Quiz, Class Participation, Attendance, Achievements etc. where individual component weightage should not exceed 20%.

Suggested Specification table with Marks (Theory) (Revised Bloom's Taxonomy):

Distribution of Theory Marks						**R**: Remembering; **U**: Understanding; **A**: Application, **N**: Analyze; **E**: Evaluate; **C**: Create
R	**U**	**A**	**N**	**E**	**C**	
20	**20**	**25**	**25**	**5**	**5**	

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Course Outcomes (CO):		
Sr.	**Course Outcome Statements**	**%weightage**
CO-1	To realize and appreciate use of standardize and its importance in design of automotive components.	10
CO-2	To understand various bearing design calculations according to applications in automotive vehicle.	**20**
CO-3	To Understand the concept and design principles of various IC Engine components.	25
CO-4	**To understand the toque, speed and power requirements of gears and gearbox with reference to force analysis.**	**25**
CO-5	**To understand concepts of various clutch and brake design method.**	20

Opp. Shastri Maidan, Beside BVM College, Vallabh Vidyanagar, Dist: Anand, Gujarat - 388120
(O): 02692-238001 | Email: adminoffice@cvmu.edu.in | www.cvmu.edu.in

Curriculum Revision:	
Version:	2
Drafted on (Month-Year):	June-2022
Last Reviewed on (Month-Year):	
Next Review on (Month-Year):	June-2027

Opp. Shastri Maidan, Beside BVM College, Vallabh Vidyanagar, Dist: Anand, Gujarat - 388120
(O): 02692-238001 | Email: adminoffice@cvmu.edu.in | www.cvmu.edu.in