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EXCITING WORLD OF AUTOMOBILES

STUDENT WORKBOOK

Curriculum :AUTO-SRV *L1-NQ*^{2012}

Unit :AUTO-SRV *L1U7*

Innovation and Development

Vocational Learning Material for Schools

PSS Central Institute of Vocational Education

Bhopal

PREFACE

Improving the parity of esteem between the general academic education and vocational education, is the policy priority of the Government of India. The National Vocational Education Qualification Framework (NVEQF) developed by the Ministry of Human Resource Development (MHRD), Government of India, is a descriptive framework that provides a common reference for linking various qualifications. It will be used for setting common principles and guidelines for a nationally recognized qualification system covering Schools, Vocational Education and Training Institutions, Technical Education Institutions, Colleges and Universities. The NVEQF will act as a translation device to make qualifications more understandable to employers, students and institutions. It will promote transparency of qualifications and facilitate learner's mobility between different qualifications, thus encouraging lifelong learning. PSSCIVE has taken lead in development of learning material for the Automobile Sector for all level in collaboration with the Automobile Skill Development Corporation (ASDC).

The present material contains activity related to Level L-1 for the Automobile service sector. This will fulfill the needs of the students willing to learn activities relating to the Automobile Service Sector. Any student/ entrepreneur willing to start an Automobile Service Sector can acquire the desired competencies with the help of this book.

The book has been written by experts but reviewed by all the members of the group. I am grateful to the authors for the development of this book and to the members of the Working Group for their candid suggestions, during the development and review. Their names are given elsewhere.

I appreciate efforts put in the by Dr. Saurabh Prakash, as the Project Coordinator of the Working Group in planning and organizing Meetings which led to the final form of this title.

I shall be grateful to receive suggestions and observations from readers, which would help in bringing out a revised and improved version of this book.

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This student workbook was developed, with active involvement of Automobile Skill Development Council (ASDC) keeping in view the National Occupation Standard (NOS) for Service Technicians L4 developed by ASDC.

This project for development of the student workbook was coordinated by the PSS Central Institute of Vocational Education, a constituent unit of National Council of Educational Research and Training, which is under Ministry of Human Resource Development, Government of India.

Student Details

Student Name: _____

Student Roll Number:_____

Batch Start Date: _____

Contents

About this Workbook

This workbook is to assist students with completing the Auto Sector **L1U7-NQ2012** unit of competency: **Innovation and Development.** Students should study the workbook in class or in their own time.

This workbook contains sessions for imparting knowledge & skills on various aspects of the unit of competency. The workbook also includes information, exercises, and assessment activities to complete. The assessment plan has been included in the workbook to assist you in scheduling your time for completing the assignments. Each assessment activity is followed by a checklist for meeting the assessment criteria. The criteria will help you to ensure that you have fulfilled all of the assessment requirements to receive a 'competency' grading/Certification by ASDC.

Unit Information

Unit name: Innovation and Developments
Unit code: Auto L1U7-NQ2012
Unit descriptor:

This unit provides introductory knowledge & related skills covering innovation and developments taking place in automobile.

Resource Required:

- Notebooks, Pen, Pencil, Eraser, Computer, Open Source Software for making digital presentation, LCD projector. Pictures, sketches, drawings & posters for building awareness about various types of innovations and new technology. Animation and videos depicting new technology & innovations.

Nominal hours: 15 hours

Elements and Performance Criteria

- Elements define the critical learning outcomes of a unit of competency.
- Performance criteria specify the level of performance required to demonstrate the achievement of the Competency Element.

Element	Performance Criteria
• Importance of innovation and development	• Able to identify major areas of innovations taking place in automobiles. • Able to broadly describe major new developments

Relevant Knowledge and Skills

1. Relevant Knowledge

- Innovation in automobile,
- Development in automobile,

2. Skills

Able to describe role of

- Innovation in automobile,
- Development in automobile,

Assessment Plan

Session No.	Assessment method	Due Date	Completion Date
1.	Fill in the Blanks		
2.	Fill in the Blanks		
3.	Fill in the Blanks		

Introduction

As you know whenever there is a demand of any item, then innovation takes place. Innovation leads to development of a technology. With the development of new technologies customer get benefits in term of comfort and safety. Sometime innovation also results in lower cost. Automobile sector is also witnessing lot of innovations and development due to which new automobile models are launched in the market.

Innovation has also been seen in the field of passenger safety. A number of devices are now provided in the cars so that in case of any accident air bags are coming into the operation to save the passenger. There is lot of research going on in the area of alternative fuel due to economic reasons and environmental concern. Even solar energy based cars have been designed these days. And these cars can go up to 80 km in a day. Some cars have been designed to use electrical energy. A combination of electrical and petrol energy have been used in cars called ‘hybrid’ cars. Technological developments of design and innovation and chassis have led to the development of MPFI system which gives more mileage per liter of fuel.

In earlier times innovations happened less by planning more by chance. However, in recent decades innovation process has become more predictable. It is a detailed method for achieving objectives of better designs, lower costs, different fuels etc. In major auto companies of the world there are large teams working on new developments and innovations. It is a continuous process involving lots of experimentation. Very highly qualified engineers and scientists work on such projects. In this Unit, you will develop an understanding of the new innovation and development taking place these days.

Session 1: Innovation and Development
Relevant Knowledge

You must have seen some old car running on roads in your village, town or city. Some old models like Ambassador cars can still be seen but these are reducing in numbers day by day. You must be noticing much more stylish looking cars on the roads now a days. Same is the case with scooters and motorcycles. Even buses and trucks are looking different day by day. Can you name a famous car innovation done by an Indian company few years back ? It was Tata Nano car manufactured by Tata Motors. One of the smallest as well as lowest powered cars in the world, it was designed to be the cheapest car in India aimed mainly at the lowest price segment in the India.

Fig : Photograph of Tata Nano Car

Fig : Measurement of Tata Nano Car

Apart from looks and style as you know one important challenge among car manufacturers is use of alternate fuel, as petrol and diesel stock is limited and we have to search new alternative fuel. Lot of research has gone in this area and some results are coming out. Some companies are working on a project to run vehicles on water or air only !

Some of the technologies being incorporated into new automobile designs include gas-electric hybrids, fuel cells and biomass fuel sources including methane.

Electric Car

You must have heard about an Electric car. An electric car is an automobile that is propelled by one or more electric motors, using electrical energy stored in batteries or another energy storage device. Electric cars are pollution free and have zero tail pipe emission. This car helps in reduction of urban air pollution. Electric cars are generally more expensive than petrol. The primary reason is the high cost of car batteries.

Fig : View of Electric Car

Hybrid Vehicle

A hybrid vehicle is a vehicle that uses two or more distinct power sources to move the vehicle. Hybrid vehicle is known as Hybrid Electric vehicles (HEVs). This vehicle combines an internal combustion engine and electric motors. Although electric cars have been around since the inception of the automobile, a new breed of gas-electric hybrid autos were introduced in the US several years ago. Most of the major automobile manufacturers including GM, Honda, Toyota, Ford and Daimler-Chrysler have either introduced or are planning to introduce new hybrid models during the next several years. New car sales on hybrids have increased by approximately 36 per cent in the US. The car in picture is *Toyota Prius* which is the world's top selling hybrid car, with cumulative global sales of 2.5 million units by February 2012.

Fig : Hybrid Vehicle

Fuel Cells

Automobile fuel cell technology is under development and has not been marketed yet, however, this innovative energy technology has the potential to revolutionize transportation. Fuel cell car technology under development creates electricity through a chemical reaction between hydrogen and oxygen (air). The reaction creates and heat which is stored in batteries to power the car. The reaction creates only water and heat and may off a solution to our energy and environmental situations.

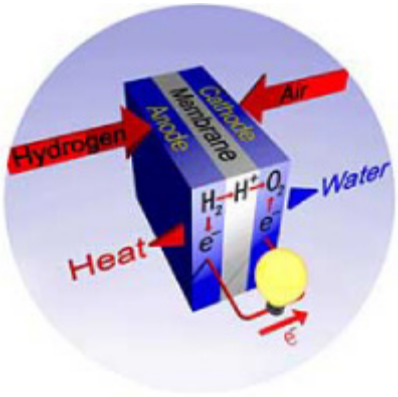

Fig : Fuel Cells

General Motors recently introduced a fuel cell stack that is 60 percent more powerful than any competitor and has announced plans to try to market a fuel cell car to the public by 2010. Hydrogen fuel distribution is still developing and will need to be in-place before fuel cell cars receive wide acceptance

Biomass Fuel

Biomass automotive fuels and lubricants have been gaining acceptance over the past several years primarily as a result of environmental concerns. Biomass fuels are typically generated through the decay of organic matter. For the past several years ethanol and di-methyl ether produced from biomass have been added to oxygenate fuels and reduce emissions. Biomass fuel can also produce hydrogen which can be used in fuel cell vehicles. Methane created from biomass is also being explored as an transportation fuel alternative.

Fig : Biomass Fuel

Biofuel

You must have heard about Jatropa plant. This Jatropha plant seeds are very rich in oil (40%). Jatropha oil has been used in India for several decades

as biodiesel for the diesel fuel requirements of remote rural and forest communities; jatropha oil can be used directly after extraction (i.e. without refining) in diesel generators and engines.

The former President of India, Dr. Abdul Kalam, is one of the strong advocators of jatropha cultivation for production of bio-diesel. In our country out of the 600,000 km^2 of wasteland that is available in India over 300,000 km^2 are suitable for Jatropha cultivation. Once this plant is grown the plant has a useful lifespan of several decades. During its life, Jatropha requires very little water when compared to other cash crops. Jatropha oil is being blended with diesel and being used in Indian vehicles.

New Development

Car Technology: The Latest Innovations In Engine Development And Safety

Car technology is focusing increasingly on safety, efficiency and the environment, and some of the major new innovations are as given below.

1. Engine development

In the last two years, carbon emissions have become an issue of contention for new and used car owners. Motorists are being encouraged by both politicians and the media to downsize their vehicles and reduce their carbon footprint. Many manufactures have changed their engine and reduced carbon dioxide emissions-tailpiece emission. BMW, Mini Cooper Diesel, Mercedes, Mercedes Benz and many more have adopted new technology in there engine.

2. Convenience and Safety

Automatic Parking: The wheel-scuffer's dream will soon be available on a whole range of luxury cars. Simply drive along a row of parked cars and the system is able to detect a space big enough for your vehicle to squeeze into.

Feeling lazy, you take your hands and feet off everything, and watch in astonishment as the car parks itself.

Pre-scan technology: This technology was also showcased in the Mercedes F700 concept, where lasers scan the road surface before the car drives over it. This prepares the suspension to react to the terrain accordingly and ensures peerless ride comfort.

Saab Alco Key: Saab wants to help reduce the number of alcohol-related road incidents with this device by fitting it as standard - apparently, one in three traffic accidents in Europe is alcohol related. This fully integrated system requests the driver to blow into a wireless hand-held unit before driving the car. The breath is then analysed and if the blood-alcohol limit is exceeded, a red LED will appear and the engine will not start.

Volvo Sleep Detection: Volvo has introduced both Driver Alert Control (DAC) as well as a Lane Departure Warning (LDW) system as a £500 option on some of its higher-priced models. LDW uses cameras located between the windscreen and the rear view mirror and monitors the car's position between the road markings. Only after a certain speed is reached does the system become active, If the car then wanders across any lane markings without using an indicator, the driver is audibly alerted.

Collision Warning System: Swedish car maker Volvo is also developing a Collision Warning system which uses radar technology with a wide-angle search area to detect objects in front of and around the car. If the car approaches a pedestrian, a red warning light comes on the windscreen's head-up display and a warning signal sounds. This helps the driver to react and, in most cases, avoid an accident.

If the risk of a collision increases, assisted panic braking is activated to provide more pressure when the brakes are applied, but if the driver still doesn't brake and a collision is imminent, the car's brakes are activated automatically.

This system can even be expanded to incorporate Collision Avoidance programming, where the car could actually perform a direct input to the steering wheel and to the direction of travel if an imminent crash is detected.

Vehicle to Vehicle Technology: This hi-tech system is being developed by General Motors and uses wireless technology to allow a driver in one car to receive information from another car further ahead on the same road - perhaps that other driver has come across an obstacle or has slammed on the brakes. This system would allow the other driver to receive this information in sufficient time to react and therefore avoid any accident.

Driverless cars: These 'intelligent vehicles' are capable of taking a person from one point to another without any driver. Providing a "taxi-like" experience to the passengers, these vehicles would navigate the roads on their own. Also called as autopilot, autonomous vehicle or auto-drive car, these vehicles are expected to be fully functional by 2020. An example of such smart cars is the 2getthere passenger vehicle that is based on the FROG navigation technology that originated in The Netherlands, DARPA Grand Challenge (from USA) and AGRO research project (from Italy).

Emission Standards: With the help of automotive technologies, a check can be put on the emission of harmful pollutants such as NO2 , particulate matter (PM) or soot, carbon monoxide (CO) or volatile hydrocarbons. As a result, it would be easier to lower down the pollution level and save the planet from global warming.

Suspension technology: The suspension system comprises of springs, shock absorbers and linkages. This system connects the vehicle to its wheels. The main function of a suspension system is to minimize jerks and provide comfort to the occupants of the vehicle. With the advancement of technology, gas-filled shock absorbers have come to being which are much more responsive than the spring absorbers.

Apart from the above mentioned technologies, steering technology and safety technologies have also helped the automotive industry in a big way to reach great heights

Innovative Car Safety Technologies in New Honda City

Car safety technologies have gained prominence in the recent years with the growing number of road accidents. Modern day cars are well equipped with safety devices compared to their old siblings. The New Honda City recently launched by Honda Seil Cars India in the Indian car market is a perfect epithet of safety.

Trinity of Braking System

Trinity of braking system is one of the most significant safety systems in the new Honda City. The trinity comprises the Antilock Braking (ABS), Electronic Brakeforce Distribution (EBD) and Brake Assist. The combination of these advanced safety technologies sets a new standard in car safety feature.

ABS uses a system of sensors, an electronic control unit and a hydraulic control unit. All these work in association with each other to monitor the movement of car wheels and prevent wheel lock up. When any of the car wheel is about to lock while braking, the sensors sense the situation and then the electronic unit or the ABS computer sends the signal to the hydraulic unit. After receiving the signal, the system modulates the braking pressure of the corresponding wheel and prevents lock up. The key motive of the ABS system is to help car drivers maintain steering control during hard braking, especially in case of slippery road conditions.

The introduction of EBD with the ABS holds its own significance in improving safety standards. The system works in conjunction with the anti-lock brakes to electronically distribute the braking pressure between front and rear wheels. It optimizes the braking performance by maintaining the pressure balance between both front and rear wheels based on road conditions, car weight, car speed, and the available traction. This balance is very important as if the rear wheels lock up before the front wheels then the car will spin.

The Brake Assist system also plays a key role in ensuring faster and safer braking in association with other two members of the trinity. This system monitors the use of brake pedal and automatically senses the need to stop the car in case of an approaching accident or as a result of panic.

G-Force Control Technology (G-CON)

G-CON or the G-force control technology is one of Honda's best innovations designed in response to the need to control or absorb the crash force in event of an unavoidable accident.

This technology helps to reduce the impact of collision from all directions on the car body. The all-new Honda City is designed with the same impact absorbing body structure along with a strong survival zone to cocoon its passengers in case of an accident. It is believed that the car is estimated to withstand a fixed-barrier frontal collision at around 55 km/h, a side collision at around 50 km/h, and a rear impact at around 50 km/h.

Pedestrian Safety

Honda's commitment to safety also includes the safety of common people who walks on roads. Safety of pedestrians has always been a key concern for Honda. With this concern, the company first studied the dynamics of pedestrian collision according to which when a person is stuck by an oncoming car, he or she is thrown up onto the car hood before rolling on the street. Keeping this in mind the company introduced pedestrian safety dummies known as POLAR II.

POLAR II is believed to be the most advanced test dummy that was designed with realistic human structure along with sensors to measure the impact of energy on a human body during a car accident. Data received after crash testing these dummies has been used to re-evaluate the shape and design of the vehicles.

The New Honda City is also designed in accordance to the data received after conducting a crash test with the POLAR II. In an event of an accident with the new City, the bonnet and front wings of the car deform on contact with a pedestrian. Even the hinges on the car bonnet and wiper pivots are designed in such a way that they bend, break or absorb energy so that head injuries to the pedestrian can be minimized.

These developments are continuous and helpful to passenger.

Session 1: Innovation and developments

Exercise: Assignment

1. List the types of innovations in automobile sector.

S.No.	Name of Innovation
1.	
2.	
3.	
4.	
5.	
6.	
7.	
8.	
9.	
10.	

Session 1: Innovation and developments

Answer the following questions
(Use additional sheets of paper if necessary)

Fill in the blanks

1. Innovation are important for _____ .
2. New car innovation have concept of hybrid car,_____,
3. New technology helps in _____.
4. Old technology vehicle are outdated because_____.

Session 1: Innovation and Development

Checklist for Assessment Activity

Use the following checklist to see if you've met all the requirements for Assessment Activity.

Part A

- Differentiate between old and new technology.

Part B

Discussed in class the following :

1. Why innovation is required?
2. What are the different types innovation used in automobile?
3. What are advantages of using new innovations?
4. Important rules of innovation should be known to all.

Performance standards/criteria covered by this assessment

Performance standards	Yes	No
Able to understand innovation		
Able to distinguish between old and new innovations		

Suggested Reading

Books

Title	Author	Publisher
Automobile Engineering Vol I	Kirpal Singh	Standard Publishers
Automobile Engineering Vol II	Kirpal Singh	Standard Publishers
Text Book of Automobile Engineering	R K Rajput	Laxmi Publications
Automobile Engineering	R K Singal	S. K. Kataria and Sons
Automobile Engineering Theory	Kapil Dev	Computech Publications
Automobile Engineering,	K. M. Moeed	S. K. Kataria and Sons

Websites

auto.indiamart.com/auto-technology

www.automobileindia.com/consumer-guide/automobile-technology

auto.indiamart.com/auto-technology

books.google.com/books/about/Automobile_Engineering.html

www.bikeadvice.org

www.wikipedia.com

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