



# Advanced Driver Assistance System (ADAS) Engineer

QP Code: ASC/Q8311

Version: 1.0

NSQF Level: 5.5

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## ASC/Q8311: Advanced Driver Assistance System (ADAS) Engineer

### Brief Job Description

The incumbent in the job is responsible for designing and developing the ADAS and its substitute systems. He/She also define design standards, guidelines and carryover strategies, review test cases for integration and system testing, prepare test scenarios, test environment and test data, review defects identified in the tests and design closure, prepare process document which would lead to improvement in the quality of validation etc

### Personal Attributes

The person should be result oriented with good technical and analytical skills, should have Excellent Interpersonal Skills, communication and presentation skills and a good team player. They should have ability to manage projects, prioritizing of work and mentoring the budding engineers

### Applicable National Occupational Standards (NOS)

#### Compulsory NOS:

1. [ASC/N9810: Manage work and resources \(Manufacturing\)](#)
2. [DGT/VSQ/N0103: Employability Skills \(90 Hours\)](#)
3. [ASC/N8339: Development of ADAS system](#)
4. [ASC/N8340: Implementation of ADAS system](#)

### Qualification Pack (QP) Parameters

<b>Sector</b>	Automotive
<b>Sub-Sector</b>	Research & Development
<b>Occupation</b>	Automotive Product Development
<b>Country</b>	India
<b>NSQF Level</b>	5.5
<b>Credits</b>	21
<b>Aligned to NCO/ISCO/ISIC Code</b>	NCO-2015/9122.0301

<b>Minimum Educational Qualification &amp; Experience</b>	Completed 3 year diploma after 10th (Mechanical/Automobile/ Electrical / Electronics) with 3 Years of experience in relevant field OR B.E./B.Tech (Pursuing 4th year) OR Certificate-NSQF (Electric Vehicle Product Design Engineer Level 5) with 2 Years of experience in relevant field
<b>Minimum Level of Education for Training in School</b>	
<b>Pre-Requisite License or Training</b>	NA
<b>Minimum Job Entry Age</b>	22 Years
<b>Last Reviewed On</b>	28th Feb 2023
<b>Next Review Date</b>	28th Feb 2026
<b>NSQC Approval Date</b>	28th Feb 2023
<b>Version</b>	1.0

## ASC/N9810: Manage work and resources (Manufacturing)

### Description

This NOS unit is about implementing safety, planning work, adopting sustainable practices for optimising the use of resources.

### Scope

The scope covers the following :

- Maintain safe and secure working environment
- Maintain Health and Hygiene
- Effective waste management practices
- Material/energy conservation practices

### Elements and Performance Criteria

#### *Maintain safe and secure working environment*

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

- PC1.** identify hazardous activities and the possible causes of risks or accidents in the workplace **PC2.** implement safe working practices for dealing with hazards to ensure safety of self and others
- PC3.** conduct regular checks of the machines with support of the maintenance team to identify potential hazards
- PC4.** ensure that all the tools/equipment/fasteners/spare parts are arranged as per specifications/utility into proper trays, cabinets, lockers as mentioned in the 5S guidelines/work instructions
- PC5.** organise safety drills or training sessions to create awareness amongst others on the identified risks and safety practices
- PC6.** fill daily check sheet to report improvements done and risks identified
- PC7.** ensure that relevant safety boards/signs are placed on the shop floor for the safety of self and others
- PC8.** report any identified breaches in health, safety and security policies and procedures to the designated person

#### *Maintain Health and Hygiene*

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

- PC9.** ensure workplace, equipment, restrooms etc. are sanitized regularly
- PC10.** ensure team is aware about hygiene and sanitation regulations and following them on the shop floor
- PC11.** ensure availability of running water, hand wash and alcohol-based sanitizers at the workplace
- PC12.** report advanced hygiene and sanitation issues to appropriate authority
- PC13.** follow stress and anxiety management techniques and support employees to cope with stress, anxiety etc
- PC14.** wear and dispose PPEs regularly and appropriately

#### *Effective waste management practices*

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

**PC15.** ensure recyclable, non-recyclable and hazardous wastes are segregated as per SOP

**PC16.** ensure proper mechanism is followed while collecting and disposing of non-recyclable, recyclable and reusable waste

*Material/energy conservation practices*

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

**PC17.** ensure malfunctioning (fumes/sparks/emission/vibration/noise) and lapse in maintenance of equipment are resolved effectively

**PC18.** prepare and analyze material and energy audit reports to decipher excessive consumption of material and water

**PC19.** identify possibilities of using renewable energy and environment friendly fuels

**PC20.** identify processes where material and energy/electricity utilization can be optimized

### **Knowledge and Understanding (KU)**

The individual on the job needs to know and understand:

**KU1.** organisation procedures for health, safety and security, individual role and responsibilities in this context

**KU2.** the organisation's emergency procedures for different emergency situations and the importance of following the same

**KU3.** evacuation procedures for workers and visitors

**KU4.** how and when to report hazards as well as the limits of responsibility for dealing with hazards

**KU5.** potential hazards, risks and threats based on the nature of work

**KU6.** various types of fire extinguisher

**KU7.** various types of safety signs and their meaning

**KU8.** appropriate first aid treatment relevant to different condition e.g. bleeding, minor burns, eye injuries etc.

**KU9.** relevant standards, procedures and policies related to 5S followed in the company

**KU10.** the various materials used and their storage norms

**KU11.** importance of efficient utilisation of material and water

**KU12.** basics of electricity and prevalent energy efficient devices

**KU13.** common practices of conserving electricity

**KU14.** common sources and ways to minimize pollution

**KU15.** categorisation of waste into dry, wet, recyclable, non-recyclable and items of single-use plastics

**KU16.** waste management techniques

**KU17.** significance of greening

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

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

- GS1.** read safety instructions/guidelines
- GS2.** modify work practices to improve them
- GS3.** work with supervisors/team members to carry out work related tasks
- GS4.** complete tasks efficiently and accurately within stipulated time
- GS5.** inform/report to concerned person in case of any problem
- GS6.** make timely decisions for efficient utilization of resources
- GS7.** write reports such as accident report, in at least English/regional language

## Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
<i>Maintain safe and secure working environment</i>	<b>20</b>	<b>13</b>	-	<b>8</b>
<b>PC1.</b> identify hazardous activities and the possible causes of risks or accidents in the workplace	4	2	-	2
<b>PC2.</b> implement safe working practices for dealing with hazards to ensure safety of self and others	3	1	-	2
<b>PC3.</b> conduct regular checks of the machines with support of the maintenance team to identify potential hazards	2	2	-	1
<b>PC4.</b> ensure that all the tools/equipment/fasteners/spare parts are arranged as per specifications/utility into proper trays, cabinets, lockers as mentioned in the 5S guidelines/work instructions	3	2	-	1
<b>PC5.</b> organise safety drills or training sessions to create awareness amongst others on the identified risks and safety practices	2	-	-	-
<b>PC6.</b> fill daily check sheet to report improvements done and risks identified	2	2	-	-
<b>PC7.</b> ensure that relevant safety boards/signs are placed on the shop floor for the safety of self and others	2	2	-	1
<b>PC8.</b> report any identified breaches in health, safety and security policies and procedures to the designated person	2	2	-	1
<i>Maintain Health and Hygiene</i>	<b>13</b>	<b>7</b>	-	<b>5</b>
<b>PC9.</b> ensure workplace, equipment, restrooms etc. are sanitized regularly	3	2	-	1
<b>PC10.</b> ensure team is aware about hygiene and sanitation regulations and following them on the shop floor	2	1	-	-
<b>PC11.</b> ensure availability of running water, hand wash and alcohol-based sanitizers at the workplace	2	2	-	1
<b>PC12.</b> report advanced hygiene and sanitation issues to appropriate authority	1	1	-	1



Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC13. follow stress and anxiety management techniques and support employees to cope with stress, anxiety etc	2	1	-	1
PC14. wear and dispose PPEs regularly and appropriately	3	-	-	1
<i>Effective waste management practices</i>	<b>6</b>	<b>4</b>	-	<b>1</b>
PC15. ensure recyclable, non-recyclable and hazardous wastes are segregated as per SOP	3	2	-	-
PC16. ensure proper mechanism is followed while collecting and disposing of non-recyclable, recyclable and reusable waste	3	2	-	1
<i>Material/energy conservation practices</i>	<b>11</b>	<b>6</b>	-	<b>6</b>
PC17. ensure malfunctioning (fumes/sparks/emission/vibration/noise) and lapse in maintenance of equipment are resolved effectively	2	2	-	1
PC18. prepare and analyze material and energy audit reports to decipher excessive consumption of material and water	3	2	-	1
PC19. identify possibilities of using renewable energy and environment friendly fuels	3	1	-	2
PC20. identify processes where material and energy/electricity utilization can be optimized	3	1	-	2
<b>NOS Total</b>	<b>50</b>	<b>30</b>	-	<b>20</b>

## National Occupational Standards (NOS) Parameters

<b>NOS Code</b>	ASC/N9810
<b>NOS Name</b>	Manage work and resources (Manufacturing)
<b>Sector</b>	Automotive
<b>Sub-Sector</b>	Generic
<b>Occupation</b>	Generic
<b>NSQF Level</b>	5
<b>Credits</b>	2
<b>Version</b>	2.0
<b>Last Reviewed Date</b>	31/08/2021
<b>Next Review Date</b>	31/08/2024
<b>NSQC Clearance Date</b>	31/08/2021

## DGT/VSQ/N0103: Employability Skills (90 Hours)

### Description

This unit is about employability skills, Constitutional values, becoming a professional in the 21st Century, digital, financial, and legal literacy, diversity and Inclusion, English and communication skills, customer service, entrepreneurship, and apprenticeship, getting ready for jobs and career development.

### Scope

The scope covers the following :

- Introduction to Employability Skills
- Constitutional values - Citizenship
- Becoming a Professional in the 21st Century
- Basic English Skills
- Career Development & Goal Setting
- Communication Skills
- Diversity & Inclusion
- Financial and Legal Literacy
- Essential Digital Skills
- Entrepreneurship
- Customer Service
- Getting ready for Apprenticeship & Jobs

### Elements and Performance Criteria

#### *Introduction to Employability Skills*

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

- PC1.** understand the significance of employability skills in meeting the current job market requirement and future of work
- PC2.** identify and explore learning and employability relevant portals
- PC3.** research about the different industries, job market trends, latest skills required and the available opportunities

#### *Constitutional values – Citizenship*

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

- PC4.** recognize the significance of constitutional values, including civic rights and duties, citizenship, responsibility towards society etc. and personal values and ethics such as honesty, integrity, caring and respecting others, etc.
- PC5.** follow environmentally sustainable practices

#### *Becoming a Professional in the 21st Century*

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

- PC6.** recognize the significance of 21st Century Skills for employment
- PC7.** practice the 21st Century Skills such as Self-Awareness, Behaviour Skills, time management, critical and adaptive thinking, problem-solving, creative thinking, social and cultural awareness, emotional awareness, learning to learn for continuous learning etc. in personal and professional life

**PC8.** adopt a continuous learning mindset for personal and professional development

*Basic English Skills*

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

**PC9.** use basic English for everyday conversation in different contexts, in person and over the telephone

**PC10.** read and understand routine information, notes, instructions, mails, letters etc. written in English

**PC11.** write short messages, notes, letters, e-mails etc. in English

*Career Development & Goal Setting*

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

**PC12.** identify career goals based on the skills, interests, knowledge, and personal attributes

**PC13.** prepare a career development plan with short- and long-term goals

*Communication Skills*

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

**PC14.** follow verbal and non-verbal communication etiquette while communicating in professional and public settings

**PC15.** use active listening techniques for effective communication

**PC16.** communicate in writing using appropriate style and format based on formal or informal requirements

**PC17.** work collaboratively with others in a team

*Diversity & Inclusion*

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

**PC18.** communicate and behave appropriately with all genders and PwD

**PC19.** escalate any issues related to sexual harassment at workplace according to POSH Act

*Financial and Legal Literacy*

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

**PC20.** identify and select reliable institutions for various financial products and services such as bank account, debit and credit cards, loans, insurance etc.

**PC21.** carry out offline and online financial transactions, safely and securely, using various methods and check the entries in the passbook

**PC22.** identify common components of salary and compute income, expenses, taxes, investments etc

**PC23.** identify relevant rights and laws and use legal aids to fight against legal exploitation

*Essential Digital Skills*

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

**PC24.** operate digital devices and use their features and applications securely and safely

**PC25.** carry out basic internet operations by connecting to the internet safely and securely, using the mobile data or other available networks through Bluetooth, Wi-Fi, etc.

**PC26.** display responsible online behaviour while using various social media platforms

**PC27.** create a personal email account, send and process received messages as per requirement

**PC28.** carry out basic procedures in documents, spreadsheets and presentations using respective and appropriate applications

**PC29.** utilize virtual collaboration tools to work effectively

### *Entrepreneurship*

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

- PC30.** identify different types of Entrepreneurship and Enterprises and assess opportunities for potential business through research
- PC31.** develop a business plan and a work model, considering the 4Ps of Marketing Product, Price, Place and Promotion
- PC32.** identify sources of funding, anticipate, and mitigate any financial/ legal hurdles for the potential business opportunity

### *Customer Service*

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

- PC33.** identify different types of customers and ways to communicate with them
- PC34.** identify and respond to customer requests and needs in a professional manner
- PC35.** use appropriate tools to collect customer feedback
- PC36.** follow appropriate hygiene and grooming standards

### *Getting ready for apprenticeship & Jobs*

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

- PC37.** create a professional Curriculum vitae (Résumé)
- PC38.** search for suitable jobs using reliable offline and online sources such as Employment exchange, recruitment agencies, newspapers etc. and job portals, respectively
- PC39.** apply to identified job openings using offline /online methods as per requirement
- PC40.** answer questions politely, with clarity and confidence, during recruitment and selection
- PC41.** identify apprenticeship opportunities and register for it as per guidelines and requirements

## **Knowledge and Understanding (KU)**

The individual on the job needs to know and understand:

- KU1.** need for employability skills and different learning and employability related portals
- KU2.** various constitutional and personal values
- KU3.** different environmentally sustainable practices and their importance
- KU4.** Twenty first (21st) century skills and their importance
- KU5.** how to use English language for effective verbal (face to face and telephonic) and written communication in formal and informal set up
- KU6.** importance of career development and setting long- and short-term goals
- KU7.** about effective communication
- KU8.** POSH Act
- KU9.** Gender sensitivity and inclusivity
- KU10.** different types of financial institutes, products, and services
- KU11.** components of salary and how to compute income and expenditure
- KU12.** importance of maintaining safety and security in offline and online financial transactions
- KU13.** different legal rights and laws
- KU14.** different types of digital devices and the procedure to operate them safely and securely
- KU15.** how to create and operate an e- mail account

**KU16.** use applications such as word processors, spreadsheets etc.

**KU17.** how to identify business opportunities

**KU18.** types and needs of customers

**KU19.** how to apply for a job and prepare for an interview

**KU20.** apprenticeship scheme and the process of registering on apprenticeship portal

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

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

**GS1.** read and write different types of documents/instructions/correspondence in English and other languages

**GS2.** communicate effectively using appropriate language in formal and informal settings

**GS3.** behave politely and appropriately with all to maintain effective work relationship

**GS4.** how to work in a virtual mode, using various technological platforms

**GS5.** perform calculations efficiently

**GS6.** solve problems effectively

**GS7.** pay attention to details

**GS8.** manage time efficiently

**GS9.** maintain hygiene and sanitization to avoid infection

## Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
<i>Introduction to Employability Skills</i>	1	1	-	-
<b>PC1.</b> understand the significance of employability skills in meeting the current job market requirement and future of work	-	-	-	-
<b>PC2.</b> identify and explore learning and employability relevant portals	-	-	-	-
<b>PC3.</b> research about the different industries, job market trends, latest skills required and the available opportunities	-	-	-	-
<i>Constitutional values – Citizenship</i>	1	1	-	-
<b>PC4.</b> recognize the significance of constitutional values, including civic rights and duties, citizenship, responsibility towards society etc. and personal values and ethics such as honesty, integrity, caring and respecting others, etc.	-	-	-	-
<b>PC5.</b> follow environmentally sustainable practices	-	-	-	-
<i>Becoming a Professional in the 21st Century</i>	1	3	-	-
<b>PC6.</b> recognize the significance of 21st Century Skills for employment	-	-	-	-
<b>PC7.</b> practice the 21st Century Skills such as Self-Awareness, Behaviour Skills, time management, critical and adaptive thinking, problem-solving, creative thinking, social and cultural awareness, emotional awareness, learning to learn for continuous learning etc. in personal and professional life	-	-	-	-
<b>PC8.</b> adopt a continuous learning mindset for personal and professional development	-	-	-	-
<i>Basic English Skills</i>	3	4	-	-
<b>PC9.</b> use basic English for everyday conversation in different contexts, in person and over the telephone	-	-	-	-

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC10. read and understand routine information, notes, instructions, mails, letters etc. written in English	-	-	-	-
PC11. write short messages, notes, letters, e-mails etc. in English	-	-	-	-
<i>Career Development &amp; Goal Setting</i>	<b>1</b>	<b>2</b>	-	-
PC12. identify career goals based on the skills, interests, knowledge, and personal attributes	-	-	-	-
PC13. prepare a career development plan with short- and long-term goals	-	-	-	-
<i>Communication Skills</i>	<b>2</b>	<b>2</b>	-	-
PC14. follow verbal and non-verbal communication etiquette while communicating in professional and public settings	-	-	-	-
PC15. use active listening techniques for effective communication	-	-	-	-
PC16. communicate in writing using appropriate style and format based on formal or informal requirements	-	-	-	-
PC17. work collaboratively with others in a team	-	-	-	-
<i>Diversity &amp; Inclusion</i>	<b>1</b>	<b>1</b>	-	-
PC18. communicate and behave appropriately with all genders and PwD	-	-	-	-
PC19. escalate any issues related to sexual harassment at workplace according to POSH Act	-	-	-	-
<i>Financial and Legal Literacy</i>	<b>2</b>	<b>3</b>	-	-
PC20. identify and select reliable institutions for various financial products and services such as bank account, debit and credit cards, loans, insurance etc.	-	-	-	-
PC21. carry out offline and online financial transactions, safely and securely, using various methods and check the entries in the passbook	-	-	-	-



Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC22. identify common components of salary and compute income, expenses, taxes, investments etc	-	-	-	-
PC23. identify relevant rights and laws and use legal aids to fight against legal exploitation	-	-	-	-
<i>Essential Digital Skills</i>	<b>3</b>	<b>5</b>	-	-
PC24. operate digital devices and use their features and applications securely and safely	-	-	-	-
PC25. carry out basic internet operations by connecting to the internet safely and securely, using the mobile data or other available networks through Bluetooth, Wi-Fi, etc.	-	-	-	-
PC26. display responsible online behaviour while using various social media platforms	-	-	-	-
PC27. create a personal email account, send and process received messages as per requirement	-	-	-	-
PC28. carry out basic procedures in documents, spreadsheets and presentations using respective and appropriate applications	-	-	-	-
PC29. utilize virtual collaboration tools to work effectively	-	-	-	-
<i>Entrepreneurship</i>	<b>2</b>	<b>3</b>	-	-
PC30. identify different types of Entrepreneurship and Enterprises and assess opportunities for potential business through research	-	-	-	-
PC31. develop a business plan and a work model, considering the 4Ps of Marketing Product, Price, Place and Promotion	-	-	-	-
PC32. identify sources of funding, anticipate, and mitigate any financial/ legal hurdles for the potential business opportunity	-	-	-	-
<i>Customer Service</i>	<b>1</b>	<b>2</b>	-	-
PC33. identify different types of customers and ways to communicate with them	-	-	-	-

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC34. identify and respond to customer requests and needs in a professional manner	-	-	-	-
PC35. use appropriate tools to collect customer feedback	-	-	-	-
PC36. follow appropriate hygiene and grooming standards	-	-	-	-
<i>Getting ready for apprenticeship &amp; Jobs</i>	<b>2</b>	<b>3</b>	-	-
PC37. create a professional Curriculum vitae (Résumé)	-	-	-	-
PC38. search for suitable jobs using reliable offline and online sources such as Employment exchange, recruitment agencies, newspapers etc. and job portals, respectively	-	-	-	-
PC39. apply to identified job openings using offline /online methods as per requirement	-	-	-	-
PC40. answer questions politely, with clarity and confidence, during recruitment and selection	-	-	-	-
PC41. identify apprenticeship opportunities and register for it as per guidelines and requirements	-	-	-	-
<b>NOS Total</b>	<b>20</b>	<b>30</b>	-	-

**National Occupational Standards (NOS) Parameters**

<b>NOS Code</b>	DGT/VSQ/N0103
<b>NOS Name</b>	Employability Skills (90 Hours)
<b>Sector</b>	Cross Sectoral
<b>Sub-Sector</b>	Professional Skills
<b>Occupation</b>	Employability
<b>NSQF Level</b>	5
<b>Credits</b>	3
<b>Version</b>	1.0
<b>Last Reviewed Date</b>	31/08/2021
<b>Next Review Date</b>	31/08/2024
<b>NSQF Clearance Date</b>	31/08/2021

## ASC/N8339: Development of ADAS system

### Description

This NOS unit is about building design and specifications of ADAS and its substitute systems as per the organisational standards and procedures.

### Scope

The scope covers the following :

- Prepare for building an ADAS system
- Build an ADAS system

### Elements and Performance Criteria

#### *Prepare for building an ADAS system*

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

- PC1.** obtain design document and inputs from the OEM/customer for building an ADAS system
- PC2.** interpret design document, ADAS design standards and protocols to identify system requirements and testing parameters which need to be measured during the testing procedure
- PC3.** identify and select appropriate development tools, programming language (i.e. java, python), development platform, driver interface, telematics system, controllers, sensors and actuators etc. as per the project requirements
- PC4.** prepare plan and costing for developing the ADAS system as per the requirements
- PC5.** install the sensors, actuators etc. in a dummy vehicle for data collection purpose **PC6.** set-up function-based obstructions on test track
- PC7.** perform test vehicle 'pre-test' conditioning
- PC8.** conduct the test drives of the vehicle and collate the data of sensors, actuators etc. on required testing parameters for the analysis purpose
- PC9.** drive and simulate all the functions of ADAS and failure points
- PC10.** perform documentation for test set-up and validation

#### *Build an ADAS system*

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

- PC11.** prepare the data, which may include trimming, decoding, data enrichment (labeling or ground truth generation), processing and adding metadata such as weather and traffic conditions
- PC12.** analyse the results of testing and prepare process design to implement required ADAS standards and protocols in the ADAS system
- PC13.** identify components of an ADAS system for building the ADAS architecture on the basis of requirement
- PC14.** develop and build algorithms for ADAS system operation as per the requirement
- PC15.** build code and configure software of micro-controllers, its components and their oriented design using embedded C, C++ and MATLAB
- PC16.** write clean and scalable codes

- PC17.** perform data automation for data outputs by using python, R, java, etc
- PC18.** create data visualizations by using Power BI, Python
- PC19.** validate codes of all the components of architecture to ensure required output
- PC20.** analyse and validate behavior of the system
- PC21.** prepare a learning and development plan considering safety standards and protocol

### **Knowledge and Understanding (KU)**

The individual on the job needs to know and understand:

- KU1.** need of ADAS system
- KU2.** objectives, principles and vision behind ADAS system
- KU3.** different standard description formats used in ADAS system
- KU4.** different protocols used in Automobile E.g., CAN, Flexray
- KU5.** ADAS system components i.e. specialized camera, radar system, sensors etc
- KU6.** ADAS system development tools
- KU7.** source code component implementation
- KU8.** various sensor and actuator components
- KU9.** various ADAS system protocols and standards
- KU10.** DFMEA- Design Failure Mode and Effect Analysis
- KU11.** Functional Safety Standard- ISO26262

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

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

- GS1.** read instructions/guidelines
- GS2.** modify work practices to improve them
- GS3.** work with supervisors/team members to carry out work related tasks
- GS4.** complete tasks efficiently and accurately within stipulated time
- GS5.** inform/report to concerned person in case of any problem
- GS6.** make timely decisions for efficient utilization of resources
- GS7.** write reports such as accident report, in at least English/regional language

## Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
<i>Prepare for building an ADAS system</i>	<b>16</b>	<b>18</b>	-	<b>10</b>
<b>PC1.</b> obtain design document and inputs from the OEM/customer for building an ADAS system	1	2	-	-
<b>PC2.</b> interpret design document, ADAS design standards and protocols to identify system requirements and testing parameters which need to be measured during the testing procedure	2	2	-	1
<b>PC3.</b> identify and select appropriate development tools, programming language (i.e. java, python), development platform, driver interface, telematics system, controllers, sensors and actuators etc. as per the project requirements	2	2	-	2
<b>PC4.</b> prepare plan and costing for developing the ADAS system as per the requirements	2	2	-	1
<b>PC5.</b> install the sensors, actuators etc. in a dummy vehicle for data collection purpose	1	2	-	1
<b>PC6.</b> set-up function-based obstructions on test track	1	2	-	1
<b>PC7.</b> perform test vehicle 'pre-test' conditioning	2	2	-	1
<b>PC8.</b> conduct the test drives of the vehicle and collate the data of sensors, actuators etc. on required testing parameters for the analysis purpose	2	2	-	1
<b>PC9.</b> drive and simulate all the functions of ADAS and failure points	2	1	-	1
<b>PC10.</b> perform documentation for test set-up and validation	1	1	-	1
<i>Build an ADAS system</i>	<b>24</b>	<b>22</b>	-	<b>10</b>
<b>PC11.</b> prepare the data, which may include trimming, decoding, data enrichment (labeling or ground truth generation), processing and adding metadata such as weather and traffic conditions	3	3	-	1

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
<b>PC12.</b> analyse the results of testing and prepare process design to implement required ADAS standards and protocols in the ADAS system	3	2	-	1
<b>PC13.</b> identify components of an ADAS system for building the ADAS architecture on the basis of requirement	2	1	-	1
<b>PC14.</b> develop and build algorithms for ADAS system operation as per the requirement	3	3	-	1
<b>PC15.</b> build code and configure software of micro-controllers, its components and their oriented design using embedded C, C++ and MATLAB	3	3	-	1
<b>PC16.</b> write clean and scalable codes	1	1	-	-
<b>PC17.</b> perform data automation for data outputs by using python, R, java, etc	2	2	-	1
<b>PC18.</b> create data visualizations by using Power BI, Python	2	2	-	1
<b>PC19.</b> validate codes of all the components of architecture to ensure required output	2	2	-	1
<b>PC20.</b> analyse and validate behavior of the system	1	1	-	1
<b>PC21.</b> prepare a learning and development plan considering safety standards and protocol	2	2	-	1
<b>NOS Total</b>	<b>40</b>	<b>40</b>	<b>-</b>	<b>20</b>

## National Occupational Standards (NOS) Parameters

<b>NOS Code</b>	ASC/N8339
<b>NOS Name</b>	Development of ADAS system
<b>Sector</b>	Automotive
<b>Sub-Sector</b>	Research & Development
<b>Occupation</b>	Automotive Product Development
<b>NSQF Level</b>	5.5
<b>Credits</b>	7
<b>Version</b>	1.0
<b>Next Review Date</b>	NA



## ASC/N8340: Implementation of ADAS system

### Description

This NOS unit is about implementing and testing of the developed ADAS system in the dummy vehicle to check the functionality. It is also about executing and validating the system for final submission.

### Scope

The scope covers the following :

- Prepare for implementing and testing of ADAS system
- Perform implementation and testing of ADAS system
- Perform validation and execution of ADAS system

### Elements and Performance Criteria

#### *Prepare for implementing and testing of ADAS system*

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

- PC1.** design steps to go from ADAS system level configuration
- PC2.** select system configuration input and customize it as per the requirement
- PC3.** integrate all sensors, actuators, controllers and allied systems with the vehicle
- PC4.** build test suites with various test use cases, as well as required closed-loop simulation and open-loop re-simulation (replay) validation jobs to verify ADAS models
- PC5.** plan to use proper testing methodologies to check the system functioning as per specifications

#### *Perform implementation and testing of ADAS system*

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

- PC6.** perform a severity wise assessment of vehicle for safety worthiness relevant to ADAS verification as prescribed in NHTSA
- PC7.** develop and execute functional test procedures
- PC8.** test the performance of the system against product specifications and regulatory requirements
- PC9.** perform product reliability and validation testing
- PC10.** perform unit testing frameworks
- PC11.** perform tracking of quality assurance matrix
- PC12.** manage multiple release streams within source code management tool
- PC13.** perform system testing of ADAS features in SiL, HiL, LABCAR and Vehicle
- PC14.** perform unit testing, functional and integration testing and system testing

#### *Perform validation and execution of ADAS system*

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

- PC15.** review codes and UTCs to identify errors, if any
- PC16.** check inputs to identify design corrections
- PC17.** correct the code and submit the corrected code to the concerned person for approval
- PC18.** perform development and integration with third party software

## **Knowledge and Understanding (KU)**

The individual on the job needs to know and understand:

- KU1.** vector tools (CANoe, CANape, HIL Set-up)
- KU2.** IBM ALM tools- Requirement, Change, version control and test management tools
- KU3.** ISO26262 L1 and L2 certification
- KU4.** QA methodologies- DFMEA and PFMEA
- KU5.** simulation tools- MATLAB, SIMULINK, Enterprise Architect
- KU6.** ECU development 'V' cycle from concept to production
- KU7.** automotive communication and diagnostic protocols- CAN, LIN, FLEXRAY, ETHERNET, UDS
- KU8.** domestic and international regulatory and certifications like CMVR, AIS, ECE, ISO, MISRA, NCAP, Cybersecurity
- KU9.** RADAR, LIDAR, Camera data processing
- KU10.** Data Analytics and Visualisation
- KU11.** ENCAP, EUROENCAP Certification
- KU12.** ARAI, ICAT testing and Approval

## **Generic Skills (GS)**

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

- GS1.** read instructions/guidelines
- GS2.** modify work practices to improve them
- GS3.** work with supervisors/team members to carry out work related tasks
- GS4.** complete tasks efficiently and accurately within stipulated time
- GS5.** inform/report to concerned person in case of any problem
- GS6.** make timely decisions for efficient utilization of resources
- GS7.** write reports such as accident report, in at least English/regional language

## Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
<i>Prepare for implementing and testing of ADAS system</i>	<b>10</b>	<b>11</b>	-	<b>7</b>
<b>PC1.</b> design steps to go from ADAS system level configuration	2	2	-	2
<b>PC2.</b> select system configuration input and customize it as per the requirement	2	2	-	1
<b>PC3.</b> integrate all sensors, actuators, controllers and allied systems with the vehicle	2	2	-	1
<b>PC4.</b> build test suites with various test use cases, as well as required closed-loop simulation and open-loop re-simulation (replay) validation jobs to verify ADAS models	3	3	-	2
<b>PC5.</b> plan to use proper testing methodologies to check the system functioning as per specifications	1	2	-	1
<i>Perform implementation and testing of ADAS system</i>	<b>22</b>	<b>19</b>	-	<b>10</b>
<b>PC6.</b> perform a severity wise assessment of vehicle for safety worthiness relevant to ADAS verification as prescribed in NHTSA	2	2	-	1
<b>PC7.</b> develop and execute functional test procedures	2	2	-	1
<b>PC8.</b> test the performance of the system against product specifications and regulatory requirements	2	2	-	1
<b>PC9.</b> perform product reliability and validation testing	2	2	-	1
<b>PC10.</b> perform unit testing frameworks	2	1	-	-
<b>PC11.</b> perform tracking of quality assurance matrix	2	2	-	1
<b>PC12.</b> manage multiple release streams within source code management tool	2	2	-	1

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC13. perform system testing of ADAS features in SiL, HiL, LABCAR and Vehicle	4	3	-	2
PC14. perform unit testing, functional and integration testing and system testing	4	3	-	2
<i>Perform validation and execution of ADAS system</i>	<b>8</b>	<b>10</b>	-	<b>3</b>
PC15. review codes and UTCs to identify errors, if any	2	3	-	1
PC16. check inputs to identify design corrections	2	2	-	-
PC17. correct the code and submit the corrected code to the concerned person for approval	2	3	-	1
PC18. perform development and integration with third party software	2	2	-	1
<b>NOS Total</b>	<b>40</b>	<b>40</b>	-	<b>20</b>

## National Occupational Standards (NOS) Parameters

<b>NOS Code</b>	ASC/N8340
<b>NOS Name</b>	Implementation of ADAS system
<b>Sector</b>	Automotive
<b>Sub-Sector</b>	Research & Development
<b>Occupation</b>	Automotive Product Development
<b>NSQF Level</b>	5.5
<b>Credits</b>	9
<b>Version</b>	1.0
<b>Next Review Date</b>	NA

## Assessment Guidelines and Assessment Weightage

### Assessment Guidelines

1. Criteria for assessment for each Qualification Pack will be created by the Sector Skill Council. Each Performance Criteria (PC) will be assigned marks proportional to its importance in NOS. SSC will also lay down proportion of marks for Theory and Skills Practical for each PC.
2. The assessment for the theory part will be based on knowledge bank of questions created by the SSC.
3. Individual assessment agencies will create unique question papers for theory part for each candidate at each examination/training centre (as per assessment criteria below).
4. Individual assessment agencies will create unique evaluations for skill practical for every student at each examination/ training centre based on these criteria.
5. In case of successfully passing only certain number of NOSs, the trainee is eligible to take subsequent assessment on the balance NOS's to pass the Qualification Pack.
6. In case of unsuccessful completion, the trainee may seek reassessment on the Qualification Pack

### Minimum Aggregate Passing % at QP Level : 70

**(Please note:** Every Trainee should score a minimum aggregate passing percentage as specified above, to successfully clear the Qualification Pack assessment.)

## Assessment Weightage

Compulsory NOS

National Occupational Standards	Theory Marks	Practical Marks	Project Marks	Viva Marks	Total Marks	Weightage
ASC/N9810.Manage work and resources (Manufacturing)	50	30	-	20	100	15
DGT/VSQ/N0103.Employability Skills (90 Hours)	20	30	-	-	50	10
ASC/N8339.Development of ADAS system	40	40	-	20	100	40
ASC/N8340.Implementation of ADAS system	40	40	-	20	100	35
<b>Total</b>	<b>150</b>	<b>140</b>	<b>-</b>	<b>60</b>	<b>350</b>	<b>100</b>

## Acronyms

<b>NOS</b>	National Occupational Standard(s)
<b>NSQF</b>	National Skills Qualifications Framework
<b>QP</b>	Qualifications Pack
<b>TVET</b>	Technical and Vocational Education and Training

## Glossary

<b>Sector</b>	Sector is a conglomeration of different business operations having similar business and interests. It may also be defined as a distinct subset of the economy whose components share similar characteristics and interests.
<b>Sub-sector</b>	Sub-sector is derived from a further breakdown based on the characteristics and interests of its components.
<b>Occupation</b>	Occupation is a set of job roles, which perform similar/ related set of functions in an industry.
<b>Job role</b>	Job role defines a unique set of functions that together form a unique employment opportunity in an organisation.
<b>Occupational Standards (OS)</b>	OS specify the standards of performance an individual must achieve when carrying out a function in the workplace, together with the Knowledge and Understanding (KU) they need to meet that standard consistently. Occupational Standards are applicable both in the Indian and global contexts.
<b>Performance Criteria (PC)</b>	Performance Criteria (PC) are statements that together specify the standard of performance required when carrying out a task.
<b>National Occupational Standards (NOS)</b>	NOS are occupational standards which apply uniquely in the Indian context.
<b>Qualifications Pack (QP)</b>	QP comprises the set of OS, together with the educational, training and other criteria required to perform a job role. A QP is assigned a unique qualifications pack code.
<b>Unit Code</b>	Unit code is a unique identifier for an Occupational Standard, which is denoted by an 'N'
<b>Unit Title</b>	Unit title gives a clear overall statement about what the incumbent should be able to do.
<b>Description</b>	Description gives a short summary of the unit content. This would be helpful to anyone searching on a database to verify that this is the appropriate OS they are looking for.
<b>Scope</b>	Scope is a set of statements specifying the range of variables that an individual may have to deal with in carrying out the function which have a critical impact on quality of performance required.
<b>Knowledge and Understanding (KU)</b>	Knowledge and Understanding (KU) are statements which together specify the technical, generic, professional and organisational specific knowledge that an individual needs in order to perform to the required standard.





<p><b>Organisational Context</b></p>	<p>Organisational context includes the way the organisation is structured and how it operates, including the extent of operative knowledge managers have of their relevant areas of responsibility.</p>
<p><b>Technical Knowledge</b></p>	<p>Technical knowledge is the specific knowledge needed to accomplish specific designated responsibilities.</p>
<p><b>Core Skills/ Generic Skills (GS)</b></p>	<p>Core skills or Generic Skills (GS) are a group of skills that are the key to learning and working in today's world. These skills are typically needed in any work environment in today's world. These skills are typically needed in any work environment. In the context of the OS, these include communication related skills that are applicable to most job roles.</p>
<p><b>Electives</b></p>	<p>Electives are NOS/set of NOS that are identified by the sector as contributive to specialization in a job role. There may be multiple electives within a QP for each specialized job role. Trainees must select at least one elective for the successful completion of a QP with Electives.</p>
<p><b>Options</b></p>	<p>Options are NOS/set of NOS that are identified by the sector as additional skills. There may be multiple options within a QP. It is not mandatory to select any of the options to complete a QP with Options.</p>