GUJARAT TECHNOLOGICAL UNIVERSITY

AUTOMOBILE ENGINEERING
AUTOMOBILE SYSTEMS
SUBJECT CODE: 2150202
B.E. 5th SEMESTER

Type of course: Advanced / application

Prerequisite: Fundamentals of I. C. Engines, Theory of Machine and Elementary of Machine Design

Rationale: Subject is designed to provide understanding about the various parts of the automobile systems. This course aims to build higher level skill to future engineers for studying different types of transmission 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 and Examination Scheme:

Teaching Scheme			Credits	Examination Marks						Total Marks
				Theory Marks			Practical Marks			
L	T	P	C	ESE (E)	PA (M)		PA (V)		PA (I)	
					PA	ALA	ESE	OEP		
4	0	2	6	70	20	10	20	10	20	150

Content:

Sr. No.	Content	Total Hrs	% Weightage
1	**Vehicle Classification and Layouts** Study various vehicle layouts as front engine and front wheel drive, front engine & rear wheel drive, rear engine & rear wheel drive, Components of transmission system, Four wheel drives	6	11%
2	**Chassis Frames and Body** Types of Chassis frames & body, Material, Unitized construction **Suspension System** Purpose, Types of suspension system, Front and rear suspension, Coil spring, Leaf spring, Torsion bars, Shock absorbers, Air and rubber suspension, Plastic suspensions, Hydro-pneumatic suspension, Independent suspension	8	14%
3	**Recent advances in Clutch and Brakes** Electromagnetic and hydraulic clutches, Lining material, Release mechanism, Fluid flywheel Function, Internal expanding brakes, Brake lining material, Properties, Calculation of braking force and shoe geometry, Hydraulic braking system, Brake oil, Bleeding of brakes, Pneumatic braking system, Vacuum brakes, Exhaust brakes, Electrical brakes, Parking brake and braking efficiency	8	14%
4	**Automatic transmission system**	10	18%

	Semi-automatic and automatic transmission system Requirements, types, Torque converter, Hydro-static and hydro-dynamic transmission, Continuously variable transmission, Belt and friction drive		
5	**Steering and Front Axle** Steering requirements, Condition for correct steering, Steering system and linkages, Steering gears, Steering geometry, Ackermann linkages, Wheel alignment, Toe-in, Toeout, Caster, Camber, Under steer and over steer conditions, Power steering, Steering wheel shimmy, Types of front axle, Elliot & reverse elliot type **Drive line and Axles** Propellers shaft, Types of drive as torque tube and hotch kiss drive, Final drive types, Bevel, Hypoid, Worm and worm wheel, Type of drive axles & differential, Fully or semi floating and three quarter floating, Dead axle	15	27%
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 **Wheels and Tyres** Types of wheel rims, Tread patterns, Types of tyres, Cross ply, Radial & tubeless tyres, Specifications of tyres	9	16%

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks				
R Level	U Level	A Level	N Level	E Level
15	16	15	14	10

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

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.

Reference Books:

1. Automotive mechanics by W. Crouse, - TMH.
2. Automobile Engineering Vol-I & II Dr. K.M. Gupta
3. Automobile Engineering, Vol-I Dr. Kripal Singh.
4. Motor vehicle Newton and steed
5. Automobile engineering GBS Narang.
6. Vehicle Technology Heinz Heizler.
7. Automobile system W. Judge

Course Outcome:

After learning the course the students should be able to:

1. Understand the various vehicle classification and its layouts.
2. Understand the different types of suspension systems.
3. Understand the functions of different types of clutches and brakes.
4. Understand the types of gear boxes and transmission systems.
5. Understand the steering requirements and types of front axle.
6. Understand the performance of vehicle.
7. Understand the types of wheel rims and tyres with their specifications.

List of Experiments:

1. To study about vehicle layouts.
2. To study about different types of clutch.
3. To study about the performance of vehicle.
4. To study about the different types of gear boxes.
5. To study about rear axle, final drive and differential.
6. To study about Automatic Transmission system.
7. To study about different types of tyres and wheels.
8. To study of different types of automobile brakes.
9. To study of steering systems.
10. To study about different types of suspension system

Design based Problems (DP)/Open Ended Problem:

Group Discussion / Technical Debate on advanced topic.

ACTIVE LEARNING ASSIGNMENTS: Preparation of power-point slides, which include videos, animations, pictures, graphics for better understanding theory and practical work – The faculty will allocate chapters/ parts of chapters to groups of students so that the entire syllabus to be covered. The power-point slides should be put up on the web-site of the College/ Institute, along with the names of the students of the group, the name of the faculty, Department and College on the first slide. The best three works should submit to GTU.