

# B.E Semester: 6 Automobile Engineering

Subject Name: Instrumentation and Vehicle Testing for Automobile(AE605-N-C)

[Dept. Elect.-2]

## A. Course Objective:

- To present a problem oriented in depth knowledge of Instrumentation and testing for automobile.
- Newly designed automobiles or automobile models are to be tested thoroughly for its performance and safety before it reaches to the users.
- To address the underlying concepts and methods behind Instrumentation and testing for automobile.
- It is mandatory to get approval for export of automobile products or its components.
- This subject will give preliminary idea regarding some of the practices and standards followed in automobile industry for their testing.

## B. Teaching / Examination Scheme:

Teaching Scheme				Total Credit	Evaluation Scheme					
L	T	P	Total		Theory		Mid Sem Exam	CIA	Pract.	Total
Hrs	Hrs	Hrs	Hrs		Hrs	Marks	Marks	Marks	Marks	Marks
3	0	2	5	4	3	70	30	20	30	150

## C. Detailed Syllabus:

Unit No.	Details
1	<b>Introduction of Automobile System</b> Current trends in automobiles with emphasis on increasing role of electronics and software, overview of generic automotive control ECU functioning, overview of typical automotive subsystems and components, AUTOSAR.
2	<b>Electronic Engine managements Systems.</b> Basic sensor arrangement, types of sensors such as oxygen sensors, crank angle position sensors, Fuel metering/ vehicle speed sensors, flow sensor, temperature, air mass flow sensors, throttle position sensor, solenoids etc., algorithms for engine control including open loop and closed loop control system, electronic ignition, EGR for exhaust emission control.
3	<b>Vehicle Performance Testing</b> Methods for evaluating vehicle performance- energy consumption in conventional automobiles, performance, emission and fuel economy, Operation of full load and part load conditions, effect of vehicle condition, tyre and road condition and traffic condition and driving habits on fuel economy, Gradability test, Turning circle diameter test, maximum speed and acceleration, brake testing on the road, hill climbing, handling and ride characteristics, safety, mechanism of corrosion, three chamber corrosion testing, wind tunnel testing, road testing, test tracks, Steering Impact test, Steering effort test.
4	<b>Noise vibration and Harshness Testing</b> Review of vibration fundamentals, vibration control, fundamentals of acoustics, human response to sound, automotive noise criteria, 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
5	<b>Active and Passive Safety System Testing</b> Body electronics including lighting control, remote keyless entry, immobilizers etc., electronic instrument clusters and dashboard electronics, aspects of hardware design for automotive including electro-magnetic interference suppression, electromagnetic compatibility etc., (ABS) antilock braking system, (ESP) electronic stability 08 16 program, air bags.
6	<b>ISI codes for Testing Automotive Engines</b> Laboratory dynamometer testing systems of power train and vehicle under simulated conditions; Instrumentation for testing vehicles; road test of automobile vehicles; wheel alignment; balancing; PUC test of vehicles; preparation of test reports, EURO standards, Bharat stages.
7	<b>Automotive Standards and Protocols</b> Automotive standards like CAN protocol, Lin protocol, flex ray, OBD-II, CAN FD, automotive Ethernet etc. Automotive standards like MISRA, functional safety standards (ISO 26262).

<b>Total hours (Theory):48</b>
<b>Total hours (Practical):32</b>
<b>Total hours:80</b>

#### D. Lesson Planning:

Sr. No.	Date/Week	Unit	Weight age	Topic No
1	1 <sup>st</sup> ,2 <sup>nd</sup> ,3 <sup>rd</sup>	Unit 1	20%	1
2	4 <sup>th</sup> .5 <sup>th</sup> ,6 <sup>th</sup>	Unit 2	20%	2
3	7 <sup>th</sup> , 8 <sup>th</sup> ,9 <sup>th</sup>	Unit 3	20%	3,4
4	10 <sup>th</sup> . 11 <sup>th</sup> . 12 <sup>th</sup>	Unit 4	20%	5
5	13 <sup>th</sup> , 14 <sup>th</sup> ,15 <sup>th</sup> ,16 <sup>th</sup>	Unit 5	20%	6,7

#### E. Instructional Method & Pedagogy

1	At the start of course, the course delivery pattern , prerequisite of the subject will be discussed
2	Lecture may be conducted with the aid of multi-media projector, black board, OHP etc. & equal Weight age should be given to all topics while teaching and conduction of all examinations.
3	Attendance is compulsory in lectures and laboratory, which may carries five marks in overall evaluation.
4	One/Two internal exams may be conducted and total/average/best of the same may be converted to equivalent of 30 marks as a part of internal theory evaluation.
5	Assignment based on course content will be given to the student for each unit/topic and will be evaluated at regular interval. It may carry an importance of ten marks in the overall internal evaluation.
6	Surprise tests/Quizzes/Seminar/Tutorial may be conducted and having share of five marks in the overall internal evaluation.
7	The course includes a laboratory, where students have an opportunity to build an appreciation for the concept being taught in lectures. Suggested list of experiment is given below

#### F. List of Practical:

1	Study of speedometer, Tachometer, Odometer, Trip odometer
2	Study of battery/ charging system lamp, low oil pressure lamp, airbag lamp
3	Study of oil pressure gauge and coolant temperature gauge
4	Study of hand-brake lamp, door ajar lamp, high beam lamp, malfunction indicator lamp/ check engine lamp
5	Study of fuel gauge and low fuel lamp
6	Study of hand brake indicator, turn light and engine service indicator
7	Study of heating and air-conditioning system of vehicle
8	Study of electronic engine management system

#### G. Students Learning Outcomes:

1	The student can identify different areas of Instrumentation for automobile.
2	Can find the applications of all the areas in day to day life.

#### H. Text Books & Reference Books:

1	Understanding Automotive Electronics by William B. Ribbens, Butterworth Heinemann Woburn, 6th ed., 2003 .
2	Sensors Applications, Sensors for Automotive Technology by Jiri Marek, Hans Peter Trah, Wiley, 1 st Edition
3	U.Kiencke, and L. Nielson, Automotive Control Systems, Springer Verlag Berlin, 2000
4	Automotive Electrical Equipment by Young A.P., Griffiths, ELBS & New Press, 1999.
5	Automotive computers and control system by Tom Weather Jr. & Cland C. Hunter, Prentice Hall Inc., New Jersey
6	Automobile Electrical Equipment by Crouse W.H., McGraw Hill Co. Inc., New York, 1995.
7	Understanding Automotive Electronic by Bechhold, SAE, 1998.
8	Automotive Hand Book by Robert Boshe, Bentely Publishers, 5th ed. Germany, 2005.