Course Syllabus
Gyanmanjari Institute of Technology
Semester-5(B. Tech)

Subject: Automobile Engineering – BETME15316

Type of course: Professional Elective Courses

Prerequisite: Thermal engineering

Rationale: This course provides a comprehensive understanding of automobile engineering by covering vehicle structure, dynamics, power transmission, control systems, and modern advancements. It equips students with essential knowledge of automobile components, including chassis, suspension, steering, braking, and transmission systems, ensuring a strong foundation in vehicle performance and safety. Additionally, the integration of modern technologies such as hybrid and electric vehicles, advanced driver-assistance systems (ADAS), and electronic control units (ECUs) aligns with industry trends. By bridging fundamental engineering principles with practical applications, this course prepares students for careers in vehicle design, maintenance, and innovation in the automotive sector.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks					Total Marks
				Theory Marks		Practical Marks		CA	
CI	T	P	C	ESE	MSE	V	P	ALA	
3	0	2	4	60	30	10	20	30	150

Legends: CI-Classroom Instructions; T – Tutorial; P - Practical; C – Credit; ESE - End Semester Examination; MSE- Mid Semester Examination; V – Viva; CA - Continuous Assessment; ALA- Active Learning Activities.

Course Content:

Unit No	Course content	Hrs.	% Weightage
1	**Fundamentals of Automobiles** **Introduction to Automobiles:** Classification and Specifications, General Layout of Automobile Chassis (Types & Arrangements), Body Construction: Types, Materials & Functional Requirements, Body Trim, Fittings & Safety Considerations **Vehicle Dynamics & Load Analysis:** Forces Acting on a Moving Vehicle, Transmission Efficiency & Factors Affecting It, Rolling Resistance, Grade Resistance & Tractive Force, Weight Transfer & Stability on Curves	11	25
2	**Power Transmission & Drive train** **Clutch System:** Types: Single Plate, Multi-Plate, Centrifugal, Semi-Centrifugal: Surface Area & Plate Calculation **Transmission Systems:** Gearboxes: Sliding Mesh, Constant Mesh, Synchromesh, Four-Wheel Drive System **Drive train & Final Drive:** Propeller Shaft, Universal Joints, Hotchkiss & Torque Tube Drive, Front & Rear Drive Shaft: Types & Construction, Differential Gearbox & Rear Axle **Automatic Transmission & CVT:** Working Principles, Faults & Diagnosis	12	25
3	**Vehicle Control Systems:** **Axle & Suspension System:** Front & Rear Axle: Types, Construction & Functions, Suspension System: Types, Design Considerations & Force Analysis, Spring Types, Rubber & Air Suspensions, Roll Centre & Kinematic Analysis **Steering System** Steering Layout & Mechanisms, Steering Geometry: Camber, Caster, KPI, Toe-In/Toe-Out, Power-Assisted Steering, Wheel Alignment & Fault Diagnosis **Brake System** Braking Fundamentals: Distance, Efficiency, Skidding, Proportioning, Hydraulic & Power-Assisted Brakes, ABS & EBD: Features, Advantages & Fault Diagnosis	12	25

4	**Wheels, Electricals & Modern Automobiles** **Wheels & Tyres** Types of Wheels & Tyres, Tyre Construction, Tread Pattern, Wear & Maintenance **Electrical & Safety Systems** Engine Control Unit, Monitoring & Instrumentation, Lighting, Gauges, Wipers, Speedometer, Odometer, Active & Passive Safety Systems: Airbags, Seatbelts, ESC, TPMS, BSD **Modern Automobiles** Electric & Hybrid Vehicle Layout, Hybrid Types, Batteries, Electric Motors & Regenerative Braking	10	25

Continuous Assessment:

Sr. No	Active Learning Activities	Marks
1	**Vehicle Component Identification** Inspect a real vehicle or model and identify key components such as chassis, suspension, transmission, and braking system & prepare Labeled diagram or images with descriptions of identified vehicle components. Upload report on the GMIU web portal.	10
2	**Clutch Plate Inspection & Wear Analysis** Inspect and measure the thickness of clutch plates to determine wear and suggest replacement criteria. Inspection report with images, measurements, and recommendations. Upload report on the GMIU web portal.	10
3	**Presentations** Faculty will assign a topic for presentation to promote independent learning and communication skills. Upload presentation on the GMIU web portal.	10
	Total	30

Suggested Specification table with Marks (Theory):60

Distribution of Theory Marks (Revised Bloom's Taxonomy)						
Level	**Remembrance (R)**	**Understanding (U)**	**Application (A)**	**Analyze (N)**	**Evaluate (E)**	**Create (C)**
Weightage	15%	25%	30%	20%	10%	-

Course Outcome:

After learning the course, the students should be able to:	
CO1	Explain automobile classification, chassis layout, body construction, and analyze vehicle dynamics and stability.
CO2	Describe power transmission systems, including clutches, gearboxes, differentials, and automatic/CVT transmissions.
CO3	Analyze steering, suspension, and braking systems for vehicle control, stability, and safety.
CO4	Identify wheel and tyre characteristics, safety systems, and advancements in electric and hybrid vehicles.

List of Practical:

Sr. No	Descriptions	Unit No	Hrs.
1	**Study of Automobile Components**: Identify and explain key components of an automobile (chassis, body, transmission, suspension, etc.).	1	2
2	**Load Transfer & Weight Distribution Analysis**: Measure and analyze load transfer under different driving conditions.	1	4
3	**Clutch Assembly & Disassembly:** Understand clutch construction, working, and wear analysis.	2	2
4	**Gearbox Mechanism Demonstration:** Study the working of sliding mesh, constant mesh, and synchromesh gearboxes.	2	2
5	**Steering System Inspection & Wheel Alignment:** Measure and adjust toe-in, toe-out, camber, and caster angles.	3	4
6	**Brake System Inspection & Testing:** Inspect braking components and measure braking efficiency.	3	2
7	**Suspension System Fault Diagnosis:** Identify faults in leaf spring, coil spring, and shock absorber systems.	3	2
8	**Tyre Inspection & Pressure Measurement:** Check tyre tread depth, pressure, and analyze tyre wear patterns.	4	4
9	**Battery Testing & Charging System Analysis**: Use a multimeter to test battery voltage, charging system, and diagnose faults.	4	4
10	**OBD-II Scanner & Vehicle Fault Code Diagnosis**: Connect an OBD-II scanner, retrieve fault codes, and interpret vehicle issues.	4	4
		Total	30

Instructional Method:

The course delivery method will depend upon the requirement of content and need of students. The teacher in addition to conventional teaching method by black board, may also use any of tools such as demonstration, role play, Quiz, brainstorming, MOOCs etc.

Students will use supplementary resources such as online videos, NPTEL/SWAYAM videos, e-courses, Virtual Laboratory
The internal evaluation will be done on the basis of Active Learning Assignment
Practical/Viva examination will be conducted at the end of semester for evaluation of performance of students in laboratory.

Reference Books:

[1] Automobile Engineering by Kirpal Singh, Standard Publishers Distributors.

[2] A Textbook of Automobile Engineering by R.K. Rajput, Laxmi Publications.

[3] Automobile Mechanics by N.K. Giri, Khanna Publishers.

[4] Automobile Engineering by Dr. K. Newton, W. Steeds, T.K. Garrett, Pearson Education.

[5] Automobile Engineering Vol. 1 & 2 by C.P. Nakra, Dhanpat Rai Publications.

[6] Automotive Mechanics by William H. Crouse & Donald L. Anglin, McGraw-Hill Education.