Upgradation of ITIs into Centers of Excellence-Broad guidelines for implementation of the Broad Based Basic Training in Automobiles Sector.

These Centres will be providing multiskill training to meet the skill requirement of particular sector of industry with their active involvement in all aspects of training. The training will be provided in three parts as given below:

- ✓ Training in Basic skill areas for a period of one year.

- ✓ Training in Advanced modules for next six months.
  The testing & certification for the Basic skill training during first year & also for advanced training during next six months will be conducted by NCVT.

- ✓ Training in specialized modules mainly in the industry (The course curricula, duration etc will be designed in consultations with the IMC/local industry. The trade testing & certification for this component will be done jointly by the State Government & Industry. Said certificate will be recognized by NCVT

As per the recommendations of the EFC, Training in the shop floor should constitute 25-40% of the curriculum.

The training programme will have multi-entry and multi-exit provisions:

- ✓ trainee can opt to go to the labour market after completing broad based basic training of one year duration as well as after completing 1½ year of training.

- ✓ trainee can join training after some time for advanced/specialised training in another module of same sector .

- ✓ ITI pass out trainee of the particular trade(s) from the conventional system can seek admission for advanced/specialised training in relevant sector.

In first year, curricula in the Area/Sector of 'Automobiles', uniform rotation for eight weeks each in the Basic Modules as mentioned below will be taken up. The trades from where existing infrastructure i.e. equipment/ instructor etc could be utilized for the training in 'Automobiles' sector is given below:

Basic modules	Name of the Module	Trade(s) from where existing infrastructure / equipment/ instructor could be utilized
ABT-01	**Basic Fitting and Measurements**	Fitter
ABT- 02	**Basic Sheet Metal Work and Welding**	Sheet metal worker/ Welder
ABT- 03	**Basic Electrical & Electronics**	Electrical/ Electronics/Mechanic Auto Electrical & Electronics
ABT- 04	**Basic Microprocessor and Computer Operation**	COPA/IT&ESM
ABT- 05	**Basic Petrol & Diesel Engines**	Mechanic (Motor Vehicle) /Mechanic (Diesel)
ABT- 06	**Basic of Transmission, Suspension, Steering System & Brakes**	Mechanic (Motor Vehicle)/ Mechanic (Diesel)

For these modules, Trade Practical will be 28 hours /week and Trade theory for 4 hours /week. Apart from above Generic modules as mentioned below will be taught throughout the year.

ABT-07- WORKSHOP CALCULATION & SCIENCE……..2 hrs/week

ABT-08-ENGINEERING DRAWING ……2hrs/week

G-01-ENTERPRENEURSHIP AND COMMUNICATION SKILLS….. 2hrs/week

In addition, 4 hours/week have been kept for Library studies & Physical Training

Vocational Instructors:

NAME OF THE MODULE	No. of Vocational Instructors (VIs)
ABT – 01 to 06	Six VIs one each for 6 module of relevant trades
ABT-07 & ABT - 08	One VI having Diploma in relevant field
G-01	`One contract/part time / guest faculty for Generic module, ENTREPRENEURSHIP AND COMMUNICATION SKILLS –G-01

The eligibility and other criteria will be as follows:

Eligibility : 10th pass under 10+2 system .

Batch size : 96 trainees 16 in each module (20% supernumeraries be allowed to take care of drop outs as already exist under CTS)

Admission:

For basic training, admissions are to be made in August / Feb each year.

Fee Structure:

Fee Structure may be decided by States Govt. in consultation with IMCs . It may be desirable to prescribe a uniform tuition fee for a sector in all Centres of Excellence of a state.

Space: Since workshop/theory class rooms are envisaged to be accommodated in the existing building of the ITI, therefore, following norms are prescribed only for new infrastructure is to be created .

(1) Workshop space of 80 Sqm. for each basic module from ABT-1 to ABT– 6 may be provided. Also , additional necessary space for vehicles may be provided for ABT-05 & ABT-06.

(2) Three Theory classrooms of 30 Sqm. each.

(some flexibility i.e. from 80 - 60 Sqm. area for workshop and 20-30 Sqm. area for class room area is proposed to be provided)

The Theory classrooms should have latest infrastructure including AV aids as per details given below:

1.	Suitable Chairs/ tables*	- As required
2.	OHP/Epidiascope	- 1 No.
3.	Laptop computer/PC (latest) & LCD projector**	- 1 No.
4.	Magnetic white board	- 1 No.
5.	White board	- 1 No.
6.	Flip chart	- 1 No.
7.	Storage Almirah	- As required

(* Optimum utilization of space/flexibility may be kept in view)

(**Keeping in view the constraints of funds under the scheme, it is proposed to procure only one set of Laptop computer/PC / LCD projector for CoE. However, States if so desire may procure additional Laptop computer/PC/LCD projector from their funds) While selecting furniture, it should be kept in mind that these are meant for Centres of Excellence. Criteria like maximum flexibility/utilization of space should be kept in view.

Office Equipment:

For each CoE one Scanner, one Photocopy Machine and one PC/printer along with suitable accessories/furniture and internet connection (if not already available in the institute) is proposed to be provided for each CoE, in addition to the equipment prescribed in the syllabus.

Addition/alteration/Construction:

For Civil Works, tentative amount of Rs 40.00 Lakh have been proposed per CoE. It is envisaged to have separate block/ wing for the Cenres of Excellence in the ITI campus. In case space is available in the existing building of an ITI for taking up new areas as per requirement of the cluster of Industry, the existing space will be renovated as per the need. Alternately, separate block will be built up in the same campus keeping in view the space requirements of the Electrical Sector.

While planning for addition /alteration/Construction of workshop and Class rooms, following may be kept in view:

- ✓ concept of a Centre of Excellence

- ✓ the fact that the requirement of funds for construction /addition /alteration for advanced training will be higher than that of basic training

Publicity

Wide publicity & advertisement be given for better response. The role of the local as well as the concerned Industry is very vital for the success of this program.

States may consider providing additional equipment/ other facilities like separate Library/upgradation of existing Library, Conference Hall/ Committee Room etc. from their own funds.

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Up gradation of ITI s into Centers of Excellence (C oE)

SECTOR – AUTOMOBILE
BROAD BASED BASIC TRAINING
(One year)

Module No.	Name of the Module	Duration in Weeks
ABT –01	BASIC FITTING AND MEASUREMENT	8 weeks
ABT –02	BASIC SHEET METAL & WELDING	8 weeks
ABT –03	BASIC ELECTRICAL , ELECTRONICS	8 weeks
ABT –04	BASIC MICROPROCESSOR AND COMPUTER OPERATION	8 weeks
ABT –05	BASIC OF PETROL & DIESEL ENGINES	8 weeks
ABT –06	BASIC OF TRANSMISSION, SUSPENSION, STEERING SYSTEM AND BRAKES	8 weeks
COMMON SUBJECT		
ABT –07	WORKSHOP CALCULATION & SCIENCE	@ 2 Hrs/ week for 48 weeks
ABT –08	ENGINEERING DRAWING	@ 2 Hrs/ week for 48 weeks
G–01	ENTREPRENEURSHIP	@ 2 Hrs/ week for 48 weeks

SECTOR – AUTOMOBILE
BROAD BASED BASIC TRAINING

(first Year)

MODULE – ABT –01 : BASIC FITTING AND MEASUREMENT

(DURATION : 8 Weeks)

COURSE CONTENT

Practical	Theory
Familiarisation with shop layout, machinery used in the trade. Introduction to safety including fire equipments and their uses Familarise with Fitter's hand tools. Physical introduction to measuring instruments, handling of instruments, Use of Linear measuring instruments such as Steel rule of different ranges. Filing a flat surface of mild steel and cast iron. Check for flatness, straightness and squareness.	Manufacturing processes in brief. Outline of various subjects to be covered. Introduction to hand tools and their safety. Introduction to Metrology, Objectives of Metrology – measurements – principles – methods of measurement Environmental Factors and Personal Safety
Simple blue print reading Mark out according to simple blue print Hack sawing to dimension Outside and inside calipers for measuring outside and inside parameters. Chieselling the edges straight and square to the surface. Grinding Chiesels	Marking and punching tools and their uses. Hacksaw – types, specification and their uses. Chiesel – types, Specification and their uses. Terminology used in Metrology – Accuracy – Repeatability –Resolution, etc. SI Units of measurements – physical quantities under SI system

Filing flat and square to size to an accuracy of ±0.1mm Marking and punching of stepped and angular components and finishing the part to the required shape and size of an accuracy of ±0.1mm Vernier Calipers – Least count, exercise in outside measurement, inside measurements, depth gauge.	Classification and specification of files, shapes, sizes and grades. Selection criteria of files Bench vice – constructional details
Center drilling, drilling, reaming, counter sinking, counter boring and tapping for various sizes of mild steel and tapping on various sizes of mild steel and cast iron material. Resharpening of drills.	Drilling machine – Types – Drilling operation – Drill bits Tool holding and work holding devices Selection of spindle RPM for drilling Standard size of threads, types Reamers – types, care and maintenance
Measurement of flat rectangular objects, cylindrical objects, hollow components, threaded components Exercises on external & internal measurements using micrometers and Height gauges. Measurement of bores using cylindrical bore gauge, use of telescopic gauge, checking squareness using combination set.	Selection of measuring instruments, care, use and maintenance of measuring instruments – Handling of precision instruments – Vernier Caliper, Micrometer, Height Gauge, Dial Gauge (Plunger and bevel type)
Fitting exercises – simple to complex (Involving drilling, tapping, reaming, counter sinking, counter boring and slide fitting) Use of stud extractor, and universal puller	Taps and Dies – Description, care and maintenance Lubrication for tapping Determination of drill size for tapping Types of fasteners, Stud extractor and puller – brief description and use. Limits and fits according to IS: 919 Applications of adhesives, Metal, Shellac, etc.

ACHIEVEMENTS

On Completion of the module, the trainee should be able to :

1. Identify and use marking and measuring tools, cutting tools, workholding devices in fitting shop

2. Measure basic linear parameters i.e., length, diameter (inside and outside) using steel rule, vernier calipers,

3. Micrometers, Height gauge, Dial bore gauge, Telescopic gauge

4. Measure geometrical parameters i.e. flatness, straightness, squareness using Engineer's square, combination indicator

5. Mark and cut the rectangular and cylindrical material

6. File the surfaces to the accuracy of ±0.1mm

7. Drill and ream the holes on drilling machine

8. Tap the hole manually and by machine

9. Remove broken studs and bolts from the holes using stud extractor

10. Remove bearing and pulleys from the shaft using universal puller

11. Perform basic skills of fitting

UPGRADATION OF ITIs INTO CENTRE OF EXCELLENCE (CoE)

SECTOR / AREA : AUTOMOBILE

BROAD BASED BASIC TRAINING

(First Year)

MODULE ABT –02 BASIC SHEET METAL WORK AND WELDING

(DURATION – 8 WEEKS)

COURSE CONTENTS

Practical	Theory
Familiarization with machinery and equipment and their layout in the section. Use of protective safety devices on shop floor Identification of tools & Equipments used in sheet metal working and welding Practice in Scribing of straight line, Bisection of straight lines with marking tools. Practice in marking simple geometrical shapes. Practice in cutting sheet metal to different shapes using various types of snips. Folding / Bending sheet metal to 90° using wooden mallet	Safety precautions to be observed in the Workshop. Importance of sheet metal work & welding in industry Safety in Gas welding & manual metal Arc welding Metals and their characteristics Sheet metal – Classification and uses Measuring & Marking Tools – Try square, dividers, trammels, marking block, Scriber, Steel rules, Calipers, SWG, etc. Types of Snips, shears and their uses Sheet metal work Tools – Mallet, Nylon Hammers, etc. Bench vice C Clamps, Pliers, Bench stakes or sheet formers, Types and uses
Flanging sheet metal to 90° To make 90° L piece of equal diameter and join them at right angle Making holes in sheet metal using punching machine Drilling holes on sheet metal using power operated hand drilling machine Practice on pipe bending by hand	Cutting methods – straight cutting – circle cutting – Louver cutting, Nibbling, Slot cutting, Notching Sheet Metal Works – Folding, Bending & Flanging Brief Description and uses of guillotine shears and circle cutting machines Brief description and use of hand punching machine Description of power operated hand drilling

	machine, drill bits, etc. Method of laying out pattern Simple exercises on development of pattern layout in parallel line, radial line and triangulation method.
Riveting practice using various types of rivet heads Making Rivetted joints Practice on removing dents of spherical and hemi-spherical articles. Buffing and polishing Spray painting using spray gun	Fastening of sheet metal, various types of fastening devices Introduction to tube and pipe Bending of pipes Brief Description of roll forming machine types and its working principle vehicle body repairing techniques – denting spray painting
Setting of Arc welding plant Striking an Arc Beading practices Welding joints in horizontal and vertical position Spot Welding on Sheet Metal	Safety in welding work Types of welding processes and application Nomenclature of welding joints & Edge preparation Terms applied to welding Welding symbols – Description and uses Distortion and its control Spot welding
Setting up of gas welding plant Opening and closing procedure of gas welding plant Lighting and adjustment of flam Beading practice Oxy acetylene, hand cutting on M S Plate Pipe Butt Joint on M S Plate	Different process of metal joints – Bolting – Riveting- Soldering, Brazing & Welding Common gases used for welding Gas welding hand tools – uses Oxy-acetylene welding – Principles and applications Types of Oxy-acetylene flames – their uses Flame Temperature – chemistry and structure of oxy-acetylene flame
Brazing. Soldering & silver soldering by oxy-Ace. Process Fusion run with / without filler rods and lab joints on Sheet metal by soldering. Square butt joint on M S plate Practice on hard soldering method (Lead & Tin)	\Oxygen cylinder, DA Cylinder description Regulator – Types – Construction Care & maintenance of blow pipes and cutting torches Filler rods used in Gas welding Welding flux Faults in gas welding – Causes – Corrections Solder – Different types of Solder and their uses (Soft & Hard) Heating appliances.

ACHIEVEMENTS

On Completion of the module, the trainee should be able to :

1. Identify and use tools and equipment used in sheet metal working and welding following safety precautions.

2. Mark and cut sheet metal in different shapes

3. Fold, flange and join sheet metal

4. Make simple riveted joints

5. Repair simple sheet metal parts by denting, buffing, polishing and spray painting

6. Make simple welding joints in horizontal and vertical positions by arc welding

7. Make simple welding joints by gas welding

8. Do brazing, soldering on sheet metal.

9. Cut bend and join M.S. pipe

10. Spot weld sheet metal parts

11. Perform basic skills of Sheet metal working and welding

UPGRADATION OF ITIs INTO CENTRE OF EXCELLENCE (CoE)

SECTOR / AREA : AUTOMOBILE
(2 YEARS)

BROAD BASED BASIC TRAINING

(First Year)

MODULE : ABT –03 – BASIC ELECTRICITY AND ELECTRONICS
(Duration – 8 Weeks)

MODULE : ABT –03 – BASIC ELECTRICITY AND ELECTRONICS
(Duration – 8 Weeks)

Practical	Theory
Familiarization with shop layout, hand tools and machines, safety precautions and first aid. Insulation stripping and cutting of wire. Making joints on simple strapped conductors, sieving or taping with insulation tape, Measurement of conductor using wire gauge.	Safety precautions and first aid. Care and maintenance of tools. Signs and symbols used in Electrical Technology. Voltage, Current and Resistance and its units. Effects of resistance on the length and cross sectional area of a conductor, conductors and insulators.
Soldering practice on wire joints, Soldering and crimping of lugs with wire ends Measurement of resistance of wire would resistors using ohmmeter. Connect two or three resistors in parallel and in series and measure total circuit resistance, Build a simple electrical circuit using a battery and resistors, Connect voltmeter to measure battery voltage and voltage drop across resistors, Connect ammeter to measure current, reconcile Ohm's law.	Cumulative resistance of parallel and series connected circuits, Exercises on series and parallel circuits. The parts of a simple electrical circuit Ohm's law – Exercises on Ohm's law. Method of using Ohmmeter. The use and method of connecting a D.C. moving call voltmeter and ammeter. Use of voltmeter to detect loose connections. Type of solder and flux required for soldering aluminum and copper conductor. Introduction to equipment used for soldering.
Build a simple earth return lamp circuit using battery, lamp, switch, a fuse, connecting wires and frames for return current, Practice of connecting voltmeter and ammeter. Checking blowing of fuse with wires short-circulated. Identify various electrical equipments on the mock up wiring board i.e. starter motor, dynamo control box etc., Follow up starting system wiring, Identify marking on terminal joints, Remove and repeat connections, Similar practice on charging system wiring.	Description of an automobile electrical circuit Earth return wiring, Polarity of earth connection, Description of switch, fuse, rating of use and their location on the circuit. Description of various automobile electrical equipment and their function in brief, Description of starter motor, Description of changing circuit – details of connections and cables sizes.

Practice in removing and fitting the batteries, Cleaning and maintenance of batteries, Testing the batteries with Hydrometer and cell tester, Topping of battery with distilled water, Connect batteries for charging.	Lead acid battery connections, Working principles, Terminal polarity, voltage and ampere-hour capacity of battery, Care and maintenance of batteries, Method of checking of batteries and recharging on a bench charger.
Demonstration and use of simple devices such as transistors, Thyristors, Triac, Diac, etc. Assembling and study of rectifier circuits and power supplies, use of measuring instruments, study of electronic system in modern automobiles	Basic electronics devices such as transistors, Integrated circuit, Thysistors, Triac, Diac, etc. Simple electronics circuits such as oscillators, amplifiers, rectifier circuits, power supplies, etc. Use of simple instruments for electronic measurements such as multimeters-Digital and Analog, Application of electronics in modern automobiles such as Automatic voltage regulators, Electronic charging circuits.
Demonstration of digital kits, Development of simple digital circuits using logic gates, Study of input and output relationships in logic circuits.	Principles of Digital electronics. Number systems and Truth table concept and application, logic gates and their applications, Simple digital circuits.

ACHIEVEMENTS

On completion of the module, the trainee should be able to:

1. Protect himself from Electrical shock and observe electrical safety precautions while working

2. Make joints on conductors and solder joints

3. Measure basic Electrical quantities e.g. voltage, current and resistance and verify Ohm's law

4. Build on earth return lamp circuit using battery, switch and other accessories.

5. Identify Electrical equipments of a mock up wiring board.

6. Test Batteries and connect to charger / vehicle with correct polarity and simple maintenance of Batteries.

7. Build small circuits using transistors, thyristors, etc.

8. Use of power supplies and various measuring instruments in electronic circuits.

SECTOR – AUTOMOBILE

ROAD BASED BASIC TRAINING

(FIRST YEAR)

MODULE –ABT –04 : BASIC MICRO PROCESS AND COMPUTER OPERATION

(DURATION – 8 WEEKS)

COURSE CONTENT

Practical	Theory
Demonstration on micro processor kits and familiarization with different related devices Demonstration and familiarization with automobile micro processor system	Study of basics of micro processor Application of micro processor in automobile system. Approach to trouble shooting in micro processor controlled systems.
Booting the computer, opening windows menus, using the mouse, refresh computer desktop using right click of the mouse, create a directory in xp and linux, format a floppy, create a file using notepad, save the file in floppy, copy the file into hard disk, copy a file from hard disk to floppy, create a directory in floppy, create a directory in hard disk, use my documents, use start menu for opening an application, to open a document recently written, change control panel settings for display, change the volume name of the hard disks using system properties., familarise with keyboard and keys.	Introduction to computer fundamentals and its parts, familiarizing with Disk Drives, Booting of a computer system, using the mouse, right click, left click and use of operating systems like windows XP, Linux, menu system, tool bars, file structures, directories, moving and copying a file from floppy to hard disk, Hard disk to floppy disk, creating directories. Formatting floppy disk.
Techniques of changing desktop wall paper, changing desktop screen properties, control panel, user accounts, customizing icons, writing a simple text using Notepad. Using paint for drawing figures to get accustomed with mouse. Saving a file. Using Windows Explorer, Install	Use of desktop, control panel settings, Explorer, regional settings, creating shortcuts, use of simple applications like Paint, Notepad.

a software, Remove a Software, Add new hardware to the system (like a Printer, Change the system date and Time, changing the regional settings of the system like country, currency, date format, using start menu, creating Desktop short cuts	
Open internet explorer, change the settings in IE , customize Internet Explorer for default applications, enable cookies, change the security settings, setup an internet connection, user ID and password saving in the computer for future usage, set up outlook express for an e-mail account, set up server authentication settings, receive and send e-mails from the account. Search using Yahoo and Google for certain topics, download a file from the internet, save the downloaded file. Set up the net meeting using MSN or Yahoo Messenger.	Study of Internet Explorer, Modem, Settings in the IE and Modem, Dial up and Broadband connections, Outlook Express, Viewing E mail from the web site and Outlook Express, Creating e mail Accounts, using search engines, Video conferencing, MS Chat.
Open MS WORD, create a new file, save a file, open an existing file, save as a text file, type a paragraph, set for left and right margins, change the letters from upper to low case, vice versa, cut a paragraph, copy a paragraph, set up tab positions, set hanging indents, draw a simple table, insert rows, insert columns, erase rows, erase columns, search the document for spelling corrections, print the letter in a printer attached, in portrait and landscape. Open Excel, and work out the following to understand the theory commands: Prepare a salary bill for ABC organisation with Column A for names, Column B for Basic Salary, Column C for DA, Column D for addition of B & C to get the full	Creating sample documents using MS WORD. Text wrapping, Text formatting, changing letters to different case, drawing table, mail merging, page formatting, using different font types, printing a document Using Excel as spread sheet, familiarizing with cells, formulae, text numbers and date, using shortcuts for entering date and numbers in progressive cells, copying formulae, text and numbers, using borders, merging cells, unmerging, changing cell width, row height, printing an area of the sheet, options of printing like fit to paper, shrinking, etc, using different sheets in a work book, changing colour of cells, fonts, text.

salary. Add the column D into a new cell as TOTAL amount Copy the sheet into sheet 2. Sort the sheet 1 as per names. Sort the sheet 2 as per Total salary. Insert two rows in sheet 1. Merge these rows. Enter heading as Salary Bill. Use border and shading for the entire used column. Print the sheet using set print area with margins, and use scale factor for reduction and enlargement. Use portrait and landscape.	
Opening a web page, search command and downloading, creating and using e-mail	Internet and e-mail Computer networking and types of networks

ACHIEVEMENTS

On completion of module, the trainees should be able to:

1. Identify Microprocessor Controlled Systems in Automobiles
2. Understand Computer Fundamentals and its parts
3. Use Input and Output Devices
4. Use Computer Operating System and basic commands of DOS and Windows XP
5. Work in MS Word, MS Excel
6. Open web page, search sites and download
7. Create and use email

UPGRADATION OF ITIs INTO CENTERS of EXCELLENCE (CoE)
SECTOR / AREA : AUTOMOBILES
(2 YEARS)

BROAD BASED BASIC TRAINING

(First Year)

Module : ABT - 05: BASICS OF PETROL & DIESEL ENGINES

(Duration - 8 weeks)

COURSE CONTENT

Practical	Theory
Familiarization with the hand tools, machinery and type of work done in the trade. Safety precautions in the use of hand tools and equipment on shop floor. Safety equipment and its use. Use of jacks, hoist and horses in the shop. Selection of materials for gaskets, packing and locking devices and their uses in the trade. Familiarization with working of four stroke petrol and Diesel engines. Identification of differences between Petrol & diesel Engine. Identification of difference between two stroke and four stroke engine.	Introduction to the trade and general precautions to be observed in the trade in storing and handling fuels, brake fluids, lubricants, acids, refrigerants, dust and asbestos. Description of safety equipment, its purpose and use. Elementary First Aid. Types of materials used in packing and gaskets, Fastening devices General description, working principle, classification and characteristics of Petrol & Diesel engines. Working principle of two stroke petrol engine. Difference between petrol and diesel engines. Difference between two stroke and four-stroke engines.
Identifying various petrol & Diesel engines auxiliaries. Practice on starting and stopping of the engine. Adjusting speeds in idling and running conditions. Running the engine and checking temperature, fuel, oil pressure and speed. Testing engine compression and vacuum with gauges. Torquing & detorquing of cylinder head bolts.	Precautions in starting, running and stopping a petrol & diesel engine. Brief description of engine auxiliaries and function of various gauges used with the engine., concept of torque, clamping force, torque wrench-use and care method of torquing, and detorquing.

Dismantle 2-stroke petrol engine. Examine its parts their materials and other working details. Measurement of cylinder bore. Assemble and start the engine.	Engine details – types, functions, materials and maintenance of, cylinder heads, cylinder, cylinder liners, Piston, piston rings, crank shaft, cam shaft, vibration damper and fly wheel.
Dismantle 4-stroke petrol engine. Examine inner details of moving parts, their materials and other working details. Assemble and start the engine.	Valve and valve operating system, valve timing diagram, camshaft and timing gears, Importance of correct tappet clearance and timing.
Familiarization with ignition system of Petrol engine. Clean spark plugs, adjust gaps and refit. Servicing air cleaner. Carry out minor adjustments on carburetor.	Ignition system of petrol engines, purpose of induction coil, flywheel magneto, distributor and spark plug. Working principle of carburetor and its adjustments. Importance of correct air fuel mixture on the engine performance. Introduction to Multi Point Fuel Injection (MPFI) System
Practice on starting and stopping of diesel engine. Running engine on stand and checking speed, temperature, and oil pressure. Compression testing of cylinders. Dismantle 4-stroke diesel engine. Examine inner details of moving parts, their materials and other working details. Measure cylinder wears and piston clearance. Decarbonise the cylinder head. Assemble and start the engine	General description, working principle and constructional details of Diesel engines. Precautions while starting, running and stoping diesel engine. Precautions while dismantling diesel engine and engine assembly procedure.
Identifying main parts of fuel injection and mounting of fuel Injection pump to the engine. Injector overhauling & testing. Replacing fuel filter elements and air cleaners.	Functions and types of Fuel feed systems in diesel engines. Various components of fuel feed system and their functions. Common troubles in fuel feed systems and remedies, Types, purpose and application of fuel injection pump. Details of In - line fuel Injection pump and Injectors.
Flushing of cooling system in engine. Dismantling and assembling oil pump, servicing oil filters, changing oil in engine.	Engine cooling systems. Functions and types of lubrication systems. Various components of lubrication system and their functions. Types of lubricants and their properties. Common troubles in lubrication systems and remedies.

ACHIEVEMENTS

On completion of the module, the trainees should be able to:

1. Identify various engine parts, auxiliaries and know their functions.
2. Dismantle and assemble 2 and 4 stroke petrol engines.
3. Dismantle and assemble 4 stroke diesel engine
4. Start, stop and carry out minor repairs.
5. Do tuning of the engine.

UPGRADATION OF ITIs into CENTERS of EXCELLENCE (CoE)
SECTOR / AREA : AUTOMOBILES

BROAD BASED BASIC TRAINING

(First Year)

Module : ABT-06 : Basics of TRANSMISSION, SUSPENSION , STEERING SYSTEMS & BRAKES

(Duration - 8 weeks)

COURSE CONTENT

Practical	Theory
Safety precautions in handling asbestos. Dismantling a clutch assembly from the engine, clean and inspect parts for wear and damage. Changing pressure plate and flywheel. Testing the of clutch springs for uniform tension, assembling of pressure plate and spring, adjusting the fingers and aligning clutch with flywheel.	Description of single plate and multi-plate clutches functions of different parts of the clutch assembly. Material for linings.
Cleaning, assembling gearshift mechanism, changing oil in the gearbox. Studying different types of oil seals and bearings used in the gearboxes.	Purpose of the gearbox, different types of power flow layouts (Front wheel drive, Rear wheel drive etc), gear ratios and function of a sliding mesh gearbox and its draw backs. Lubrication system in a gearbox. Description and advantage of (1) constant mesh gearbox, (2) synchromesh gearbox. Function of the gear shifter rod. Type of lubricating oil used in gearboxes.
Studying the gear ratios in the gearbox. Removing, cleaning and refitting 'U' joints, propeller shaft drive. Dismantling of an old final rear axle assembly, clean and inspect parts, cut packing and gaskets. Remove crown wheel, pinion and bearings, clean parts. Check tooth contact in the crown and pinion and adjust backlash. Assemble rear axle assembly and study its functioning.	Working of propeller shaft, 'U' joints and a rear axle. Description and function of final drive (differential). Tooth contact and backlash adjustment in rear axle assembly.
Removing and refitting a leaf spring as an assembly in a vehicle, changing rubber bushes of shock absorbers and independent front suspension. Lubrication of suspension units.	General description of conventional suspension system, Leaf spring & shock absorber, Wheels, tyres and tube sizes, applications, care & maintenance

Removing and refitting steering boxes from vehicle, checking and topping up oil in steering box. Checking and adjusting steering wheel play and backlash.	Types and functions of steering gear boxes. Layout of steering assembly and linkages, function of each part. Lubrication of linkages and steering gear box.
Checking and correcting the steering geometry with instruments,	Steering geometry: Ackerman steering, castor, camber, king pin inclination, toe, toe-out on turns, description and purpose, common steering troubles and remedy.
Identification of Pneumatic valves, Components, parts of Air compressor and to draw the symbols. Construction of circuits using single acting cylinder, Double acting cylinder and direction control valve. Construction of circuits for pneumatic power press, pneumatic hammer using double acting cylinder, directional control valve and flow control valve.	Introduction to Pneumatics, Pneumatic Symbols, block diagrams, Compressed Air Theory, Production, Purification and Distribution Construction and applications of directional control valve, pressure control valve and flow control valve with accessories
Dismantling and assembling of 4 / 3 way directional control valve Dismantling and assembling of flow control valve Dismantling and assembling of Single acting, Double acting and double acting double rod cylinders Dismantling and Assembling of Pressure Control valve Tracing and drawing the hydraulic circuits for the following machines Hydraulic Power hack saw machine	Direction control valves – types, construction and functions Pressure Control valves - types, construction and functions Flow control valves- types, construction and functions Construction of circuits using single acting cylinders, double acting cylinders with direction control valves and flow control valve on the trainer kit
Checking and adjusting hand brakes and pedal play in foot brakes. Dismantling wheel brake assembly– removing old lining and fitting new lining on the brake shoe.	Types of braking systems. Layout of Mechanical & hydraulic brake systems. Description and advantages of vacuum assisted hydraulic brakes. Master Cylinders – types including the tandem master cylinder, special features ,Construction , functions , common troubles and remedy. Drum brakes and disc brakes
Removing & cleaning of brake drums. Fittings new cups and brake hose pipes – re-assembling. Adjusting all four wheel brakes and testing for brake concern.	Brake linings – types and materials. Relining the brake shoes – precautions to be observed.

Bleeding of vacuum assisted hydraulic brakes – Removing and refitting of vacuum boosters – repairing of pipelines – adjusting the brakes in vacuum assisted hydraulic brakes. Locating air leaks in the brake lines and rectification	Layout of air brake system – Major components in the system, description and purpose of each part, their care and maintenance. Troubles in Air brake assembly and their remedy. Brake testing – efficiency of brakes Introduction to anti-lock braking system (ABS).

ACHIEVEMENTS

On completion of the module, the trainee should be able to:

1. Clean, inspect, adjust and replace clutch assembly.
2. align gear shifter rod and change gear box oil
3. replace propeller shaft and clean and assemble U joints
4. adjust differential back lash
5. remove, wheel assembly and repairing tyre puncture
6. lubricate suspension units and able to adjust steering wheel play
7. to construct a simple hydraulic & pneumatic circuits
8. to perform overhauling of mechanical, hydraulic & pneumatic brake system
9. understand the working parts of hydraulic & pneumatic system
10. adjust & bleeding of hydraulic brake

Tool, Machinery, Equipments, etc. for a batch of 16 trainees

Module ABT–01 (Basic Fitting and Measurement)

Sl. No.	Item	Qty
1.	Steel rule 30 cm graduated both in English & Metric units	17 Nos.
2.	Outside spring caliper 150mm	17 Nos.
3.	Inside spring caliper 150cm	17 Nos.
4.	Hemaphrodite caliper	17 Nos.
5.	Divider spring 150mm	17 Nos.
6.	Centre punch 100mm	17 Nos.
7.	Hammer B.P. 0.5 kg	17 Nos.
8.	Combination plier 150mm	17 Nos.
9.	Safety glasses	17 Nos.
10.	File flat bastard 300mm	17 Nos.
11.	File flat 2nd cut 250mm	17 Nos.
12.	Engineers Screw driver	17 Nos.
13.	File flat smooth 200mm	17 Nos.
14.	Cold chisel flat 25x200mm	17 Nos.
Tools Instruments and General Shop outfits		
15.	Granite Surface plate 100mmx630mm grade 1	4 Nos.
16.	Metal stand Table for surface plate 900x900x120mm	4 Nos.
17.	Screw Driver Set (multiheads)	1 Set
18.	Scribing block universal 300mm	2 Nos.
19.	Vee Block universal 300mm	2 Nos.
20.	Try square 150mm	2 Nos.
21.	Outside spring caliper 200mm	2 Nos.
22.	Divider spring 200mm	2 Nos.
23.	Inside spring caliper 200mm	2 No.
24.	Straight edge steel 500mm	1 No.
25.	Straight edge steel 500mm	1 No.
26.	Steel tape 2 metre in case	1 No.
27.	Spirit level 2V 250, 05 metre	1 No.
28.	Hammer B.P. 800 gms with handle	6 Nos
29.	Screw driver, heavy duty 300 mm with handle	4 Nos
30.	Hammer lead 1 Kg	2 Nos.
31.	Combination set 300mm	2 Nos.
32.	Spindle blade screw driver 100mm	2 Nos
33.	Allen hexagonal keys 2.5 to 12	2 sets
34.	Spanner D.E.C.P. series 2(7pcs. each)set	6 sets
35.	Adjustable spanner 12 Nos	3 Nos
36.	Reduction sleeve MT as required	1 Set

37.	Angle plate size 200x100x200mm	2 Nos
38.	Angle plate adjustable 250x150x175	2 Nos
39.	Solid parallels in pairs (Different sizes) in Metric	12 pairs
40.	Oil cane pressure feed 500mg	6 Nos.
41.	Oil stone 150x50x25mm	2 Nos
42.	Twist drills 3mm to 13 mm (Parallel Shank)	2 sets
43.	Drill Chuck 0-20 with taper shank	2 Nos.
44.	Centre drill A1 to 5	2 sets
45.	Grinding wheel dresser (star type)	1 No.
46.	Clamps C 100mm	2 Nos.
47.	Clamps C 200mm	2 Nos.
48.	Tap and die set in box metric pitch	1 set
49.	Drill HSS tape shank	1 set
50.	File flat 2nd cut 250 mm	4 Nos.
51.	File flat smooth 250mm	4 Nos.
52.	File H/R 2nd cut 250mm	4 Nos.
53.	File triangular smooth 200mm	4 Nos.
54.	Needle file set	1 No.
55.	File square 2nd cut 250mm	4 Nos.
56.	Reamer 6mm to 13mm by 1mm	1 set
57.	Hacksaw adjustable 250-300mm with blades	8 Nos.
58.	Hand vice 50mm jaw	2 Nos.
59.	Magnifying glass 75mm	2 Nos.
60.	Stud Extractor Set of 3	2 sets
61.	Universal puller for removing pulleys, bearings	2 sets
62.	Stud remover with socket handle	1 No.
63.	Combination plier 15cm	1 No.
64.	Oil Cane – 0.5 lit cap.	2 Nos.
65.	Steel Measuring Tape 10m in a case	1 No
	Measuring Instruments	
66.	Micrometer outside 0-25mm	4 Nos.
67.	Micrometer outside25-50mm	4 Nos.
68.	Micrometer outside 50-75mm	2 Nos.
69.	Micrometer depth gauge 0-150mm	8 Nos.
70.	Direct reading Vernier caliper 0-300	4 Nos.
71.	Vernier height gauge 250mm	1 No.
72.	Vernier bevel protractor with least count of 5 minutes	1 No.
73.	Plunger Type Dial Gauge	4 Nos.
74.	Lever Type dial gauge	4 Nos.
75.	Dial gauge stand	4 Nos.
76.	Screw pitch gauge for metric pitches (0.5 to 7mm)	2 sets
77.	Radius gauge metric set (1-6mm)	1 set
78.	Feeler gauge	1 No.
79.	Dial Vernier caliper 200mm	1 No.
80.	Dial micrometer (0-25mm)	1 No.

81.	Cylinder bore gauge	1 No.
82.	Telescopic gauge	1 No.
	General Installation	
83.	Sensitive Drilling machine pillar 12mm capacity with accessories	2 Nos.
84.	Radial Drill Machine 1200mm motorized with tapping attachment	1 No.
85.	Drilling machine pillar 20mm capacity with accessories	1 No.
86.	Pedestal grinder	1 No.
87.	Hand Drilling Machine Power (10mm)	1 No.

Sl. No.	**Workshop Furniture**	**Quantity**
1.	Suitable Work Tables with vices	As required
2.	Stools	17 Nos.
3.	Discussion Table	1 No.
4.	Tool Cabinet	2 Nos.
5.	Trainees locker	2 Nos.
6.	Fire fighting equipment, first- aid box	As required
7.	Book shelf (glass panel)	1 No.
8.	Storage Rack	As required
9.	Storage shelf	As required.

TOOLS, MACHINERY, EQUIPMENTS, ETC. FOR A BATCH OF 16 TRAINEES

Module ABT-02 Basic Sheet Metal Worker and Welding
Duration : 8 Weeks

Sl. No.	Item	Qty
1.	Steel Rule 300mm	17 Nos.
2.	Wing Divider 200mm	17 Nos.
3.	Centre Punch 100mm	17 Nos.
4.	Spring Dividers 150mm	17 Nos.
5.	Ordinary Wooden Mallet 50mm	17 Nos.
6.	Cross Peen Hammer 0.25 Kg with handle	17 Nos.
7.	Protractor with blade 150mm	17 Nos.
8.	Steel Tape 2 meters	17 Nos.
9.	Ballpane Hammer 0.5 Kg with handle	17 Nos.
10.	Scriber 150mm x 3mm (Engineers)	17 Nos.
11.	Soldering copper 0.2 Kg	17 Nos.
12.	Goggles	17 Nos.
13.	Gloves	17 Nos.
14.	Apron	17 Nos.
15.	Spark lighter	17 Nos.
16.	Hammer Chipping 0.25 Kg	17 Nos.
SHOP OUT FIT		
17.	Tin Man’s 450 mm x 600mm	4 Nos.
18.	Sheet Metal Gauge	2 Nos.
19.	Stake Round and Bottom	4 Nos.
20.	Half Moon Stake	4 Nos.
21.	Funnel Stake	4 Nos.
22.	Anvil Face Stake	4 Nos.
23.	Bick Iron Stake	4 Nos.
24.	Tinmans Horse	2 Nos.
25.	Hammer Peaning with handle	4 Nos.
26.	Hammer Creasing with handle	4 Nos.
27.	Hammer Planshing with handle	4 Nos.
28.	Hammer Block with handle	2 Nos.
29.	Sher Tinmans 300mm	8 Nos.
30.	Snips straight 250mm	8 Nos.
31.	Right cut snips 250mm	4 Nos.
32.	Left cut snips 250mm	4 Nos.
33.	Hand Shear Universal 250mm	4 Nos.
34.	Punch Round 3mm, 4mm &6mm Dia	4 Nos.
35.	Punch Round 4mm Diia	4 Nos.
36.	Punch Round 6mm Dia	4 Nos.

37.	Rivet sets snap and Dolly combined 3mm, 4mm, 6mm	4 Nos. each
38.	Chisel cold flat 25mm x250mm	4 Nos.
39.	Punch Letter 4mm and Punch Number 4mm	1 set each
40.	File flat 250mm second cut and smooth	2 Nos. each
41.	File flat 250mm smooth	2 Nos.
42.	File flat 300mm bastard	2 Nos.
43.	File half round 300mm smooth	2 Nos.
44.	Hacksaw frame 300mm adjustable (tubular)	4 Nos.
45.	Hand Groover 3mm, 4mm, 5mm	4 Nos.
46.	Plier Combination 150mm	2 Nos.
47.	Grip Wrench 200mm	2 Nos.
48.	Ladle 150mm Dia	2 Nos.
49.	Blow Lamp 1 litre	2 Nos.
50.	H.S.S. Twist Drill 3mm, 4mm & 6mm (Parellel Shank)	3 Nos. each
51.	Hand Drill 0 to 6mm, 8mm, 10mm & 12mm	2 Nos. each
52.	Soldering Copper Hatchet type 500gms	8 Nos.
53.	Pneumatic rivet gun	2 Nos.
54.	Trammel Point (with beam 600mm)	1 No.
55.	Vernier Caliper (0mm-150mm)	1 No.
56.	Micrometer outside (0 to 25mm)	1 No.
57.	Raspcut file 250mm	4 Nos.
58.	D.E. Spanner G.P. (6mm to 32mm) (set of 12 spanner)	2 set
59.	Bessing Mallet	4 Nos.
60.	Endfaked Mallet	4 Nos.
61.	Soft Hammer (Brass, Copper, Lead, Rubber and Rawhide heads with handle)	4 Nos.
62.	Steel Rule 600mm	4 Nos.
63.	Oil Can Pressure feed 500ml	2 Nos.
64.	Raising Hammer with handle	4 Nos.
65.	Raw Punch holder and bits (No.8, 10, 12, 14)	2 sets
66.	Hollowing Hammer with handle	4 Nos.
67.	Tripaning tool 70mm	1 No.
68.	Safety Glasses	4 pairs
69.	Handvice 50mm	16 Nos.
70.	Steel wire Brush 50mmx150mm	16 Nos.
71.	Gloves for Welding (Leather and Asbestos)	16 Nos.
72.	Leather Apron	16 Nos.
73.	Tongs, Close mouth and pick up (1 each)	4 pair
74.	Portable Electric drill (Single phase)	2 Nos.
75.	Crow baar 910 x25mm	2 Nos.
76.	Trowel Medium	1 No.
77.	Trowel small	1 No.
78.	Poprivet gun	2 Nos.
79.	Lazy Tong	2 Nos.
80.	Screw Driver 250mm	2 Nos.

81.	Round File 2nd Cut 250mm	4 Nos.
82.	Triangular File Smooth 250mm	4 Nos.
83.	Square File 2nd Cut 250mm	4 Nos.
84.	'C' Clamp 150mm	6 Nos.
GENERAL INSTALLATION		
85.	Light General purpose portable forge	2 Nos.
86.	Liquified Petroleum Gas (LPG) Cylinder, Regulator and Torch with Burner	2 Nos.
87.	Bench lever shears 250mm Blade x 3mm Capacity	1 No.
88.	Air Compressor (Pressure and displacement of air)	1 No.
89.	Spray Gun (Painting) 500ml	1 No.
90.	Guilltotine shearing Machine foot operation (1mt x 18G Capacity)	1 No.
91.	Welding plant Oxy-Acetylene complete (high pressure)	2 Nos.
92.	Pillar type drilling machine 12mm	1 No.
93.	D.E. Grinder Pedestal motorized 200mm	1 No.
94.	Anvil 50 Kgs with Stand	1 No.
95.	Bench vice 120mm, 150mm	2 each
96.	Fly press / Ball press No.4 single body	1 No.
97.	Buffing and Polishing Machine	1 No.
98.	Wooden Rule 450mm	1 No.
99.	Portable Nibbler	2 Nos.
100.	Portable Pneumatic Shear	2 Nos.
101	Pipe Bending Machine (Hydraulic type) 12mm to 30mm	1 No.
102	Hand Press Brake Capacity	1 No.
103.	Welding Transformer (200 to 400 Amps)	2 Nos.
104.	Gas Welding Table 1220mm x760mm	2 Nos.
105.	Spot Welding Machine	1 No.
106.	Tin smiths bench folder 600 x 1.6mm	1 No.

Sl. No.	**Workshop Furniture**	**Qty**
1.	Suitable Work Tables with vices	As required
2.	Stools	17 Nos.
3.	Discussion Table	1 No.
4.	Tool Cabinet	2 Nos.
5.	Trainees locker	2 Nos.
6.	Fire Fighting Equipment, First-aid box, etc.	As required
7.	Book shelf (glass panel)	1 No.
8.	Storage Rack	As required
9.	Storage shelf	As required

III) TOOLS, MACHINERY, EQUIPMENTS, ETC FOR A BATCH OF 16 TRAINEES

(a) Tool Kit

Module ; ABT : 03 BASIC ELECTRICITY AND ELECTRONICS

Sl. No.	Item	Quantity
1.	Plier insulated 150mm	17 Nos.
2.	Nose Plier insulated 150mm	17 Nos.
3.	Screw drives 100mm insulated handle and thin steel	17 Nos.
4.	Screw drivers 150mm	17 Nos.
5.	Knife double Blade Electrician	17 Nos.
6.	Wire insulation Stripper for shinning conductors from 0.4mm to 4mm	17 Nos.
7.	Electrician testing Pencil (Line / Neon tester)	17 Nos.
8.	Scriber 150mm x 4mm	17 Nos.
9.	Rule Steel 300mm	17 Nos.
10.	Punch Centre 150mm x 9mm	17 Nos.
11.	Heavy duty screw driver 200mm	17 Nos.
12.	Hammer Ball Peen 0.50Kg with handle	17 Nos.
13.	Hammer Cross Peen 100gms. With handle	17 Nos.
14.	Pliers Side Cutting insulated 150mm	17 Nos.
15.	Pincers 150mm	17 Nos.
16.	Electrician Screw Driver 250mm	17 Nos.

(b) SHOP TOOLS, INSTRUMENT AND GENERAL OUTFIT

Sl.No.	Item	Quantity
1.	Rule Wooden 4 fold 600mm	2 Nos.
2.	Saw tenon 250mm	2 Nos.
3.	Finner Chisel Wood 6mm, 12mm and 25mm	2 Nos.
4.	Blow lamp 0.5 liter	2 Nos.
5.	Electric drill machine portable 6mm capacity	1 No.
6.	C-clamps 100mm /150mm/200mm	1 No.
7.	Hand drill machine portable 6mm capacity	1set
8.	Raw / Plug tool and lab	2 sets
9.	Masonry Bit (associated up to 12mm)	2 sets
10.	Multi meter 0 to 1000 Ohms 0.5 to 500 volts	1 No.
11.	Voltmeter 5 0 30 V/DC	5 Nos.
12.	Ammeter 10 0 60 A DC with external shunt	5 Nos.
13.	Standard variable resistances as used in the lab	4 Nos.
14.	DC Ohmmeter 0 to 300 Ohms, mid scales at 20 Ohms	1 No.
15.	Pliers flat Nose and round nose 100mm	4 each
16.	Drill SS Twist 3mm to 6mm	10 Nos.

17.	File half round 200mm (smooth & 2nd cut)	4 Nos.
18.	File round 100 and 200mm	2 Nos.
19.	File half 100, 150 and 200mm (assorted cuts)	6 Nos.
20.	Electric Soldering Iron 230 V 60 watts 230 V 25 watts	2 each
21.	Vice hand 50mm jaw	4 Nos.
22.	Copper bit soldering iron 0.25 Kg	5 Nos.
23.	Electric heaters 1000 watt 250 V	2 Nos.
24.	Thimbles of different sizes	2 Nos.
25.	Wire Gauge (metric)	10 Nos.
26.	Hand operated crimping tool (i) for crimping up to 4mm' and (ii) for crimping up to 10mm'	1 No.
27.	Hand rubber gloves tested for 5000 V	1 pair
28.	Holders, lamp teakwood boards, plug sockets, solders, flux wires and cables batteries round consumable blocks and other consumables as required	As required
29.	Outside micrometer 0.25mm	1 No.
30.	Hydrometer	2 Nos.
31.	High rate discharge tester (cell tester)	1 No.
32.	Mock up wiring board of automobile wiring system	1 No.
33.	Discrete component Trainer	2 Nos.
34.	Multimeter	6 Nos.
35.	Digital Electronics Trainer	2 Nos.
36.	Power Supply 0-12 v, lamp	1 No.
37.	Oscilloscope 20MHz	1 No.

Sl. No.	**Workshop Furniture**	**Quantity**
1.	Suitable Work Tables	As required
2.	Stools	17 Nos.
3.	Discussion Table	1 No.
4.	Tool Cabinet	2 Nos.
5.	Trainees locker	2 Nos.
6.	Fire fighting equipment, first-aid box, etc.	As required
7.	Book shelf (glass panel)	1 No.
8.	Storage Rack	As required
9.	Storage shelf	As required

TOOLS, MACHINERY, EQUIPMENT, ETC. FOR A BATCH OF 16 TRAINEES

Module –ABT-04 BASIC MICROPROCESSOR & COMPUTER OPERATION

Sl. No.	Item	Quantity
1.	PENTIUM V COMPUTER or latest WITH 512 MB RAM WITH FOLLOWING ACCESSORIES DVD COMBO DRIVE WITH THE LATEST X VERSION, HARD DISK WITH 80 GB OR ABOVE, 17" MONITOR, AGP GRAPHICS CARD WITH 64 MB	9 Nos.
2.	CENTRALIZED UPS WITH 5KVA CAPACITY	1 No.
3.	LASER PRINTER	1 No.
4.	DOT MATRIX PRINTER	1 No.
5.	Inkjet Printer (colour)	1 No.
6.	WINDOWS XP OPERATING SYSTEM	09 Nos.
7.	MS- OFFICE 2000	09Nos.
8.	Scanner	1 No.
9.	Internet connection	As required
10.	External Modem	1 No.

Sl. No.	Furniture-Computer Lab	Quantity
1.	Suitable Computer Tables	As required
2.	Computer Chairs	17 Nos.
3.	Tool Cabinet	2 Nos.
4.	Trainees locker	2 Nos.
5.	Book shelf (glass panel0	1 No.
6.	Shoe Rack	As required
7.	Vacuum cleaner	1 No.

TOOLS, MACHINERY, EQUIPMENTS etc. for a batch of 16 trainees

Module ABT –05 BASIC OF PETROL & DIESEL ENGINEERING
DURATION- 6 Weeks

Sl No	Item	Qty
02	Steel rule 15 cm. English and metric	17 Nos
03	Screw driver 20 cm. x 9 mm blade	17 Nos
04	Screw driver 30 cm x 9 mm blade	17 Nos
05	Spanner D E set of 12 pieces (6mm to 32 mm)	17 Nos
06	Pliers combination 15 cm	17 Nos
07	Hand file 20 cm. Second cut	17 Nos
08	Centre punch 10 mm dia x 100 mm	17 Nos
09	Chisel cold flat 20 mm	17 Nos
10	Ring spanner set of 12 pieces (6mm to 32 mm.)	17 Nos
11	Feeler gauge 20 blades (metric)	17 Nos
12	Steel tool box with lock & key (folding type) size 400x200x150mm .	17 Nos
13	Allen Key set of 12 pieces (2 mm to 14 mm)	04 Sets
14	Philips Screw Driver Type set of 5 pieces 100 mm to 300 mm	04 Sets
MEASURING INSTRUMENTS AND GENERAL SHOP TOOLS		
15	Steel Rule 30 cm, English and metric	2 nos.
16	Engineer's square 15 cm.	2 nos.

Sl No	Item	Qty
22	Hacksaw frame adjustable for 30 cm blade	4 nos.
23	Engineer's Stethoscope	1 no.
24	Hand vice 37mm	2 nos.
25	File assorted (8 types)	16 Nos
26	Drill Twist (assorted)	10 nos.
27	Taps and Dies complete set in a box BA, BSW, BSF American & metric with handle	2 sets each
28	Hand reamer adjustable 10.5 to 11.25 mm, 11.25 to 12.75 mm,12.75 to 14.25 mm and 14.25 to 15.75 mm	1 set
29	Dial indicator to read 0.01 mm	1 no.
30	Micrometer outside 0-25 mm, 25-50 mm, 50-75mm, 75-100 mm	1 each
31	Micrometer inside 25-50, 50-75, 75-150 mm with extension rod.	1 each
32	Mallets (wooden/plastic)	1 nos.
33	Piston ring filer	2 sets
34	Spanner, ring offset set of 6 (S A E)	2 sets.
35	Spanner, adjustable 20 cm.	1 no.
36	Spanner for spark plugs 14 mm	2 nos.
37	Spanners socket of 8 with handle, T bar and ratchet	1 set.
38	Chain and Pulley block	1 no.

	Blade	
17	Divider spring joint 15 cm.	2 nos.
18	Prick punch 15 cm	2nos.
19	Chisels Cross cut 200 mm x 6 mm	2 nos.
20	Ball peen Hammer 0.5 kg	2 nos.
21	Scriber 15 cm with scribing block universal	1 each

	3000 kg. Capacity	
39	Horses	4 nos.
40	Screw jack 1 ton capacity double lift	2 nos.
41	Oil can 0.5 liter cap	1 no.
42	Cleaning Tray 45 x 30 cm.	8 nos.
43	Torque wrench set of 3 Nos	1 set.

Sl No	Item	Qty
44	Work bench each 250 x 120x60 with 4 bench vices 12 cm jaw	2 nos.
45	Pullers screw powered 2 mm with bearing puller attachment	1 no.
46	Vice grip pliers	1no.
47	Circlip pliers Expanding and contracting type 15 cm and 20 cm each	8 sets
48	Inspection lamp with guard and wandering lead of 100 ft.	1 no.
49	Distributor	2 no.
50	Carburetor (two different types)	2 nos
51	Crow bar	2 each
52	Hollow punch set of seven pieces 6 mm to 15 mm	1 set
53	Cleaning tray- Aluminum 45 x 30 cm	8 nos.
54	Valve spring Compressor	1 no.
55	Tool valve grinding, suction type (consumable tool)	6 nos.
56	Valve seat cutting tools complete with guides and pilot bar(all angles) in a	1 set

Sl No	Item	Qty
71	Battery 12 V	2 Nos.
72	Vernier Caliper 250 or 200 mm inside, outside & depth	1 No.
73	DMM Auto range	2 Nos.
74	Petrol Injector	2 Nos.
75	Petrol Fuel pump of MPFI system	2 Nos.
76	Hydrometer	2 Nos.
77	Piston Ring compressor	1 no.
78	Valve spring lifter	1 no.
79	Fuel injection pump one with pneumatic governor , one with R Q governor and one with R.S.V. governor	1 each
80	Fuel feed pump	1 no.
81	Injectors	2 nos.
GENERAL INSTALLATION		
82	Petrol engine (4 strokes, Multi Cylinder) of different makes in running	4 nos.

	box	
57	Cylinder bore gauge capacity 50 to 150 mm	1 no.
58	Fuel feed pump	1 no.
50	Bearing puller screw powered/hydraulic with attachments Max spread 80, 200 and 300 mm	1 each
60	Hammer Copper 1 kg with handle	1 no.
61	Surface Plate 60 x 60 cm	1 no.
62	'V' Block 75 x 38 mm pair with Clamps	2 nos.
63	Spanner off set double ended set of 7 pieces.(6 mm -17 mm)	1 set
64	Valve key inserter	1 no.
65	Compression testing gauge to read 0 to 115 kg/sq cm	1 no.
66	Vacuum gauge to read 0 to 760 mm of Hg.	1 no.
67	Piston Ring compressor & Ring Expander	Each 1
68	Tachometer - to read upto 5000 rpm	
69	Triple leg grip puller with bearings attachment screw/ hydraulic powered max. spreed 80, 160, 250, 450 mm	1 no.
70	Pliers water pump multifix 250 mm Long	1 no.

	condition. (3nos. with MPFI System & 1 Nos. with Carburettor)	
83	Petrol engine (2 stroke) of different makes in running condition	2 nos.
84	Diesel engine (4 stroke, Multi Cylinder) of different makes in running condition	4 nos.
85	Cut model of 4 stroke petrol engine on stand	1 no.
86	Cut model of 2 stroke petrol engine on stand	1 no
87	Cut model of 4 stroke diesel engine on stand	1 no.
88	Drilling machine bench to drill up to 12 mm dia	1 no.
89	Electric pedestal grinder with two 18 cm wheel	1 no.
90	Nipple forming tool to form nipple on high pressure pipe lines 6.8 and 10 mm dia	1no.
91	Portable electric drill 6 mm	1 No.
92	Spark plug cleaner and tester similar to Bosch / champion	1 no.
93	Battery charger 6v- 18 v	1 no
94	Injector testing set (hand operated)	1 no.
95	Injector dismantling jig with mounting bench	1 no.
96	Engine cranker with 12V and 24 V Ac to DC Power supply system	1 No.

NOTE : **All the tools and equipment etc should be Latest available in the Market**

	Workshop furniture	Qty
1	Suitable Work Tables with vices	As required
2	Stools	17 Nos
3	Discussion Table	1 No
4	Tool Cabinet	2 Nos
5	Trainees locker	2 Nos
6	Fire fighting equipment, first aid box etc	As required
7	Book shelf (glass panel)	1 No.
8	Storage Rack	As required
9	Storage shelf	As required

TOOLS, MACHINERY, EQUIPMENTS etc. for a batch of 16 trainees

Module : ABT 0-06 Basic of Transmission , Suspension , Steering System & Brakes

Sl No	Item	Qty
01	Hammer ball peen 0.75 kg.	17 Nos.
02	Steel rule 15 cm, English and metric	17 Nos.
03	Screw driver 20 cm X 9 mm, Blade (Plastic handle)	17 Nos.
04	Screw driver 30 cm X 9 mm, Blade	17 Nos.
05	Spanner D.E. set of 6 mm. To 32 mm. Set of 12	17 Nos.
06	Pliers combination 15 cm.	17 Nos.
07	Hand file 20 cm. Second cut	17 Nos.
08	Centre punch 10 mm x 100 mm	17 Nos.
09	Chisel cold flat 20 cm	17 Nos.
10	Ring spanner set of 12 (6 to 32 mm)	17 Nos.
11	Feeler gauge 20 blade	17 Nos.
12	Steel tool box with lock and keys	17 Nos.
13	Allen Key set of 12 pieces (2 mm to 14 mm)	04 Sets
14	Philips Screw Driver Type set of 5 pieces 100 mm to 300 mm	04 Sets
MEASURING INSTRUMENTS AND GENERAL SHOP TOOLS		
15	Multi-plate Clutch assembly with flywheel	2 Nos.
16	Single plate Clutch assembly	2 Nos.

Sl No	Item	Qty
24	Box spanner set with 'I' handle speed wrench, ratchet handle, extension rods complete in a box metric /UNF/BSF/BSW.	1 Set Each
25	Bearing puller armed type	1 No.
26	Universal wheel puller	1 No.
27	Copper drift 10 mm. & 15 mm. Dia.	1 Each
28	Hollow punches set of 5	1 Set
29	Oil gun with flexible pipe	1 No.
30	Oil can 0.5 litre capacity	1 No.
31	Circlip pliers expanding and contracting type	1 Each
32	Spring balance (0.25 kg.)	1 No.
33	Torque wrench set of 3 Nos.	1 set
34	Grease gun hand operated	1 No.
35	Surface gauge with dial test Indicator to read 0.01 mm With magnetic base	1 No.
36	Hand operated grease gun (high pressure)	1 No.
37	Puncture repair kit (hot patch kit)	1 No.
38	Tyre lever (in pairs) 50 cm. Dunlop type	2 Nos.
39	Tyre Pressure gauge to read up to 30 kg. (Pencil type)	2 Nos.
40	Tyre pressure gauge (wall	1 No.

	with flywheel	
17	Propeller shaft with universal joints assembly	2 Nos.
18	Cut-Section model of a sliding mesh gear box	1 No.
19	Cut-Section model of a synchromesh gear box	1 No.
20	Cut-Section model of differential assembly	1 No.
21	Rear axle assembly complete with drive shafts and brake drums (full floating, semi floating type and ¼ floating)	1 Each
22	Micrometer outside 0-25 mm, 25-50 mm, 50-75 mm, 75-100 mm	1 Each
23	Drain plug spanner	1 No.

	mounted)	
41	Hot patch clamp	2 Nos.
42	Plastic mug and bucket	2 Nos.
43	Wheel spanner (universal) boss type	2 Nos.
44	Steering wheel puller	1 No.
45	Spring balance	1 No.
46	Drop arm puller	1 No.
47	Adjustable spanner 15 cm. long maxim. opening 25 cm.	1 No.

Sl No	Item	Qty
44	Puncture repair equipment and Vulcanising unit 230 V, 50 W electrical/ steam	1 No.
45	Pullers screw powered two arm grip with bearing puller attachment maximum	1 No.
46	Triple leg grip puller with bearing attachment hydraulic powered maximum spread 80 mm., 160 mm., 250 mm. & 450 mm.	1 No. each
47	Inspection lamp with wire guard and insulated handle and 3 core flux wire 7 mm x 35 mm	1 No. each
48	Vice grip pliers	4 Nos.
49	Tray for clearing 45 x 30 cm	2 Nos.

Sl No	Item	Qty
60	Conventional front axle assembly and I.S.F. wheel assembly	1 No.
61	Horses props	4 Nos.
62	Shock absorbers	4 Nos.
63	Motor vehicle in running condition	1 No.
64	Chassis of heavy commercial motor vehicle, with all accessories in working condition	1 No.
65	Pneumatic operated wrench with all accessories	1 No.

50	Bench vices	8 Nos.
51	Coil spring compressor for suspension spring	1 No.
GENERAL INSTALLATION		
52	Chain sling alloy steel double leg 10 mm Having 3 meter long each pair link and 2 slip hooks	1 No.
53	Tripod axle stand adjustable 1500 kg Capacity	8 Nos.
54	Portable crane hydraulically operated with swiveling & self alignment hook lifting capacity 1 ton.	1 No.
55	Arbor press 2 tones capacity	1 No.
56	Leaf springs	4 Nos.
Sl No	**Item**	**Qty**
57	Hydraulic jack- high (trolley type) 2000 kg. Capacity	2 Nos.
58	Lifting jack screw type 1000/1500 kg.	1 No.
59	Hydraulic jack 5 ton	1 No.

66	Air Compressor-stationary, compression load 8 bar, Suction Capacity 200 liters/min, reservoir 200 liters	1 sets.
67	Brake spring pliers	1 No.
68	Brake pipe flaring tool	1 No.
69	Vacuum assisted hydraulic brake assembly	1 No.
70	Air brake assembly	1 No.
71	Brake lining riveting machine (foot operated)	1 No.
Sl No	**Item**	
72	Hydraulic brake assembly. (Brake pedal, booster, Tandem master cylinder, wheel cylinder, brake drum – mock up assembly)	
73	Models/ wall charts of braking system (Hydraulic & Pneumatics)	1 Each

NOTE : All the tools and equipment etc should be Latest available in the Market

	Workshop furniture	Qty
1	Suitable Work Tables with vices	As required
2	Stools	17 Nos
3	Discussion Table	1 No
4	Tool Cabinet	2 Nos
5	Trainees locker	2 Nos
6	Fire fighting equipment, first aid box etc	As required
7	Book shelf (glass panel)	1 No.
8	Storage Rack	As required
9	Storage shelf	As required

ABT – 07 WORKSHOP CALCULATION & SCINECE

(DURATION – 2 HOURS/WEEK-48 WEEKS)

- Applied Workshop problems involving multiplication, division.
- Common fractions, additions, subtractions, multiplications and divisions of fractions.
- Applications of fractions to shop problems (Measurement in units). Conversion from decimal to common fractions shop problems (Measurement in units.)
- Decimals addition, subtraction, multiplication, conversion from decimal to common fractions shop problems (Measurement in units).
- Square roots of a perfect square root of whole number and decimals.
- Ration and proportion and shop problems (including percentage calculations).
- Algebraic symbols, addition, subtractions, multiplication and division of expressions involving algebraic symbols.. Simple equations and transposition problems. Standard Formulae, simple simultaneous equations with two unknown quantities, Simple algebraic problems.
- Menstruation area of rectangles, squares, triangles, circles, regular polygons etc. Calculation of areas, calculation of volumes and weight of simple solid bodies such as cubes, squares and prisms shop problems,. (cylinder, pyramid, cone, rotating body, examples out of automotive assemblies).
- Geometry properties of lines, angles, triangles and circles, simple solid problems.
- Reading of simple graphs. Exercises in reading in monograph. Calculations of volume.

All of the above mentioned items should be taught in a way that they are directly related to the trade area.

SCIENCE

- Mass, units of mass, force, weight of a body, units of weight, shop problems MKS & SI system of units of force, weight etc. their conversion shop problems. Forces, torque and lever.

- Heat and temperature thermometric scales conversion of °F & °C and vice versa. Temperature measuring instruments used in workshops. Heat and thermal quantities: Temperature, units of temperature, heat quantity and units, calorific value, fuel value, specific melting resp. evaporation heat, heat extension (length and volume).

- Properties and uses of cast iron, wrought iron, plain carbon steel. HSS and alloy steel.

- Properties and uses of copper and aluminum, brass, bronze, solder, bearing metals.

- Characteristics of ferrous and non-ferrous metals.

- Alloying of ferrous and non-ferrous metals are explained in terms of binary systems. (Brass, carbon steel, solder.)

- Characteristics of ferrous and non-metals are identified and related to their application. (Mechanical properties, mach inability, cast ability, weld ability, formability, corrosion resistance,.)

- Heat treatment, hardening, annealing, tempering and normalizing. Case hardening their standards and measurements. Heat treatment processes of ferrous metals are explained in terms of procedures. (Homogenizing, annealing, normalizing, stress relieving, sub-critical annealing, hardening, tempering, case hardening.) Hardening and tempering are completed and related to color method for temperature determination of tool. (Punch, scriber, chisel.)
  Heat treatment of non-ferrous metals is explained in terms of procedures. (Homogenizing, annealing, stress relieving, solution treatment, precipitation hardening).

- Meaning of tenacity, elasticity, malleability, brittleness, hardness. Compressibility and ductility examples.

- Work, units of work, energy, power, different forms of energy simple applied problems., Horsepower and brake Horsepower, mechanical advantage and velocity ratio.

- Meaning of stress, strain, modules elasticity and ultimate strength., Examples,. Factors of safety.

- Electricity and its uses, electric current positive and negative terminals. Use of switches and uses, conductors and insulators. Electricity: atomic mode, potential, current, voltage and resistance, ohms law, serial, parallel circuits, specific resistance, conductivity, current density, voltage drop, preheating of diesel engine (glow plug)": Electric work, power and efficiency, examples to starter alternator and battery.

- Velocity, average velocity, circumferential velocity, rotation speed cutting velocity.

- Friction: Static friction, dynamic friction, rolling friction, dry fiction, friction and lubrication; examples for clutches, brakes, tire and pavement.

- Belt drive and simple gear drive, transmission, calculation of transmission ratio, rotation speed and circumferential velocity.

- Engine calculation: Calculation of volume, compression ratio, force on the piston due to combustion pressure, average piston velocity, internal power of engine respecting two or four stroke, calculation of effective power on crank shaft by using mechanical efficiency.

Lubricants

The main functions of lubricants are described according to manufacturer's specifications. Lubricating, cooling, preventing corrosion, cleaning, seating.

Fuels

- The main differences between types and grades of petrol that are commercially available are described according to oil company specifications. (Regular, super).

- The need for fuel additives to prevent valve seat recession is identified.

- The properties of a diesel fuel are described according to oil company specifications. Viscosity, flashpoint, self-ignition temperature, ignition qualities, sulphur content, cloud point, effects of contamination, energy content.

- The different grades of diesel fuel are defined. (Cetane number).

ABT-08 BASIC ENGINEERING DRAWING
(duration – 2 hours/week – 48 weeks)

- Free hand sketching of straight lines, rectangles, circles, polygon's simple solids, cube, rectangular blocks, cylinders, their dimensioning.

- Free hand sketching of nuts, bolts, rivets, washers, keys screw threads, keys with dimensions from samples. Dimensioning technique.

- Explanation of simple orthographic projection first angle and third angle. Sketching of different views of simple solid and hollow bodies with dimensions.

- Use of different types of lines and symbols of drawing welding symbols, electric symbols.

- Simple isometric drawing, isometric views of square, rectangle, circle, cubes, various types of prism.

- Use of drawing instruments. Drawing simple figures and solids with dimensions and titles. Use of different types of seals and lettering numbers and alphabets. Isometric drawings with dimensions of various simple objects.

- Sections and sketching orthographic views of various solids and hollow objects with section views.

- Blue print reading. Preparation of simple working drawings from sketches.

- Dimensioning, system of dimensioning, various methods of dimensioning.

- Introduction to Auto CAD.