

NIRMA UNIVERSITY

Institute:	Institute of Technology
Name of Programme:	M. Tech. in Electrical Engineering (Electric Vehicular Technology)
Semester:	II
Course Code:	3EE32D34
Course Title:	Autonomous and Connected Vehicles
Course Type:	(<input type="checkbox"/> Core/ <input type="checkbox"/> Value Added Course / <input checked="" type="checkbox"/> Department Elective / <input type="checkbox"/> Institute Elective/ <input type="checkbox"/> University Elective/ <input type="checkbox"/> Open Elective / <input type="checkbox"/> Any other)
Year of Introduction:	2022 – 23

L	T	Practical component				C
		LPW	PW	W	S	
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Course Learning Outcomes (CLOs):

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

1. classify various types of advanced driver assistance systems (BL2)
2. explain the concept of fully autonomous vehicles (BL2)
3. relate the concept of the connected vehicle and its role in ADAS and automated vehicles (BL3)
4. illustrate the sensor technology for autonomous and connected vehicles (BL3)

Syllabus:

Teaching Hours: 45

Unit-1: Connected and Autonomous Vehicle Technology 06

Basic Control System Theory, Overview of ECU operation, Concept of Cyber-Physical Control Systems, Remote Sensing Technology, Wireless Networks and Autonomy

Unit-2: Advanced Driver Assistance Systems 10

Basics of Theory of Operation, Applications, Integration of ADAS Technology into Vehicle Electronics, System Examples, Role of Sensor Data Fusion, Present ADAS Technology Examples, Troubleshooting and Maintenance of ADAS, Non-Passenger Car Advanced Driver Assistance Systems and Autonomous Operation

Unit-3: Sensor Technology for Advanced Driver Assistance Systems 12

Basics of Radar Technology and Systems, Ultrasonic Sonar Systems, Lidar Sensor Technology and Systems, Camera Technology, Night Vision Technology, Other Sensors, Use of Sensor Data Fusion, Integration of Sensor Data to On-Board Control Systems, Overview of Wireless Technology, Wireless Networking and Applications to Vehicle Autonomy

Unit-4: Autonomous Vehicles 08

Driverless Car Technology, Moral, Legal and Roadblock Issues, Technical and Security Issues, Role of Artificial Intelligence and Deep Learning in autonomous vehicles, AI-based functions in autonomous vehicles, Autonomous driving platform using cloud

Unit-5: Connected Car Technology

09

Connectivity Fundamentals, Navigation and Other Applications, Vehicle-to-Vehicle Technology and Applications, Vehicle-to-Roadside and Vehicle-to-Infrastructure Applications, Wireless Security Overview, Connected Car Display Technology, Center Console Technology, Gauge Cluster Technology, Heads-Up Display Technology, Warning Technology – Driver Notification

Self-Study:

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

Suggested Readings:

1. Hanky Sjafrie, Introduction to Self-Driving Vehicle Technology, Chapman and Hall/CRC
2. Abdelaziz Bensrhair, Thierry Bapin, From AI to Autonomous and Connected Vehicles-Advanced Driver-Assistance Systems (ADAS', Wiley-ISTE
3. Nyle Phillips, Autonomous Vehicles-Safety Deployment and Effect of Infrastructure, Nova Science Publishers, Inc.
4. Shaoshan Liu, Liyun Li, Jie Tang, Shuang Wu, Jean-Luc Gaudiot, Creating Autonomous Vehicle Systems, Morgan & Claypool Publishers
5. Thor I. Fossen, Kristin Y. Pettersen, Henk Nijmeijer, Sensing and Control for Autonomous Vehicles-Applications to Land, Water and Air Vehicles, Springer
6. Radovan Miucic, Connected Vehicles-Intelligent Transportation Systems, Springer
7. Autonomous Vehicle Technology Report, Wevolver

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

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