



## AUTOMOTIVE OPEN SYSTEM (AUTOSAR) ENGINEER

QP Code: ASC/Q8309

Version: 1.0

NSQF Level: 6

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

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## ASC/Q8309: Automotive Open System (AUTOSAR) Engineer

### Brief Job Description

The individual in this job roles performs planning, creation and integration of internal and exterior software and its components. The individual creates software configuration and also monitor its consistency for different variants of system. He/she coordinate with the responsible person of the software subsystems and the software project manager with regards to software integration and testing, debugging and analyzing integration problems

### 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. [Manage work and resources \(Manufacturing & R&D\)](#)
2. [Employability NOS \(90 Hours\)](#)
3. [Develop AUTOSAR Architecture](#)
4. [Configure and execute AUTOSAR project](#)

### Qualification Pack (QP) Parameters

Sector	Automotive
Sub-Sector	Research and Development
Occupation	Automotive Product Development
Country	India
NSQF Level	6
Aligned to NCO/ISCO/ISIC Code	NCO-2015/7213.0201
Minimum Educational Qualification & Experience	<p>3 years Diploma (Mechanical/Automobile/ Electrical / Electronics/ Computer Science/ IT) after class 10th or BCA from recognized regulatory body with 5 years of relevant (like Automotive embedded system) experience</p> <p>OR</p> <p>B.E./B.Tech/ MCA in the relevant field with 1 Year of relevant experience,</p> <p>OR</p> <p>M.E./M.Tech in the relevant field</p>

	OR Certificate-NSQF (Automotive Prototype Manufacturing Lead Technician/ Electric Vehicle Product Design Engineer Level 5) with 3 Years of relevant experience
<b>Minimum Level of Education for Training in School</b>	
<b>Pre-Requisite License or Training</b>	Basic of Microcontrollers Automobile ECU functionality Embedded C Course
<b>Minimum Job Entry Age</b>	21 Years
<b>Last Reviewed On</b>	17/11/2022
<b>Next Review Date</b>	17/11/2025
<b>Deactivation Date</b>	17/11/2025
<b>NSQC Approval Date</b>	17/11/2022
<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>	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

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
<b>NOS Total</b>	<b>50</b>	<b>30</b>	<b>-</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>	6
<b>Credits</b>	TBD
<b>Version</b>	1.0
<b>Last Reviewed Date</b>	28 <sup>th</sup> July, 2022
<b>Next Review Date</b>	28 <sup>th</sup> July, 2025
<b>NSQC Clearance Date</b>	28 <sup>th</sup> July, 2022

## ASC/NXXXX: Develop AUTOSAR Architecture

### Description

This NOS unit is about building design and specifications of AUTOSAR architecture and its components i.e. Virtual Functional Bus, ports and interfaces, runtime environment, operating system, abstraction layer and service layer etc. as per the AUTOSAR standards.

### Scope

The scope covers the following:

- Prepare for building AUTOSAR architecture
- Build AUTOSAR architecture

### Elements and Performance Criteria

#### *Prepare for building AUTOSAR architecture*

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

- PC1. obtain AUTOSAR project develop requirements from the organization/OEM
- PC2. interpret technical specification document and AUTOSAR standards to identify vehicle ECU input-output, Virtual functional bus (VFB), Runtime Environment (RTE), ECU Layered Software Architecture, Microcontroller Abstraction Layer etc. requirements
- PC3. identify and select appropriate AUTOSAR development tools, coding language, development platform, OS etc. as per the project requirements

#### *Build AUTOSAR architecture*

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

- PC4. identify vehicle ECU's functional domains (Body Control, Security systems, Power train) for building the AUTOSAR architecture on the basis of requirement
- PC5. interpret ECU architecture and extract SW-C (standard description format) product specifications from vehicle specifications
- PC6. interpret and develop code for Virtual functional bus (VFB) as per the requirement
- PC7. build code and configure Runtime Environment (RTE) for the project
- PC8. build code and configure software, its components and their oriented design
- PC9. configure ports and interfaces, Sender-Receiver communication and Client-Server communication as per the requirement
- PC10. validate codes of all the components of architecture to ensure required output
- PC11. analyse and validate components communication behavior
- PC12. write code to develop and configure ECU Layered Software Architecture, Microcontroller Abstraction Layer and service layer as per the requirement
- PC13. develop complex drivers for running the system

## Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

- KU1. need of AUTOSAR
- KU2. history of AUTOSAR and evolutions brought in AUTOSAR
- KU3. objectives, principles and vision behind AUTOSAR
- KU4. motivation for AUTOSAR development
- KU5. AUTOSAR organization structure
- KU6. type of partners and list of partner companies in AUTOSAR consortium
- KU7. different standard description formats used in AUTOSAR
- KU8. different protocols used for ECU's communication in Automobile. E.g., CAN, Flexray
- KU9. AUTOSAR system constraints and ECU descriptions
- KU10. AUTOSAR Tools - implementation, BSW configurator, RTE generator, system tooling
- KU11. separation between application and infrastructure
- KU12. atomic software component
- KU13. shipment of software component
- KU14. source code component implementation
- KU15. API, Client Server relationship and Sender Receiver relationship
- KU16. communication and application attributes required
- KU17. various sensor and actuator components
- KU18. various non-standardized drivers

## 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 for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
<i>Prepare for building AUTOSAR architecture</i>	3	15	5	2
PC1. obtain AUTOSAR project develop requirements from the organization/OEM				

	1	5	1	-
PC2. interpret technical specification document and AUTOSAR standards to identify vehicle ECU input-output, Virtual functional bus (VFB), Runtime Environment (RTE), ECU Layered Software Architecture, Microcontroller Abstraction Layer etc. requirements	1	5	2	1
PC3. identify and select appropriate AUTOSAR development tools, coding language, development platform, OS etc. as per the project requirements	1	5	2	1
<i>Build AUTOSAR architecture</i>	<b>17</b>	<b>35</b>	<b>15</b>	<b>8</b>
PC4. identify vehicle ECU's functional domains (Body Control, Security systems, Power train) for building the AUTOSAR architecture on the basis of requirement	2	3	2	
PC5. interpret ECU architecture and extract SW-C (standard description format) product specifications from vehicle specifications	2	3	2	1
PC6. interpret and develop code for Virtual functional bus (VFB) as per the requirement	2	4	2	1
PC7. build code and configure Runtime Environment (RTE) for the project	1	3	2	1
PC8. build code and configure software, its components and their oriented design	2	3		1
PC9. configure ports and interfaces, Sender-Receiver communication and Client-Server communication as per the requirement	2	4	2	1
PC10. validate codes of all the components of architecture to ensure required output	1	4		
PC11. analyse and validate components communication behavior	1	3	2	1
PC12. write code to develop and configure ECU Layered Software Architecture, Microcontroller Abstraction Layer and service layer as per the requirement	2	4	2	1
PC13. develop complex drivers for running the system	2	4	1	1

<b>NOS Total</b>	<b>20</b>	<b>50</b>	<b>20</b>	<b>10</b>
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## ASC/NXXXX: Configure and Execute AUTOSAR Project

### Description

This NOS unit is about design, software processes, interfacing with RTE, events, Report attributes and PPort attributes. It also describes runnable and communication, activation of runnable, resource consumption etc.

### Scope

The scope covers the following:

- Develop system work flow
- Configure and build executable system

### Elements and Performance Criteria

#### *Develop system work flow*

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

- PC1. design steps to go from system level configuration to generation of ECU executable
- PC2. select system configuration input and customize it as per the requirement
- PC3. identify and distinguish system constraints
- PC4. configure ECU extract of system configuration
- PC5. define detailed scheduling information or the configuration data of the system

#### *Configure and build executable system*

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

- PC6. configure component aspect that supports proper configuration of RTE and the BSW
- PC7. configure component aspect that describes the communication properties of software component
- PC8. configure and execute component aspect that serves as a basis for the description of detailed resource
- PC9. configure component aspect that provides more detailed description of the timing behavior of atomic software component
- PC10. define and execute RTE events
- PC11. design and investigate response to events
- PC12. define and configure communication attributes, RPort attributes, PPort attributes and connector attributes
- PC13. design and execute time driven activation of runnables
- PC14. interpret resource consumption for the project

#### *Execute and validate project*

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

- PC15. use appropriate BSW configurator, RTE generator, system tooling etc. to connect all the AUTOSAR architecture components and execute them for demonstration
- PC16. set up environment and develop use cases for simulation and testing
- PC17. plan to use proper testing methodologies to check the system functioning as per specifications

- PC18. test the performance of the system against product specifications and regulatory requirements
- PC19. review codes and UTCs to identify errors, if any
- PC20. check inputs to identify design corrections
- PC21. correct the code and submit the corrected code to the concerned person for approval

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

The individual on the job needs to know and understand:

- KU1. AUTOSAR format for formal description via information exchange format
- KU2. software components template, ECU resources, System constraints
- KU3. AUTOSAR system configuration tool
- KU4. system communication matrix
- KU5. runnable entities
- KU6. states of an Atomic software component in each runnable
- KU7. AUTOSAR services
- KU8. Pre-emption, Reentrancy and library functions
- KU9. tree of ComSpec classes
- KU10. attributes specific to distribution of data
- KU11. communication attributes for server port
- KU12. interaction pattern for application of the sender receiver paradigm
- KU13. internal behavior of runnable
- KU14. data set points of runnable entity
- KU15. invoking an operation
- KU16. planning of scheduling strategy
- KU17. basic handling of BSW implementation tools, MCAL implementation tools, BSW configurator tools, RTE generator tools and system tools
- KU18. type of licenses and their respective usage scenario
- KU19. different hardware used as ECU
- KU20. sample projects and its repository

### **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 for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
<i>Develop system work flow</i>	<b>5</b>	<b>15</b>	<b>5</b>	<b>2</b>
PC1. design steps to go from system level configuration to generation of ECU executable	1	3	1	-
PC2. select system configuration input and customize it as per the requirement	1	3	1	1
PC3. identify and distinguish system constraints	1	3	1	1
PC4. configure ECU extract of system configuration	1	3	1	-
PC5. define detailed scheduling information or the configuration data of the system	1	3	1	-
<i>Configure and build executable system</i>	<b>10</b>	<b>20</b>	<b>10</b>	<b>5</b>
PC6. configure component aspect that supports proper configuration of RTE and the BSW	1	2	2	
PC7. configure component aspect that describes the communication properties of software component	2	2	1	
PC8. configure and execute component aspect that serves as a basis for the description of detailed resource	1	2	1	1
PC9. configure component aspect that provides more detailed description of the timing behavior of atomic software component	1	3	1	1
PC10. define and execute RTE events	1	2	1	
PC11. design and investigate response to events	1	2	1	1
PC12. define and configure communication attributes, RPort attributes, PPort attributes and connector attributes	1	2	1	1
PC13. design and execute time driven activation of runnable	1	3	1	



PC14. interpret resource consumption for the project	1	2	1	1
<i>Execute and validate project</i>	<b>5</b>	<b>15</b>	<b>5</b>	<b>3</b>
PC15. use appropriate BSW configurator, RTE generator, system tooling etc. to connect all the AUTOSAR architecture components and execute them for demonstration	1	3	1	1
PC16. set up environment and develop use cases for simulation and testing	1	2	1	
PC17. plan to use proper testing methodologies to check the system functioning as per specifications	1	2	1	
PC18. test the performance of the system against product specifications and regulatory requirements		2		1
PC19. review codes and UTCs to identify errors, if any	1	2		
PC20. check inputs to identify design corrections		2	1	1
PC21. correct the code and submit the corrected code to the concerned person for approval	1	2	1	
<b>NOS Total</b>	<b>20</b>	<b>50</b>	<b>20</b>	<b>10</b>

## 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
Employability NOS (90 Hours)	20	30	-	-	50	10
Develop AUTOSAR Architecture	20	50	20	10	100	35
Configure and execute AUTOSAR project	20	50	20	10	100	40
<b>Total</b>	<b>110</b>	<b>160</b>	<b>40</b>	<b>40</b>	<b>350</b>	<b>100</b>

## Acronyms

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

