



# Fundamentals of Connected Vehicle (V2X) Technology

Unit Code: ASC/N8117

Version: 1.0

NSQF Level: 5.5

Automotive Skills Development Council || 153, GF, Okhla Industrial Area, Phase 3  
New Delhi 110020 || email:garima@asdc.org.in

## Description

This NOS unit is about preparing for the highly disruptive technology of connected vehicles and the emerging market of future mobility. This NOS unit is about designing smart systems for communication between vehicle and everything around (V2X). Its also about skilling on designing fail-safe systems with an understanding of associated hazards and the methodical risk mitigation process in vehicle development

## Scope

The scope covers the following :

- Prepare on connected vehicle technology (V2X) and automation in transportation
- Designing of smart system in vehicles and for traffic management solutions
- Analysis of the inherent hazards of connected vehicles and the risk mitigation process

## Elements and Performance Criteria

### *Prepare on connected vehicle technology (V2X) and automation in transportation*

To be competent, the user/individual on the job must be able to:

- PC1.** Understand the systems that are dynamically functional in all the vehicle sub-systems
- PC2.** Study all types of information exchangeable digitally with things around
- PC3.** Examine the evolving transportation methods and traffic systems
- PC4.** Review the emerging trends in communication protocols
- PC5.** Review the matured technologies in V2X and successful tools in Product Engineering (PE)
- PC6.** Explore all types of V2X technology - V2V, V2I, V2C, V2P, V2D, V2N, V2G (Vehicle-to-Vehicle, Infrastructure, Cloud, Pedestrian, Device, Network, Grid)

### *Designing of smart system in vehicles and for traffic management solutions*

To be competent, the user/individual on the job must be able to:

- PC7.** Examine the configurations of hardware in connected vehicles and smart systems
- PC8.** Analyse the software algorithms to create-control-correct connectivity for smart mobility
- PC9.** Learn technology aided systems - computer vision, LIDAR, informatics, GPS, Ethernet-connected-Vehicle (EcV) and the like deployed in smart mobility
- PC10.** Explore applications of Internet of Vehicles (IoV), embedded systems, ECUs, etc in transportation and traffic management
- PC11.** Analyse operation of systems as per safety standards - error-free, bug-free, risk-free
- PC12.** Study advanced diagnostic systems like on-board diagnostics, remote-repair, digital-twinning, etc.

### *Deployment of safety standards in Vehicle Development Process (VDP)*

To be competent, the user/individual on the job must be able to:

- PC13.** Enlist critical and non-critical risks in V2X communication
- PC14.** Analyse automotive safety protocols (AUTOSAR, ISO26262, IEEE, SAE, etc) for V2X
- PC15.** Examine solutions for risk mitigation in interconnected transportation network
- PC16.** Identify systems in vehicles to check and correct errors

## Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

- KU1.** Vehicle sub-system and sub-assembly functionalities
- KU2.** Electrical/Electronic (E/E) sub-system and functions of sub-units within
- KU3.** Basics of data generated in vehicle operation (idle to peak) and on external/ambient interfacing
- KU4.** Information communicated between connected vehicles and transportation infrastructure
- KU5.** Systems communicating between vehicles and digitally connected things around
- KU6.** Computer aided tools to design-develop-analyse smart systems
- KU7.** Working principles of equipments/systems like LIDAR, computer vision, GPS
- KU8.** Basics of operation of digital systems like IoV, EcV, etc
- KU9.** Automotive safety standards applicable to digitally connected transportation systems
- KU10.** Hazards of vehicle system malfunctioning and communication breakdown or hijacking

### **Generic Skills (GS)**

User/individual on the job needs to know how to:

- GS1.** read and interpret notes, designs and instructions shared by various teams internal/external
- GS2.** follow instructions, guidelines, procedures, rules, and service level agreements/contracts
- GS3.** listen & comprehend accurately and communicate smoothly with the supervisor/team-mates
- GS4.** follow rule-based decision-making process and make judgments for positive business impact
- GS5.** imbibe the work culture, recognise workplace problems correctly and take suitable actions
- GS6.** analyse aptly all information gathered from observation, experience, explanation, literature
- GS7.** plan and organise the work to achieve targets and meet deadlines
- GS8.** apply problem-solving approaches to different situations appropriately
- GS9.** act with attention-to-detail, being first-time-right, for on-time-delivery
- GS10.** exchange technical information clearly using proper language and manage data per protocol

## Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
<i>Prepare on connected vehicle technology (V2X) and automation in transportation</i>	<b>10</b>	<b>6</b>	-	<b>6</b>
<b>PC1.</b> Understand the systems that are dynamically functional in all the vehicle sub-systems	2	-	-	1
<b>PC2.</b> Study all types of information exchangeable digitally with things around	2	-	-	1
<b>PC3.</b> Examine the evolving transportation methods and traffic systems	1	-	-	1
<b>PC4.</b> Review the emerging trends in communication protocols	1	-	-	1
<b>PC5.</b> Review the matured technologies in V2X and successful tools in Product Engineering (PE)	2	3	-	1
<b>PC6.</b> Explore all types of V2X technology - V2V, V2I, V2C, V2P, V2D, V2N, V2G (Vehicle-to-Vehicle, Infrastructure, Cloud, Pedestrian, Device, Network, Grid)	2	3	-	1
<i>Designing of smart system in vehicles and for traffic management solutions</i>	<b>14</b>	<b>29</b>	-	<b>10</b>
<b>PC7.</b> Examine the configurations of hardware in connected vehicles and smart systems	2	4	-	2
<b>PC8.</b> Analyse the software algorithms to create-control-correct connectivity for smart mobility	2	4	-	2
<b>PC9.</b> Learn technology aided systems - computer vision, LIDAR, informatics, GPS, Ethernet-connected-Vehicle (EcV) and the like deployed in smart mobility	2	5	-	2
<b>PC10.</b> Explore applications of Internet of Vehicles (IoV), embedded systems, ECUs, etc in transportation and traffic management	2	5	-	1
<b>PC11.</b> Analyse operation of systems as per safety standards - error-free, bug-free, risk-free	3	7	-	2
<b>PC12.</b> Study advanced diagnostic systems like on-board diagnostics, remote-repair, digital-twinning, etc.	3	4	-	1

<b>Assessment Criteria for Outcomes</b>	<b>Theory Marks</b>	<b>Practical Marks</b>	<b>Project Marks</b>	<b>Viva Marks</b>
<i>Deployment of safety standards in Vehicle Development Process (VDP)</i>	<b>6</b>	<b>15</b>	-	<b>4</b>
<b>PC13.</b> Enlist critical and non-critical risks in V2X communication	2	5	-	1
<b>PC14.</b> Analyse automotive safety protocols (AUTOSAR, ISO26262, IEEE, SAE, etc) for V2X	2	3	-	1
<b>PC15.</b> Examine solutions for risk mitigation in interconnected transportation network	1	5	-	1
<b>PC16.</b> Identify systems in vehicles to check and correct errors	1	2	-	1
<b>NOS Total</b>	<b>30</b>	<b>50</b>	-	<b>20</b>

**National Occupational Standards (NOS) Parameters**

<b>NOS Code</b>	ASC/N8117
<b>NOS Name</b>	Fundamentals of Connected Vehicle (V2X) Technology
<b>Sector</b>	Automotive
<b>Sub-Sector</b>	Research & Development
<b>Occupation</b>	Automotive Product Designing
<b>NSQF Level</b>	5.5
<b>Credits</b>	2
<b>Minimum Educational Qualification &amp; Experience</b>	Completed 2nd year of UG (UG Diploma) (In trades: Manufacturing/Mechanical/Automobile/Electrical/Electronics or relevant ) with 1-2 Years of experience OR Pursuing 3rd year of UG (In trades: Manufacturing/Mechanical/Automobile/Electrical/Electronics or relevant )
<b>Version</b>	1.0
<b>Last Reviewed Date</b>	NA
<b>Next Review Date</b>	NA
<b>CCN Category</b>	1