FACULTY OF ENGINEERING & TECHNOLOGY

Effective from Academic Batch: 2022-23

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

Semester: **V**

Course Code: **202010501**

Course Title: **Automobile Systems - II**

Course Group: **Professional Core Course**

Course Objectives: The course aims to build higher level skill to future engineers for studying different types braking, steering and suspension systems. The knowledge of this subject is essential to calculate the resistances during motion, power required for acceleration and constant velocity motions, braking force and engine characteristics.

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	2	4	50 / 18	25 /9	50 / 17	25 / 9	150 / 53

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

Detailed Syllabus:

Sr.	Contents	Hours
1	**Chassis Frames and Body** Layout of chassis and its main components, Types of Chassis frames & body, Frame sections, Material, Sub frames, Defects in frames, Loads on frame.	05
2	**Braking System** Function, Requirements and classification, Brake efficiency and stopping distance, Internal expanding brakes, Brake lining material, Disc brake, Hydraulic braking system, Brake oil, Bleeding of brakes, Pneumatic braking system, Vacuum brakes, Exhaust brakes, Electrical brakes, Parking brake, Antilock braking system (ABS).	07

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3	**Suspension System** Purpose, Basic ride considerations, Types of suspension system, Types of suspension springs, Front and rear suspension, Coil spring, Leaf spring, Torsion bars, Shock absorbers, Independent suspension, Stabilizer bar, Air suspension, Hydro-pneumatic suspension.	**07**
4	**Steering and Front Axle** Steering functions and requirements, Steering geometry: Camber, Castor, King Pin Inclination, Combined angle & Scrub radius, Toe-in, Toe-out, Condition for correct steering, Wheel alignment and its factor, Under steer and over steer conditions, Steering system and linkages, Ackermann linkages, Steering gears, Steering ratio, Types of steering columns, Power steering, Adaptive steering, Four wheel steering, Types of front axle.	**07**
5	**Wheels and Tyres** Types of wheel rims, Wheel dimensions, Wheel balancing, Tread patterns, Functions of tyre and desirable properties, Types of tyres, Cross ply, Radial & tubeless tyres, Tyre materials, Specifications of tyres, Tyre inflation, Effects of tyre pressure on tyre performance. Tyre wear patterns and their causes, Factors affecting tyre life.	**07**
6	**Performance of Vehicle** Vehicle motion, Resistances during motion, Power required for acceleration and constant velocity motions, Tractive efforts and draw bar pull, Power required and engine characteristics, Gear ratio requirement, Motion on gradient, Performance curves.	**07**
7	**Safety Systems** Safety considerations, Active and passive systems, Components, Introduction to adaptive cruise control, Safety sensors, Automotive Industry Standards (AIS) for safety.	**05**
	Total	**45**

List of Practicals / Tutorials:

1	Demonstration and measurement of the chassis frames of a Heavy / light duty vehicle frame.
2	Demonstration of different typical car body construction.
3	Dismantling and assembling of different types of brake.
4	To perform bleeding of brake operation.
5	Dismantling and assembling of suspension system.

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6	Demonstration of steering system and measurement of steering geometry angles.
7	Dismantling and assembling of front axle.
8	Demonstration of different types of tyres and wheels.
9	To study about the performance of vehicle.
10	To prepare seminar report for any one safety system of vehicle.
11	Demonstration and measurement of the chassis frames of a Heavy / light duty vehicle frame.

Reference Books:

1	Automotive mechanics by W. Crouse, TMH.
2	Automobile Engineering Vol-I & II by Dr. K.M. Gupta.
3	Automobile Engineering, Vol-I & II by Dr. Kirpal Singh.
4	Vehicle and Engine Technology by Heinz Heizler, SAE Publications.
5	Light and Heavy Vehicle Technology, M.J. Nunney, Elsevier.
6	Newton Steeds & Garrot, Motor Vehicles, SAE International and Butterworth Heinemann.
7	Automobile engineering by GBS Narang.
8	P S Gill, Automobile Engineering Vol-II, S K Kataria & Sons.
9	Automobile Mechanics By N K Giri.
10	Automotive mechanics by W. Crouse, TMH.

Supplementary learning Material:	
1	NPTEL Resources

Pedagogy:

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

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%.

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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**	
25%	25%	25%	20%	5%	0%	

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	Understand different types of chassis frame and automobile body.	**10**
CO-2	Understand the functions of different types of brakes and suspensions.	**30**
CO-3	Understand the types steering, wheel rims and tyres with their specifications.	**30**
CO-4	Understand the performance of vehicle.	**15**
CO-5	Understand the different safety system in vehicles.	**15**

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

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