



GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering

Subject Code: 3160214

Semester – VI

Subject Name: VEHICLE TESTING AND HOMOLOGATION

Type of course: Professional Core

Prerequisite: Zeal to learn the subject

Rationale: This subject will give preliminary idea regarding some of the practices and standards followed in automobile industry for their testing and homologation.

Teaching and Examination Scheme:

Teaching Scheme			Credits C	Examination Marks				Total Marks
L	T	P		Theory Marks		Practical Marks		
			ESE (E)	PA (M)	ESE (V)	PA (I)		
3	0	2	4	70	30	30	20	150

Content:

Sr. No.	Content	Total Hrs
1	Introduction: Need of vehicle testing and homologation, Vehicle testing organizations, Hierarchy of testing: Individual component approval, System level approval and Whole vehicle approval. Type Approval & Conformity of Production tests, Approval for Safety systems(Active & Passive).	3
2	Engine ,Fuel systems and Emissions Testing: Laboratory testing of basic engine parameters: Measurement of BHP, IHP, Engine testing on dynamometers, different types of dynamometers hydraulic, eddy current etc., engine analyzers- for petrol and diesel engines, FIP calibrating and testing. Emission test for CO, HC, NOx, CO2, PM, etc. using exhaust gas analyzers, Spectroscopic methods, NDIR (Non Dispersive Infrared), FID (Flame Ionization Detector), Chemiluminescent analyzers, Gas Chromatograph, Smoke meters.	6
3	Noise vibration and Harshness Testing: Standard noise measurement methods, Noise inside and outside the vehicle, sources of vehicle noise- intake and exhaust noise, combustion noise, mechanical noise, noise from auxiliaries, wind noises, transmission noises, brake squeal, structure noise, noise control methods. Pass by Noise testing method.	4
4	Vehicle Performance Testing: Methods for evaluating vehicle performance- energy consumption in conventional automobiles, performance, emission and fuel economy, Operation of full load and part load conditions. Gradability test, Turning circle diameter test, Steering Impact test, Steering effort test. Road and track testing: Maximum speed and acceleration, brake testing, lane changing, handling and ride characteristics. Track testing on Multi Friction Braking Track, High Speed Track, Wet skid pad, Test slopes, External noise test track, Accelerated fatigue track, Water wade, Salt water wade, Gravel road and off road track, Dry handling circuit, Comfort track.	8
5	Vehicle testing on chassis dynamometers: Two wheel & four wheel dynamometers, vehicle	7



GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering

Subject Code: 3160214

	testing lanes - side slip testers, Emission testing on Chassis dynamometer ,Climate chamber tests. Emission testing on chassis dynamometers, Driving Cycles- USA, Japan, Euro and India. Test procedures – European driving cycles, Modified Indian Driving Cycle, SHED (Sealed Housing for. Evaporative Determination) Test on chassis dynamometers.	
6	Automobile testing standards: Introduction, overview and study of testing standards like; AIS testing standards, Euro Standards, SAE standards. ISO26262 standards for functional safety of electrical and/or electronic systems in automobiles. Understanding of some AIS Standards: AIS-008 (Installation requirements of lighting and light-signaling devices for motor vehicles having more than three wheels, trailer and semi-Trailer excluding agricultural tractor and special purpose vehicles), AIS-018:2001 (Automotive Vehicles - Speed limitation Devices – Specifications), AIS-037 (Procedure for Type Approval and establishing conformity of production for safety of critical components), AIS093 (Code of practice for construction and approval of truck cabs & truck bodies), AIS-003 (Automotive Vehicles - Starting Gradeability -Method of Measurement and Requirements), AIS-038 (Battery Operated Vehicles – Requirements for Construction and Functional Safety).	14

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
15	15	15	10	15	-

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. Raymond M. Brach and R. Matthew Brach, "Vehicle Accident Analysis and Reconstruction Methods", SAE International, 2011
2. J. G. Giles – Vehicle operation and performance, Wildlife Publications, London, 1969.
3. W. H. Crouse and L. Anglin – Motor vehicle inspection, McGraw Hill Book Co. 1978.
4. Dr. N.K.Giri- Automotive technology – Khanna publishers, 2009
5. Ulrich Seiffert and Lothar Wech, “Automotive Safety Handbook”, SAE International, 2007
6. ISO Standards, ICS: 43.020, 43.040, 43.100
7. Indian emission Standards.



GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering

Subject Code: 3160214

Course Outcomes:

Sr. No.	CO statement	Marks % weightage
CO-1	Understand the need of vehicle testing and homologation.	10
CO-2	Apply fundamental knowledge to measure the emissions and calculate the vehicle performance with reference to standard reference conditions.	17
CO-3	Identify the testing procedures of evaluating the vehicle performance, road test and track test.	23
CO-4	Understand standard procedures for vehicle certification and approval as per rules and regulations.	25
CO-5	Interpret and understand various automotive testing standards.	25

List of Experiments:

1. To study the performance and emission characteristics of automobile Petrol engines with Gasoline and CNG,LPG.
2. To study the performance and emission characteristics of automobile Diesel engines with Diesel and BioDiesel.
3. To study the performance characteristics of Hybrid Electric vehicles.
4. Calibration of fuel injection pump and testing, Calibration of injectors Petrol and Diesel Engines.
5. Measurement of Brake stopping distance.
6. Vehicle testing on chassis dynamometers.
7. Gradability test.
8. Turning circle diameter test.
9. Measurement of steering effort.
10. Pass by noise test.

List of Open Source Software/learning website: <https://nptel.ac.in/course.php>