NIRMA UNIVERSITY

Institute:	**Institute of Technology**
Name of Programme:	**M. Tech. in Electrical Engineering (Electric Vehicular Technology)**
Semester:	**II**
Course Code:	**3EE3201**
Course Title:	**Vehicular Control Systems and Instrumentation**
Course Type:	(√ **Core**/ □ Value Added Course / □ Department Elective / □ Institute Elective/ □ University Elective/ □ Open Elective / □ Any other)
Year of Introduction:	**2022 – 23**

L	**T**	**Practical component**				**C**
		LPW	**PW**	**W**	**S**	
3	**0**	**2**	**-**	**-**	**-**	**4**

Course Learning Outcomes (CLOs):

At the end of the course, the students will be able to-

1. appreciate the various components of an automobile system **(BL2)**
2. analyse the control system of electric vehicle **(BL4)**
3. evaluate various safety systems associated with electric vehicle **(BL5)**
4. comprehend various sensors used in the operation of an electric vehicle **(BL5)**

Syllabus: **Teaching Hours: 45**

Unit-1: Introduction of automobile system **05**

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.

Unit-2: Engine Control system **14**

Basic Engine operation, Engine concepts, air – fuel ratio, Engine control, fuel measurement, air mass per combustion cycle, ignition angle control, Lambda control, oxygen sensor, lambda control circuit, idle speed control, energy conversion model and torque balance, knock control, knock sensors, temperature sensor, air mass flow sensor, throttle position sensor etc.

Unit-3: Vehicle control systems **15**

Electronic transmission control, adaptive power Steering, adaptive cruise control, heating and air conditioning system, traction control and electronic stability, active suspension control, yaw control, battery management system (BMS).

Unit-4: Active and Passive safety systems **11**

Body electronics including lighting control, remote keyless entry, electronic instrument clusters and dashboard electronics, electromagnetic suppression systems, anti-lock braking system (ABS), airbags

Self-Study:
The self-study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

Laboratory Experiments:
This shall consist of at least 10 experiments / simulations based on the above syllabus.

Suggested Readings:

1. Uwe Kiencke, Lars Nielsen, Automotive control systems for engine, driveline and vehicle, Springer
2. Giafranco Pistosia, Electric and Hybrid vehicles, Elsevier.
3. Bosch, Automotive Handbook, Bentley Publishers, Germany.

Suggested List of Experiments (not restricted to the following):
(Only for Information)

1. To evaluate the working of speedometer and odometer of a vehicle.
2. Demonstration of vehicle wiring and harness.
3. To understand the working of fuel gauge and low fuel lamp.
4. To understand the working of heating and air-conditioning system of vehicle (04 hours).
5. To simulate a basic battery management system. (04 hours)
6. Demonstration of battery management system. (04 hours)
7. To understand the protocols like serial and parallel communication.
8. To design a communication link using CAN bus protocol (04 hours).
9. Demonstration of cooling system actuation using thermosensitive sensor.
10. Demonstration of over current protection using hall effect sensors.

L = Lecture, T = Tutorial, P = Practical, C = Credit

w.e.f. academic year 2022 - 23 and onwards