



Flex Fuel Engine Designer

QP Code: ASC/Q8105

Version: 1.0

NSQF Level: 5.5

Automotive Skills Development Council || 153, Gr Floor, Okhla Industrial Area, Phase - III, Leela Building, New Delhi - 110020

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ASC/Q8105: Flex Fuel Engine Designer

Brief Job Description

The individual at this job is responsible for end-to-end design and development of engine-fuel-exhaust systems (Electronic controls & Mechanical parts), leading the product engineering work guided on technical functions through trending technologies, market regulations & supply-chain conditions, validation of system design & analysis of vehicle performance, proposing alternatives based on emerging statutory standards and recording QIP (Quality Improvement Plan) related activities towards achieving product quality excellence.

Personal Attributes

The person should be result oriented with good technical and analytical skills, should have excellent interpersonal skills & communication and be a good team player. He/she should have ability to manage projects, prioritizing of work & delivering in time, collaborating well with peers & other departments and attention-to-details.

Applicable National Occupational Standards (NOS)

Compulsory NOS:

1. [ASC/N9818: Manage work and resources \(Research and Development\)](#)
2. [DGT/VSQ/N0103 - Employability Skills \(90 hours\)](#)
3. [ASC/N8109: Design an engine management system](#)
4. [ASC/N8110: Conduct Design of Experiments \(DoE\) methods to investigate the behaviour on various blends of flex fuel](#)
5. [ASC/N8111: Perform calculation, design level simulation and test result analysis](#)

Qualification Pack (QP) Parameters

Sector	Automotive
Sub-Sector	Research and Development
Occupation	Automotive Product Designing
Country	India
NSQF Level	5.5
Aligned to NCO/ISCO/ISIC Code	NCO-2015/NIL
Minimum Educational Qualification & Experience	3 years Diploma (Mechanical/Automobile/ Electrical / Electronics) after class 10th from recognized regulatory body with 3 years of relevant experience OR Pursuing 4th year of B.E./B.Tech in the relevant field

	<p>and continuous education OR Certificate-NSQF (Electric Vehicle Product Design Engineer/ Automotive Prototype Manufacturing Lead Technician Level 5) with 2 Years of relevant experience</p> <p>** Knowledge of data collection process</p>
Minimum Level of Education for Training in School	
Pre-Requisite License or Training	NA
Minimum Job Entry Age	22 Years
Last Reviewed On	28/02/2023
Next Review Date	28/02/2026
Deactivation Date	28/02/2026
NSQC Approval Date	28/02/2023
Version	1.0

ASC/N9818: Manage work and resources (Research and Development)

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>	20	13	-	8
PC1. identify hazardous activities and the possible causes of risks or accidents in the workplace	4	2	-	2
PC2. implement safe working practices for dealing with hazards to ensure safety of self and others	3	1	-	2
PC3. conduct regular checks of the machines with support of the maintenance team to identify potential hazards	2	2	-	1
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	3	2	-	1
PC5. organise safety drills or training sessions to create awareness amongst others on the identified risks and safety practices	2	-	-	-
PC6. fill daily check sheet to report improvements done and risks identified	2	2	-	-
PC7. ensure that relevant safety boards/signs are placed on the shop floor for the safety of self and others	2	2	-	1
PC8. 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>	13	7	-	5
PC9. ensure workplace, equipment, restrooms etc. are sanitized regularly	3	2	-	1
PC10. ensure team is aware about hygiene and sanitation regulations and following them on the shop floor	2	1	-	-
PC11. ensure availability of running water, hand wash and alcohol-based sanitizers at the workplace	2	2	-	1
PC12. 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>	6	4	-	1
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>	11	6	-	6
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
NOS Total	50	30	-	20

National Occupational Standards (NOS) Parameters

NOS Code	ASC/N9818
NOS Name	Manage work and resources (Research and Development)
Sector	Automotive
Sub-Sector	Generic
Occupation	Generic
NSQF Level	5
Credits	TBD
Version	1.0
Last Reviewed Date	NA
Next Review Date	NA
NSQC Clearance Date	

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	-	-
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	-	-	-	-
<i>Constitutional values - Citizenship</i>	1	1	-	-
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	-	-	-	-
<i>Becoming a Professional in the 21st Century</i>	1	3	-	-
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	-	-	-	-
<i>Basic English Skills</i>	3	4	-	-
PC9. 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 & Goal Setting</i>	1	2	-	-
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>	2	2	-	-
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 & Inclusion</i>	1	1	-	-
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>	2	3	-	-
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>	3	5	-	-
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>	2	3	-	-
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>	1	2	-	-
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 & Jobs</i>	2	3	-	-
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	-	-	-	-
NOS Total	20	30	-	-

National Occupational Standards (NOS) Parameters

NOS Code	DGT/VSQ/N0103
NOS Name	Employability Skills (90 Hours)
Sector	Cross Sectoral
Sub-Sector	Professional Skills
Occupation	Employability
NSQF Level	5
Credits	3
Version	1.0
Last Reviewed Date	NA
Next Review Date	27/05/2024
NSQC Clearance Date	27/05/2021

ASC/N8109: Design an engine management system

Description

This NOS unit is about designing and developing Engine Management System (EMS) comprising Fuel injector, Fuel rail, Manifold Absolute Pressure (MAP) & Mass Air Flow (MAF) sensors, throttle body, etc. and also designing of fuel intake & exhaust systems.

Scope

The scope covers the following:

- Assess the Flex Fuel system as applicable to the Vehicle Development Plan (VDP)
- Design parts for fuel system on CAD software
- Develop Design Statement of Requirement (D-SOR) for the development of Engine-Fuel-Exhaust systems
- Integrate parts to sub-assemblies and validate the system level functionality and performance
- Release designs of Flex Fuel Vehicle (FFV) after test-validation and design-finalisation

Elements and Performance Criteria

Prepare for building an ADAS system

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

- PC1. Identify the types of Flex Fuel Vehicle (FFV) systems that are compatible with the Vehicle Development Plan (VDP) in the target markets
- PC2. Analyse the effects of Flex Fuel blending ratios on the vehicle (per VDP) in the standpoint of EMS design modifications
- PC3. Enlist the parts and systems in the engine assembly, fuel & exhaust systems and estimate the engineering effort & cost of design modifications
- PC4. Identify the risks involved in inappropriate usage of Flex Fuel blends

Design parts for fuel system on CAD software

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

- PC5. identify and select software like CATIA, AutoCAD, Unigraphics etc. for creating the designs and models as per the requirement
- PC6. collate the design requirements in terms of material used for making the component, packaging and other requirements to decide the dimensions, measurements and tolerances of the aggregate/component
- PC7. prepare a rough sketch of the end product by visualizing the requirements of the customer
- PC8. set the required unit and dimension parameters and insert sketches, scanned images, diagrams, signs or symbols, etc. of required product design in a CAD file
- PC9. create a 3D model of product by using CAD techniques as per the information received
- PC10. apply different drawing/ drafting aids like colours, symbols etc. to highlight areas in the drawings
- PC11. test the 3D model through simulation/ packaging study on the feasibility of actual product as per the customer requirement
- PC12. create 2D drawing of the component as per the SOP/WI
- PC13. make accurate and complete notes related to design in terms of overall dimensions or other manufacturing specifications like assembly sequence etc. in the drawing

Develop Design Statement of Requirement (D-SOR) for the development of Engine-Fuel-Exhaust systems

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

- PC14. Classify the parts undergoing design modification such as Black-box, Gray-box, White-box and identify the Tier-1 suppliers for the design development as per VDP stipulations
- PC15. Segregate the sub-assemblies (Engine-Fuel-Exhaust) and parts (Mechanical, Electronic) in the standpoint of development cycle time (Design-Proto-DV/PV-PPAP]
- PC16. Detail the design in the D-SOR released to vendors in the perspective of Cost-Quality-Time stipulated by the VDP
- PC17. Evaluate the quality of parts & sub-assemblies sourced from vendors and their functional performance through PPAP (Production Part Approval Process)

Integrate parts to sub-assemblies and validate the system level functionality and performance

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

- PC18. Analyse the discrete performance of critical parts in the EMS like Fuel injector, Fuel rail, Mass Air Flow (MAF) sensor, Manifold Absolute Pressure (MAP) sensor, O2 sensor, Throttle Body Position sensor (TPS), Temperature sensor, etc
- PC19. Lead the integration of parts & sub-assemblies developed with the rest of the engine assembly and Intake-Exhaust-Fuel systems
- PC20. Monitor the tests of engine on dynamometer and vehicle under pre-defined conditions and analyse the performance of each part for normal & extraordinary operating conditions
- PC21. Analyse the test results and report the output to the vendors and relevant person in the organisation

Release designs of Flex Fuel Vehicle (FFV) after test-validation and design-finalisation

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

- PC22. Conduct DRBTR (Design Review Based on Test Results) for the parts & sub-assemblies engineered for the FFV VDP
- PC23. Modify D-SOR to effect the changes desired
- PC24. Monitor design re-development and DV tests associated with each part
- PC25. Conduct PPAP for each of the vendor developed parts / products
- PC26. Release the design of parts for Pre-Production prototypes (PPP) towards Pre-production Proto Validation (PPV) testing, FFV user trials, Homologation tests & Quality audits, Reliability studies, Manufacturing process validation and as well production drawings for mass manufacturing

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

- KU1. Technical functionalities of FFV and EMS parts & sub-assemblies
- KU2. Processes involved in the development of FFV and its deployment in target markets
- KU3. Market trends, consumer preferences, government / agency statutory norms, customer feedback
- KU4. FMEA (Failure Modes & Effects Analysis) of Flex Fuel blend proportions and misuse / abuse

- KU5. Classification of BB/GB/WB (Black/Gray/White-Box) parts and automotive market trends
- KU6. Supplier integration level and its impacts on the VDP imperatives - QCT (Quality-Cost-Time)
- KU7. Supply Chain of alternate fuels
- KU8. Impact of Flex Fuel blend ratios and Regulatory standards on environment & Safety compliance norms
- KU9. Key players in markets worldwide for fuels & additives and Tier-1/2 suppliers
- KU10. Serviceability aspects involved in FFV MRO (Maintenance-Repair-Overhaul) and Re-cycling

Generic Skills (GS)

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

- GS1. follow instructions, guidelines, procedures, rules, and service level agreements
- GS2. listen effectively and communicate information accurately
- GS3. follow rule-based decision-making processes
- GS4. make decisions on suitable courses
- GS5. plan and organize the work to achieve targets and meet deadlines
- GS6. apply problem-solving approaches to different situations
- GS7. analyse the business impact and disseminate relevant information to others
- GS8. apply balanced judgments to different situations
- GS9. check the work is complete and free from errors

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
<i>Assess the Flex Fuel system as applicable to the Vehicle Development Plan (VDP)</i>	5	4		3
PC1. Identify the types of Flex Fuel Vehicle (FFV) systems that are compatible with the Vehicle Development Plan (VDP) in the target markets	1	1		1
PC2. Analyse the effects of Flex Fuel blending ratios on the vehicle (per VDP) in the standpoint of EMS design modifications	1	1		1
PC3. Enlist the parts and systems in the engine assembly, fuel & exhaust systems and estimate the engineering effort & cost of design modifications	2	1		1
PC4. Identify the risks involved in inappropriate usage of Flex Fuel blends	1	1		-
<i>Design parts for fuel system on CAD software</i>	13	14		7
PC5. identify and select software like CATIA, AutoCAD, Unigraphics etc. for creating the designs and models as per the requirement	1	1		1
PC6. collate the design requirements in terms of material used for making the component, packaging and other requirements to decide the dimensions, measurements and tolerances of the aggregate/component	1	2		1
PC7. prepare a rough sketch of the end product by visualizing the requirements of the customer	1	1		-
PC8. set the required unit and dimension parameters and insert sketches, scanned images, diagrams, signs or symbols, etc. of required product design in a CAD file	2	2		2
PC9. create a 3D model of product by using CAD techniques as per the information received	2	2		1
PC10. apply different drawing/ drafting aids like colours, symbols etc. to highlight areas in the drawings	2	2		-
PC11. test the 3D model through simulation/ packaging study on the feasibility of actual product as per the customer requirement	2	2		1

PC12. create 2D drawing of the component as per the SOP/WI	1	1		1
PC13. make accurate and complete notes related to design in terms of overall dimensions or other manufacturing specifications like assembly sequence etc. in the drawing	1	1		-
<i>Develop Design Statement of Requirement (D-SOR) for the development of Engine-Fuel-Exhaust systems</i>	9	8		4
PC14. Classify the parts undergoing design modification such as Black-box, Gray-box, White-box and identify the Tier-1 suppliers for the design development as per VDP stipulations	2	1		1
PC15. Segregate the sub-assemblies (Engine-Fuel-Exhaust) and parts (Mechanical, Electronic) in the standpoint of development cycle time (Design-Proto-DV/PV-PPAP]	2	2		1
PC16. Detail the design in the D-SOR released to vendors in the perspective of Cost-Quality-Time stipulated by the VDP	3	3		1
PC17. Evaluate the quality of parts & sub-assemblies sourced from vendors and their functional performance through PPAP (Production Part Approval Process)	2	2		1
<i>Integrate parts to sub-assemblies and validate the system level functionality and performance</i>	6	6		3
PC18. Analyse the discrete performance of critical parts in the EMS like Fuel injector, Fuel rail, Mass Air Flow (MAF) sensor, Manifold Absolute Pressure (MAP) sensor, O ₂ sensor, Throttle Body Position sensor (TPS), Temperature sensor, etc.	2	2		1
PC19. Lead the integration of parts & sub-assemblies developed with the rest of the engine assembly and Intake-Exhaust-Fuel systems	2	2		1
PC20. Monitor the tests of engine on dynamometer and vehicle under pre-defined conditions and analyse the performance of each part for normal & extraordinary operating conditions	1	1		1
PC21. Analyse the test results and report the output to the vendors and relevant person in the organisation	1	1		-

<i>Release designs of Flex Fuel Vehicle (FFV) after test-validation and design-finalisation</i>	7	8		3
PC22. Conduct DRBTR (Design Review Based on Test Results) for the parts & sub-assemblies engineered for the FFV VDP	2	2		1
PC23. Modify D-SOR to effect the changes desired	1	1		-
PC24. Monitor design re-development and DV tests associated with each part	1	1		-
PC25. Conduct PPAP for each of the vendor developed parts / products	2	2		1
PC26. Release the design of parts for Pre-Production prototypes (PPP) towards Pre-production Proto Validation (PPV) testing, FFV user trials, Homologation tests & Quality audits, Reliability studies, Manufacturing process validation and as well production drawings for mass manufacturing	1	2		1
NOS Total	40	40	-	20

National Occupational Standards (NOS) Parameters

NOS Code	ASC/N8109
NOS Name	Design an engine management system
Sector	Automotive
Sub-Sector	Research & Development
Occupation	Automotive Product Designing
NSQF Level	5.5
Credits	TBD
Version	1.0
Last Reviewed Date	28/02/2023
Next Review Date	28/02/2026
NSQC Clearance Date	28/02/2023

ASC/N8110: Conduct Design of Experiments (DoE) methods to investigate the behaviour on various blends of flex fuel

Description

This NOS unit is about conducting Design of Experiments (DoE) to study the effect of various blend ratios of Flex Fuel on the vehicle performance and to verify the parts & systems involved in the FFV for QRD (Quality-Reliability-Durability) under all operating conditions.

Scope

The scope covers the following:

- Analyse all possible conditions of operation of FFV & its systems
- Develop DoE and evaluate the FFV Engine Management
- Assess the capability of FFV system and its components

Elements and Performance Criteria

Analyse all possible conditions of operation of FFV & its systems

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

- PC1. design steps to go from ADAS system level configuration
- PC2. Enlist all possible operating conditions and accidental / abusive situations of Flex Fuel blending
- PC3. Enlist all measurement parameters (Temperature, Pressure, Flow, Noise, RPM, BHP, Torque, SFC, Emissions (% , PPM), Vibration, Voltage, Current, Cycles (injection, ignition, valve-opening, scavenging), MAF, MAP, Throttle position, Timing, etc.) during running (full-throttle, cruising, accelerating, jerky, null-throttle, etc) & idling (corrosion, clogging, phase-change, etc.) conditions
- PC4. Study all possible driving patterns, traffic conditions, fuel quality ranges, test stipulations, compliance standards, emerging trends, simulation options
- PC5. Analyse possible design solutions for critical parts (ECU, Microprocessors, Sensors, Regulators, Injector, Fuel rail, Manifold, EGR system, FlexStart, Catalytic converter) and non-critical parts (fuel line, exhaust pipe, engine parts, filters, tubes / pipes, valves / orifices, connectors / joineries)

Develop DoE and evaluate the FFV Engine Management

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

- PC6. Develop Design of Experiments (DoE) workflow (Define - Design - Experiment - Optimise) based on all inputs gathered and analysed
- PC7. Define physical test sequence of parts on Hardware-in-Loop (HiL) bench, of assemblies on Chassis-Dyno, of the Vehicle on Road/Field/Track
- PC8. Prepare for Analysis (CAE / Mathematic-modelling) software (AVL-Cruise, AVL-Boost, GT-Power, MATLAB-Simulink, Ansys, HyperStudy) and Boundary conditions for simulation of operating & impossible conditions
- PC9. Assess the effects of chosen combinations on Functioning, Performing, Enduring, Reconditioning
- PC10. Enlist the Flex Fuel combinations (Ratios (Ethanol : Gasoline), Octane number, Calorific value, etc.
- PC11. Study the resulting performance of vehicle and quality of emissions as per variations in design variables and service conditions - Driver (WoT (Wide-Open Throttle) / Full, Partial & Nil Throttle), Geographic (Gradient, Altitude, Latitude, Ambient, Humidity, Traction

(full/partial/null), Environmental (Sunny, Sultry, Humid, Rainy, Snowy, Wet, Windy, Inundated, Arid, Hot, Cold), Engine related (large/medium/small displacement, compression-ratio, heat-transfer (overheated/cold-start), inlet-chamber / cylinder-head (swirl, etc), valve-frequencies, RPM, Injection timing temperature (fuel pre-heating, etc), treatment (exhaust-recirculation, catalytic-converter, back-pressure, etc) and fuel-supply (steady, gas-locked, starved)

PC12. Conduct experiments to analyse all possible combinations (Fuel, Engine, Loading conditions) and to predict performance of the FFV

Assess the capability of FFV system and its components

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

PC13. Analyse FFV performance under all Drive Cycles (NEDC / New European Drive Cycle, CADC / Common Artemis Driving Cycle, WLTC / World harmonized Light-duty vehicle Test Cycle), design life conditions (normal-life, extended-life, reusability / recyclability), test/drive conditions (correct/normal, extreme/unusual, abusive/accidental) and optimise systems accordingly

PC14. Finalise the design of parts as per user-trials, DV/PV/PPV-tests, Homologation/QC-audits, Simulations (DoE, math-based, empirical-calculation) and release production drawings of parts for FFV product variants as per VDP

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

KU1. Global markets and Government/Agency standards

KU2. Hardware, Software, Load-cases, Competitor data, Benchmark values, Consumer-statistics for Simulations

KU3. Ethanol sourcing channels, Sustainability factors, Storage challenges, Blend ratios, Fuel properties, etc.

KU4. Emission regulations, Statutory compliance audits, Energy/Water/Carbon footprint, Penalties / Compensations, Insurance liabilities, Carbon credits, Warranty claims, Customer satisfaction indices, Emerging market trends and intangible benefits of alternate fuel usage

KU5. Experiment set-up, Workbench, Test labs, Chassis dynos, Material test labs, Metrology labs, Quality inspection labs

KU6. Electro-mechanical functions, Structural designs, Bio-mimicking themes, Digital data processing, Re-cycling objectives and User/Consumer/Customer preferences, VPD techniques, VDP imperatives, technical know-how

KU7. Vehicle performance criteria, Engine management factors, monitoring equipment, Test rigs, measuring devices, Index/Go-NoGo parameters

Generic Skills (GS)

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

GS1. follow instructions, guidelines, procedures, rules, and service level agreements

GS2. listen effectively and communicate information accurately

GS3. follow rule-based decision-making processes

GS4. make decisions on suitable courses

GS5. plan and organize the work to achieve targets and meet deadlines

GS6. apply problem-solving approaches to different situations

GS7. analyse the business impact and disseminate relevant information to others

GS8. apply balanced judgments to different situations

GS9. check the work is complete and free from errors

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
<i>Analyse all possible conditions of operation of FFV & its systems</i>	9	9		6
PC1. Enlist all possible operating conditions and accidental / abusive situations of Flex Fuel blending	2	2		1
PC2. Enlist all measurement parameters (Temperature, Pressure, Flow, Noise, RPM, BHP, Torque, SFC, Emissions (% , PPM), Vibration, Voltage, Current, Cycles (injection, ignition, valve-opening, scavenging), MAF, MAP, Throttle position, Timing, etc.) during running (full-throttle, cruising, accelerating, jerky, null-throttle, etc) & idling (corrosion, clogging, phase-change, etc.) conditions	2	2		2
PC3. Study all possible driving patterns, traffic conditions, fuel quality ranges, test stipulations, compliance standards, emerging trends, simulation options	2	2		1
PC4. Analyse possible design solutions for critical parts (ECU, Microprocessors, Sensors, Regulators, Injector, Fuel rail, Manifold, EGR system, FlexStart, Catalytic converter) and non-critical parts (fuel line, exhaust pipe, engine parts, filters, tubes / pipes, valves / orifices, connectors / joineries)	3	3		2
<i>Develop DoE and evaluate the FFV Engine Management</i>	17	18		12
PC5. Develop Design of Experiments (DoE) workflow (Define - Design - Experiment - Optimise) based on all inputs gathered and analysed	3	3		2
PC6. Define physical test sequence of parts on Hardware-in-Loop (HiL) bench, of assemblies on Chassis-Dyno, of the Vehicle on Road/Field/Track	2	2		2
PC7. Prepare for Analysis (CAE / Mathematic-modelling) software (AVL-Cruise, AVL-Boost, GT-Power, MATLAB-Simulink, Ansys, HyperStudy) and Boundary conditions for simulation of operating & impossible	3	3		2

conditions				
PC8. Assess the effects of chosen combinations on Functioning, Performing, Enduring, Reconditioning	2	2		1
PC9. Enlist the Flex Fuel combinations (Ratios (Ethanol : Gasoline), Octane number, Calorific value, etc.	2	2		1
PC10. Study the resulting performance of vehicle and quality of emissions as per variations in design variables and service conditions - Driver (WoT (Wide-Open Throttle) / Full, Partial & Nil Throttle), Geographic (Gradient, Altitude, Latitude, Ambient, Humidity, Traction (full/partial/null), Environmental (Sunny, Sultry, Humid, Rainy, Snowy, Wet, Windy, Inundated, Arid, Hot, Cold), Engine related (large/medium/small displacement, compression-ratio, heat-transfer (overheated/cold-start), inlet-chamber / cylinder-head (swirl, etc), valve-frequencies, RPM, Injection timing temperature (fuel pre-heating, etc), treatment (exhaust-recirculation, catalytic-converter, back-pressure, etc) and fuel-supply (steady, gas-locked, starved)	3	3		3
PC11. Conduct experiments to analyse all possible combinations (Fuel, Engine, Loading conditions) and to predict performance of the FFV	2	3		1
<i>Assess the capability of FFV system and its components</i>	4	3		2
PC12. Analyse FFV performance under all Drive Cycles (NEDC / New European Drive Cycle, CADC / Common Artemis Driving Cycle, WLTC / World harmonized Light-duty vehicle Test Cycle), design life conditions (normal-life, extended-life, reusability / recyclability), test/drive conditions (correct/normal, extreme/unusual, abusive/accidental) and optimise systems accordingly	2	2		1
PC13. Finalise the design of parts as per user-trials, DV/PV/PPV-tests, Homologation/QC-audits, Simulations (DoE, math-based,	2	1		1

empirical-calculation) and release production drawings of parts for FFV product variants as per VDP				
NOS Total	40	40	-	20

National Occupational Standards (NOS) Parameters

NOS Code	ASC/N8110
NOS Name	Conduct Design of Experiments (DoE) methods to investigate the behaviour on various blends of flex fuel
Sector	Automotive
Sub-Sector	Research & Development
Occupation	Automotive Product Designing
NSQF Level	5.5
Credits	TBD
Version	1.0
Last Reviewed Date	28/02/2023
Next Review Date	28/02/2026
NSQF Clearance Date	28/02/2023

ASC/N8111: Perform calculation, design level simulation and test result analysis

Description

This NOS is about conducting various types of CAE tests to check and validate vehicle and aggregate design in a non-laboratory and without building the actual prototype for conducting an on road test.

Scope

The scope covers the following:

- Understanding the testing requirement and the process
- Conduct CAE tests for assessing vehicle performance and durability

Elements and Performance Criteria

Understanding the testing requirement and the process

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

- PC1. Identify the type of vehicle under test along with detailed understanding of the vehicle specifications
- PC2. Read and interpret the various organizational, domestic and international regulations impacting the performance of the vehicle under test
- PC3. Plan the type of tests to be performed in the computer simulated environment by using the test checklist provided by the cross functional team
- PC4. Identify various types of software modules like Ansys, HyperWorks, Nastran, etc. and their utility to conduct various CAE based component and vehicle tests
- PC5. Select the testing methodology, process and test parameters required as per the Work Instructions/Standard Operating Procedures.
- PC6. Establish various data parameters for test results to enable comparison / simulation of performance
- PC7. Ensure selection of specified software program for testing the given component/ vehicle
- PC8. Ensure selection of correct testing and simulation parameters as per the testing instruction manual provided by the team

Conduct CAE tests for assessing vehicle performance and durability

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

- PC9. Conduct the structural analysis of the test prototype and measure fatigue strength, body structure strength, chassis strength, vehicle door and window framework strength and metal fatigue analysis by selecting the correct testing parameters in the structural analysis program
- PC10. Calculate the bending stiffness and torsional stiffness values for the vehicle components under testing
- PC11. Conduct CAE enabled motion tests for checking complex mechanical systems as engine, gearbox, powertrain and note down observations
- PC12. Conduct CAE simulated time motion based vehicle crash tests as per the testing instructions mentioned in the testing manual and note observations
- PC13. Conduct front, side and rear crash impact testing and note observations of crash impact on vehicle structure and vehicle inhabitants (through biomechanics and CAE dummies)
- PC14. Plot graphs for Force Vs. deformation and Time Vs. deformation and conduct first level analysis

of impact

- PC15. Using the recommended software programs, conduct the metal fatigue and stress strain analysis on vehicles and components
- PC16. Conduct the CAE simulated drop test to understand stress and shock bearing strength of the vehicle and the components
- PC17. Conduct CFD (Computational Fluid Dynamics) to test the flow of fuel, lubricants, oil and water in the vehicle piping system
- PC18. Ensure testing of thermal flow including exhaust gases through the thermal flow analysis module
- PC19. Conduct non-linear analysis of rubber, plastic and metallic components to understand denting impact, cross movement, compression and expansion of components
- PC20. Using CAE enabled modules, test the outer body of vehicles to understand the vibrational behaviour of vehicle body and frames
- PC21. Using digital electrical and electronic simulation program, test the working and performance of the vehicle electrical, electronics, telematics, instrumentation and navigation systems to ensure error free communication and decision making
- PC22. Carry transfer path analysis, acoustic testing and component frequency analysis using relevant NVH testing modules
- PC23. Conduct ergonomics testing using CAE enabled modules to test vehicle design, rider comfort, seating comfort, braking process, steering movement process and overall vehicle dimensions
- PC24. Carry out the vehicle dynamics tests as per the testing instruction to validate the vehicle manoeuvrability and vehicle performance through simulated obstacle testing tracks and proving tracks
- PC25. Conduct CAE enabled virtual driving test to validate the vehicle performance from a driver's point of view and measure driving comfort, manoeuvrability, vehicle handling and comfort level similar to an on-road condition
- PC26. Collate the test results and compare them with the internal/ external benchmarking standards and actual testing data parameters shared by the cross functional design team
- PC27. Prepare simulation & test result comparison for Engineering CFT /management team

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

- KU1. working of various automobile components
- KU2. general working of automobiles and linkage & impact of one parameter to another
- KU3. various types of software testing programs like Ansys, HyperWorks, Nastran, etc available in the market
- KU4. impact of wind, water flow, hot & cold conditions, pressure on the performance of the vehicle
- KU5. impact of various mechanical and thermal stresses on the external frame of the vehicle and overall vehicle performance
- KU6. various national and international regulations, norms and standards on vehicles and engine performance - regulations related to noise, vibrations, durability, reliability factors for 2 wheeler, 3 wheeler and 4 wheelers under normal and difficult environmental conditions
- KU7. various defects related to reliability and durability of the component and impact of the defect on the final component and vehicle performance
- KU8. probable sources of vehicle noise and possible impacts
- KU9. analytical tools like Histogram analysis, Pareto Analysis, Why analysis, Process Mapping, Ishikawa (Fishbone) analysis

- KU10. basic human anatomy and impact of vehicle performance on human body
- KU11. basic laws of physics, chemistry, metallurgy and mathematics
- KU12. basic laws of geometry and product design
- KU13. the methods of using instruments like Vernier callipers, micrometres, rulers and other inspection tools
- KU14. how to read and interpret sketches and engineering drawings
- KU15. potential health and safety hazards and related safety precautions during driving

Generic Skills (GS)

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

- GS1. follow instructions, guidelines, procedures, rules, and service level agreements
- GS2. listen effectively and communicate information accurately
- GS3. follow rule-based decision-making processes
- GS4. make decisions on suitable courses
- GS5. plan and organize the work to achieve targets and meet deadlines
- GS6. apply problem-solving approaches to different situations
- GS7. analyse the business impact and disseminate relevant information to others
- GS8. apply balanced judgments to different situations
- GS9. check the work is complete and free from errors

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
<i>Understanding the testing requirement and the process and establish parameters for comparison</i>	10	9	-	4
PC1. Identify the type of vehicle under test along with detailed understanding of the vehicle specifications	2	1	-	1
PC2. Read and interpret the various organizational, domestic and international regulations impacting the performance of the vehicle under test	1	1	-	-
PC3. Plan the type of tests to be performed in the computer simulated environment by using the test checklist provided by the cross functional team	1	1	-	1
PC4. Identify various types of software modules like Ansys, HyperWorks, Nastran, etc. and their utility to conduct various CAE based component and vehicle tests	2	1	-	1
PC5. Select the testing methodology, process and test parameters required as per the Work Instructions/Standard Operating Procedures.	1	1	-	1
PC6. Establish various data parameters for test results to enable comparison / simulation of performance	1	1	-	-
PC7. Ensure selection of specified software program for testing the given component/ vehicle	1	1	-	-
PC8. Ensure selection of correct testing and simulation parameters as per the testing instruction manual provided by the team	1	2	-	-
<i>Conduct CAE tests for assessing vehicle performance and durability</i>	30	31	-	16
PC9. conduct the structural analysis of the test prototype and measure fatigue strength, body structure strength, chassis strength, vehicle door and window framework strength and metal fatigue analysis by selecting the correct testing parameters in the structural analysis program	2	2	-	1
PC10. calculate the bending stiffness and torsional stiffness values for the vehicle components under testing	2	2	-	1

PC11. conduct CAE enabled motion tests for checking complex mechanical systems as engine, gearbox, powertrain and note down observations	2	2	-	1
PC12. conduct CAE simulated time motion-based vehicle crash tests as per the testing instructions mentioned in the testing manual and note observations	2	2	-	1
PC13. conduct front, side and rear crash impact testing and note observations of crash impact on vehicle structure and vehicle inhabitants (through biomechanics and CAE dummies)	2	2	-	1
PC14. plot graphs for force vs. deformation and time vs. deformation and conduct first level analysis of impact	2	2	-	1
PC15. using the recommended software programs, conduct the metal fatigue and stress strain analysis on vehicles and components	2	2	-	1
PC16. conduct the CAE simulated drop test to understand stress and shock bearing strength of the vehicle and the components	2	1	-	1
PC17. conduct CFD (computational fluid dynamics) to test the flow of fuel, lubricants, oil and water in the vehicle piping system	2	1	-	1
PC18. ensure testing of thermal flow including exhaust gases through the thermal flow analysis module	2	1	-	1
PC19. conduct non-linear analysis of rubber, plastic and metallic components to understand denting impact, cross movement, compression and expansion of components	2	2	-	1
PC20. using CAE enabled modules, test the outer body of vehicles to understand the vibrational behaviour of vehicle body and frames	1	1	-	1
PC21. using digital electrical and electronic simulation program, test the working and performance of the vehicle electrical, electronics, telematics, instrumentation and navigation systems to ensure error free communication and decision making	1	2	-	1
PC22. carry transfer path analysis, acoustic testing and component frequency analysis using relevant NVH testing modules	1	1	-	-

PC23. conduct ergonomics testing using CAE enabled modules to test vehicle design, rider comfort, seating comfort, braking process, steering movement process and overall vehicle dimensions	1	2	-	1
PC24. carry out the vehicle dynamics tests as per the testing instruction to validate the vehicle manoeuvrability and vehicle performance through simulated obstacle testing tracks and proving tracks	1	2	-	1
PC25. conduct CAE enabled virtual driving test to validate the vehicle performance from a drivers point of view and measure driving comfort, manoeuvrability, vehicle handling and comfort level similar to an on road condition	1	2	-	1
PC26. collate the test results and compare them with the internal/ external benchmarking standards and actual testing data parameters shared by the cross functional design team.	1	1	-	-
PC27. prepare simulation & test result comparison for engineering CFT /management team.	1	1	-	-
NOS Total	35	65	-	-

National Occupational Standards (NOS) Parameters

NOS Code	ASC/N8111
NOS Name	Perform calculation, design level simulation and test result analysis
Sector	Automotive
Sub-Sector	Research & Development
Occupation	Automotive Product Designing
NSQF Level	5.5
Credits	TBD
Version	1.0
Last Reviewed Date	28/02/2023
Next Review Date	28/02/2026
NSQC Clearance Date	28/02/2023

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) (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	0	20	100	15
DGT/VSQ/N0104 - Employability Skills (120 hours)	20	30	-	-	50	10
ASC/N8109: Design an engine management system	40	40	-	20	100	25
ASC/N8110: Conduct Design of Experiments (DoE) methods to investigate the behaviour on various blends of flex fuel	40	40	0	20	100	25

ASC/N8111: Perform calculation, design level simulation and test result analysis	40	40	0	20	100	25
Total	190	180	-	80	450	100

Acronyms

NOS	National Occupational Standard(s)
NSQF	National Skills Qualifications Framework
QP	Qualifications Pack
TVET	Technical and Vocational Education and Training
AMC	Annual Maintenance Contract
PPE	Personal Protective Equipment
ERP	Enterprise Resource Planning
PM	Predictive Maintenance
QMS	Quality Management System
TOPS	Team Oriented Problem Solving
QMS	Quality Management System
CFT	Complement Fixation Test

Glossary

Sector	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.
Sub-sector	Sub-sector is derived from a further breakdown based on the characteristics and interests of its components.
Occupation	Occupation is a set of job roles, which perform similar/ related set of functions in an industry.
Job role	Job role defines a unique set of functions that together form a unique employment opportunity in an organisation.
Occupational Standards (OS)	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.
Performance Criteria (PC)	Performance Criteria (PC) are statements that together specify the standard of performance required when carrying out a task.
National Occupational Standards (NOS)	NOS are occupational standards which apply uniquely in the Indian context.
Qualifications Pack (QP)	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.
Unit Code	Unit code is a unique identifier for an Occupational Standard, which is denoted by an 'N'
Unit Title	Unit title gives a clear overall statement about what the incumbent should be able to do.
Description	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.
Scope	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.
Knowledge and Understanding (KU)	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.

Organisational Context	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.
Technical Knowledge	Technical knowledge is the specific knowledge needed to accomplish specific designated responsibilities.
Core Skills/ Generic Skills (GS)	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.
Electives	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.
Options	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.