# Introduction to Automotive Engines

MCr Code: ASC/MCr-0005

Version: 1.0

NSQF Level: 2

Automotive Skills Development Council | E-113, Okhla Industrial Area, Phase – III,
New Delhi – 110020

# Table of Contents

# Training Parameters

| | |
|---|---|
| **Sector** | Automotive |
| **Sub-Sector** | Manufacturing |
| **Occupation** | Product Development |
| **Country** | India |
| **NSQF Level** | 2 |
| **Minimum Educational Qualification and Experience** | Pursuing 6th Class |
| **Pre-Requisite License or Training** | No Minimum age restriction for school education perusing learners. No pervious certification required. |
| **Minimum Job Entry Age** | 18 Years |
| **Last Reviewed On** | 18/02/2025 |
| **Next Review Date** | 18/02/2028 |
| **NSQC Approval Date** | 18/02/2025 |
| **Model Curriculum Creation Date** | 18/02/2025 |
| **Model Curriculum Valid Up to Date** | 18/02/2028 |
| **Minimum Duration of the Course** | 30 Hours |
| **Maximum Duration of the Course** | 30 Hours |

# Program Overview

This section summarizes the end objectives of the program along with its duration.

## Training Outcomes

At the end of the program, the learner should have acquired the listed knowledge and skills to:

- Understand about engine and its types
- Discuss about various components of engine and their basic functioning
- Discuss about various engine parameters and their impact on engine functioning
- Demonstrate functioning of four stroke engine

## Compulsory Modules

The table lists the modules and their duration corresponding to the Compulsory NOS of the QP.

| NOS and Module Details | Theory Duration | Practical Duration | Total Duration |
|---|---|---|---|
| Module 1: Introduction of course and industry | 01:00 | 00:00 | 01:00 |
| Module 2: About engine and its types | 06:00 | 02:00 | 08:00 |
| Module 3: Engine components and its parameters | 10:00 | 04:00 | 14:00 |
| Module 4: Four-stroke engine | 05:00 | 02:00 | 07:00 |
| **Total Duration** | **22:00** | **08:00** | **30:00** |

# Module Details

## Module 1: Introduction of course and industry

**Terminal Outcomes:**

- Discuss about course and automobile industry.

| **Duration: 01:00** | **Duration: 00:00** |
|---|---|
| **Theory – Key Learning Outcomes** | **Practical – Key Learning Outcomes** |
| • Discuss about course structure and its objective.<br>• Discuss about automobile industry and career opportunities in it.<br>• Explain about Indian automotive market.<br>• List various automobile Original Equipment Manufacturers (OEMs) and different products/ models manufactured by them. | |
| **Classroom Aids** | |
| Training Kit - Trainer Guide, Presentations, Whiteboard, Marker, Projector, Laptop, Video Films | |
| **Tools, Equipment and Other Requirements** | |
| | |

# Module 2: About engine and its types

**Terminal Outcomes:**

- Understand about engine and its importance in vehicle functioning.
- Understand about various types of engines.

| **Duration: 06:00** | **Duration: 02:00** |
|---|---|
| **Theory – Key Learning Outcomes** | **Practical – Key Learning Outcomes** |
| • Describe engine and its working principle<br>• Describe role and importance of engine in functioning of vehicle<br>• Discuss history of engine and its evolution<br>• List various types of engines i.e. petrol, diesel, CNG, hybrid, electric etc.<br>• Differentiate between each type of engine.<br>• Describe working process of each type of engine<br>• Describe various terms associated with engine and its working<br>• Explain engine cycles.<br>• Describe internal combustion engine<br>• Describe the general thermodynamic concepts governing the operation of an internal combustion engine and its various cycles<br>• Compare the principle operational differences of the various fuels used in internal combustion engines, their availability, and summarize the applicability of each | • Demonstrate the working of an engine<br>• Demonstrate different types of engine by showing a video<br>• Demonstrate difference between working of an engine by showing a video |
| **Classroom Aids** | |
| Training Kit - Trainer Guide, Presentations, Whiteboard, Marker, Projector, Laptop, Video Films | |
| **Tools, Equipment and Other Requirements** | |
| Different types of vehicle engine and its components | |

# Module 3: Engine components and its parameters

**Terminal Outcomes:**

- Describe functioning and selection criteria of components of an engine
- Describe various parameters associated with engine performance

| **Duration: 10:00** | **Duration: 04:00** |
|---|---|
| **Theory – Key Learning Outcomes** | **Practical – Key Learning Outcomes** |
| • List various components of an internal combustion engine.<br>• Recognize elements of the fuel system, and how the elements relate to the engine.<br>• Recognize some common components of the ignition system.<br>• Recognize the elements in induction and exhaust systems.<br>• Recognize the automotive elements that provide cooling and lubrication.<br>• Discuss the function and operation of all major components and systems within a modern internal combustion engine<br>• Describe importance and need of each component in engine working<br>• Describe various parameters associated with engine performance<br>• Describe impact of each parameter on the engine performance<br>• Describe selection criteria of engine components<br>• Recognize the limitations of the current designs and implementations of the modern internal combustion engine | • Demonstrate functioning of each component of an engine.<br>• Demonstrate how to select engine components as per the vehicle model and selection parameters<br>• Perform a basic assessment and evaluation of new, cutting-edge designs and new powertrain initiatives as they apply to the mobility industry |
| **Classroom Aids** | |
| Training Kit (Trainer Guide, Presentations). Whiteboard, Marker, Projector, Laptop | |
| **Tools, Equipment and Other Requirements** | |
| Different types of vehicle engine and its components | |

# Module 4: Four-stroke engine

**Terminal Outcomes:**

- Describe functioning of four-stroke engine.

| **Duration: 05:00** | **Duration: 02:00** |
|---|---|
| **Theory – Key Learning Outcomes** | **Practical – Key Learning Outcomes** |
| • Explain working of four-stroke engine.<br>• Differentiate between two-stroke and four-stroke engine.<br>• List various components of a four-stroke engine.<br>• Discuss in detail the basic functioning and component interaction in a four-stroke engine<br>• Discuss the function and operation of all major components and systems within a four-stroke engine<br>• Describe various parameters associated with four-stroke engine performance | • Demonstrate working of a four-stroke engine<br>• Demonstrate functioning of each component of a four-stroke engine. |
| **Classroom Aids** | |
| Training Kit (Trainer Guide, Presentations). Whiteboard, Marker, Projector, Laptop | |
| **Tools, Equipment and Other Requirements** | |
| Different types of vehicle engine and its components | |

# Annexure

## Trainer Requirements

| Trainer Prerequisites | | | | | | |
|---|---|---|---|---|---|---|
| **Minimum Educational Qualification** | **Specialization** | **Relevant Industry Experience** | | **Training Experience** | | **Remarks** |
| | | ***Years*** | ***Specialization*** | ***Years*** | ***Specialization*** | |
| B.E./B.Tech | Mechanical/ Automobile | 3 | Mechanical/ Automobile | 1 | Mechanical/ Automobile | NA |

| Trainer Certification | |
|---|---|
| **Domain Certification** | **Platform Certification** |
| Certified for Job Role: "Introduction to Automotive Engines" mapped to QP: "ASC/MCr-0005", v1.0. Minimum accepted score as per SSC guideline is 80% | MEP/Q2601, v2.0 Trainer (VET and Skills). Minimum accepted score as per SSC guideline is 80% |

# Assessor Requirements

| Assessor Prerequisites | | | | | | |
|---|---|---|---|---|---|---|
| **Minimum Educational Qualification** | **Specialization** | **Relevant Industry Experience** | | **Training/Assessment Experience** | | **Remarks** |
| | | ***Years*** | ***Specialization*** | ***Years*** | ***Specialization*** | |
| B.E./B.Tech | Mechanical/ Automobile | 4 | Mechanical/ Automobile | 1 | Mechanical/ Automobile | NA |

| Assessor Certification | |
|---|---|
| **Domain Certification** | **Platform Certification** |
| Certified for Job Role: "Introduction to Automotive Engines" mapped to QP: "ASC/MCr-0005", v1.0. Minimum accepted score as per SSC guideline is 80% | MEP/Q2701, v2.0 Assessor (VET and Skills). Minimum accepted score as per SSC guideline is 80%. |

# Assessment Strategy

1. Assessment System Overview:

- Batches assigned to the assessment agencies for conducting the assessment on SDSM/SIP or email.
- Assessment agencies send the assessment confirmation to VTP/TC looping SSC.
- The assessment agency deploys the ToA certified Assessor for executing the assessment.
- SSC monitors the assessment process & records.

2. Testing Environment:

- Confirm that the centre is available at the same address as mentioned on SDMS or SIP.
- Check the duration of the training.
- Check the Assessment Start and End time to be as 10 a.m. and 5 p.m.
- If the batch size is more than 30, then there should be 2 Assessors.
- Check that the allotted time to the candidates to complete Theory & Practical Assessment is correct.
- Check the mode of assessment—Online (TAB/Computer) or Offline (OMR/PP).
- Confirm the number of TABs on the ground are correct to execute the Assessment smoothly.
- Check the availability of the Lab Equipment for the particular Job Role.

3. Assessment Quality Assurance levels / Framework:

- Question papers created by the Subject Matter Experts (SME).
- Question papers created by the SME verified by the other subject Matter Experts.
- Questions are mapped with NOS and PC.
- Question papers are prepared considering that level 1 to 3 are for the unskilled & semi-skilled individuals, and level 4 and above are for the skilled, supervisor & higher management.
- An assessor must be ToA certified & the trainer must be ToT Certified.
- The assessment agency must follow the assessment guidelines to conduct the assessment.

4. Types of evidence or evidence-gathering protocol:

- Time-stamped & geotagged reporting of the assessor from assessment location.
- Center photographs with signboards and scheme-specific branding.
- Biometric or manual attendance sheet (stamped by TP) of the trainees during the trainingperiod.
- Time-stamped & geotagged assessment (Theory + Viva + Practical) photographs & videos.

5. Method of verification or validation:

- A surprise visit to the assessment location.
- A random audit of the batch.
- Random audit of any candidate.

6. Method for assessment documentation, archiving, and access:

- Hard copies of the documents are stored.

- Soft copies of the documents & photographs of the assessment are uploaded / accessedfrom Cloud Storage.
- Soft copies of the documents & photographs of the assessment are stored in the HardDrives.

## References

# Glossary

| Term | Description |
|---|---|
| **Declarative Knowledge** | Declarative knowledge refers to facts, concepts and principles that need tobe known and/or understood in order to accomplish a task or to solve a problem. |
| **Key Learning Outcome** | A key learning outcome is a statement of what a learner needs to know, understand and be able to do in order to achieve the terminal outcomes. Aset of key learning outcomes will make up the training outcomes. Training outcome is specified in terms of knowledge, understanding (theory) and skills (practical application). |
| **OJT (M)** | On-the-job training (Mandatory); trainees are mandated to completespecified hours of training on-site |
| **OJT (R)** | On-the-job training (Recommended); trainees are recommended thespecified hours of training on-site |
| **Procedural Knowledge** | Procedural knowledge addresses how to do something, or how to perform atask. It is the ability to work or produce a tangible work output by applying cognitive, affective or psychomotor skills. |
| **Training Outcome** | Training outcome is a statement of what a learner will know, understandand be able to do upon the completion of the training. |
| **Terminal Outcome** | The terminal outcome is a statement of what a learner will know, understand and be able to do upon the completion of a module. A set ofterminal outcomes help to achieve the training outcome. |

# Acronyms and Abbreviations

| Term | Description |
|---|---|
| NOS | National Occupational Standard (s) |
| NSQF | National Skills Qualifications Framework |
| OJT | On-the-job Training |
| QP | Qualifications Pack |
| PwD | People with Disability |
| PPE | Personal Protective Equipment |