SHORT TERM VOCATIONAL

CERTIFICATE COURSE

FOUR WHEELER TECHNICIAN COURSE

(12 Months Duration)

Prepared by

P. SAMBAIAH
Junior Lecturer in AET,
GVJC, Nampally, Hyderabad

&

G. VAMSI KRISHNA
Faculty in AET, GJC Malkajigiri, Hyderabad

Course Coordinator:
Dr. R. JYOTHSNA RANI
Principal & Lecturer SIVE,
O/o Director of Intermediate Education, Hyderabad

STATE INSTITUTE OF VOCATIONAL EDUCATION
O/o Director of Intermediate Education, Hyderabad
HYDERABAD, TELANGANA

NAME OF THE COURSE: **FOUR WHEELER TECHNICIAN COURSE**

SECTOR : Engineering

COURSE CODE : FWT

ENTRY QUALIFICATION: 10th Class (above 18 years)

DURATION: 12 months (40 Hours: English + Course: 200 Hours per module)

PRE-REQUISITES: Basic Knowledge in English reading and writing.

TERMINAL COMPETENCE: After completing this course, student will be able to work as a technician for maintaining, diagnosing, and repairing four wheeler vehicles.

INTRODUCTION OF THE COURSE: An introduction to a four-wheeler technician course would cover the foundational knowledge and skills necessary to work in the automotive repair and maintenance industry, specifically focusing on cars and other vehicles with four wheels.

OBJECTIVES: The course aims to provide students with both theoretical knowledge and practical skills encompassing four-wheeler systems, components, and technologies, enabling them to comprehensively understand and proficiently diagnose, maintain, and repair cars and other vehicles with four wheels.

SKILLS: Students undertaking a four-Wheeler Technician Course gain a diverse set of skills that prepare them for a career in the automotive industry, particularly in the servicing and maintenance of four-wheeler vehicles such as cars and other vehicles with four wheels. Here are some of the key skills -- Mechanical Skills, Electrical Skills, Diagnostic Skills, Problem-Solving Skills, Technical Skills, Safety Practices, Communication Skills, Customer Service Skills.

CAREER OPPORTUNITIES: Upon completion of the Four-Wheeler Technician Course, student can pursue various career opportunities in the automotive industry, including four-wheeler service technician at authorized service centers or set up an independent repair shops.

SCHEME OF INSTRUCTION/MODULE:

1. **Communicative English: 40 hours (per module)**
2. **Course: 400 hours (12 months)**

Duration of Course	Theory		On the Job Training		Total	
	Hours	weightage	Hours	weightage	Hours	weightage
Module- I & II (One Year)	120	30%	280	70%	400	100%

COURSE SYLLABUS

THEORY (60Hrs) **MODULE – I** **Total Marks : 80**

S.No	THEORY SYLLABUS	Hours	Marks			TOTAL MARKS
			LAQ	SAQ	MCQ	
1	**INTRODUCTION:** Overview of automotive systems and components. Introduction to vehicle architecture and construction. Safety procedures and practices in automotive workshops.	4 Hrs	--	1Q (5M)	2Q (2M)	7
2	**ENGINE :** Internal combustion engine principles. Engine components and operation. Engine lubrication, cooling, and filtration systems.	16 Hrs	1Q (10M)	2Q (10M)	2Q (2M)	22
3	**ELECTRICAL AND ELECTRONIC SYSTEMS:** Fundamentals of automotive electrical systems. Understanding wiring diagrams and schematics. Battery, charging, and starting systems.	14 Hrs	1Q (10M)	1Q (5M)	2Q (2M)	17
4	**Fuel and Emission Systems:**	14	1Q (10M)	1Q	2Q	17

	Fuel delivery systems (carburetors, fuel injection). Exhaust gas recirculation (EGR) systems. Evaporative emission control systems (EVAP).	Hrs		(5M)	(2M)	
5	**FIUR WHEELER ELECTRIC VEHICLES:** Introduction about e-vehicle. Construction and working of Battery pack, Electric motor, Controller and charging system. Benefits of riding electric motor four wheeler.	12 Hrs	1Q (10M)	1Q (5M)	2Q (2M)	17

MODULE-I

<u>ON THE JOB TRAINING AND PRACTICAL</u>: 140 Hrs

Maximum Marks: 100 (OJT: 50 & External Exam: 50)

S.No.	Name of the topic for OJT/Practical	Time in Hrs
1.	Tools, Equipment and Safety precautions in workshop	10
2.	Diagnosis and repair of common engine issues.	40
3.	Diagnosis and repair of electrical faults.	30
4.	Diagnosis and repair of fuel and emission system faults.	25
5.	Four wheeler electrical vehicle trouble shooting.	25

LIST OF EQUIPMENT

1. Hand Tools:

- Socket sets (metric and standard)
- Wrenches (combination, adjustable, torque)
- Screwdrivers (flathead, Phillips, Torx)
- Pliers (needle-nose, slip-joint, locking)
- Hammers (ball-peen, rubber mallet)
- Spanners (ring spanners, open-end spanners)
- Allen keys (hex wrenches)
- Chisels and punches
- Pry bars and crowbars

2. Power Tools:

- Electric drills
- Impact wrenches

- Angle grinders
- Sanders and polishers
- Jigsaws and reciprocating saws
- Circular saws
- Heat guns

3. Diagnostic Equipment:

- Scan tools
- Multimeters
- OBD-II code readers
- Battery testers
- Compression testers
- Fuel pressure testers
- Vacuum gauges
- Timing lights

4. Specialty Tools:

- Engine hoists and stands
- Transmission jacks
- Brake caliper tools
- Bearing pullers
- Ball joint separators
- Oil filter wrenches
- Spark plug sockets
- Serpentine belt tools

5. Shop Equipment:

- Vehicle lifts (two-post, four-post, scissor)
- Brake lathes
- Wheel balancers
- Tire changers
- Hydraulic presses
- Parts washers
- Bench grinders
- Workbenches

6. Fluid Handling Equipment:

- Oil drain pans
- Fluid evacuators
- Coolant flush machines
- Grease guns
- Brake bleeding kits
- Funnel sets
- Oil filter crushers

8. Safety Equipment:

- Safety goggles
- Hearing protection

- Gloves (mechanic's gloves, disposable gloves)
- Respirators
- Fire extinguishers
- First aid kits
- Safety cones and barriers

9. Storage and Organization:

- Tool chests and cabinets
- Pegboards and tool racks
- Parts bins and trays
- Shelving units
- Tool carts and trolleys
- Drawer organizers

10. Cleaning and Detailing Supplies:

- Pressure washers
- Steam cleaners
- Vacuum cleaners
- Polishers and buffers
- Cleaning chemicals and solvents
- Degreasers
- Interior and exterior detailing products

Qualifications of Teaching Faculty:

1. Engineering Graduate from Mechanical/ Automobile Engineering from any recognized university with an aggregate of 55% marks.

DIVISION OF MARKS:

Theory: 100 Max. Marks

1. Communicative English: 20 marks
2. Short Questions: 6 x5m = 30 marks
3. Long Questions: 4x10 = 40 marks
4. Multiple Choice Questions: 10x1=10 marks

Practical: 100 Max. Marks

1. External: 40 marks
2. Record/ Mini Project & Viva: 10 marks
3. Internship (OJT): 50 marks

MODEL QUESTION PAPER (Theory)

MODULE - I

Time : 3hrs **Max. Marks : 100**

I. **Section – I (Language)**
(Communicative English) **20M**

Section – II (Subject)

II. Answer all the following: **6 x 5 = 30M**

1. Mention safety precautions to be taken in automobile workshop.
2. Write a short note on: a) Crankshaft b) Camshaft
3. Write a note on Filtering elements
4. What is the purpose of alternator in a vehicle?
5. Explain the purpose of PCV (Positive Crankcase Ventilation) valve.
6. Mention the benefits of electric motor 4-wheeler.

III. Answer any four of the following questions: **4 x 10 = 40M**

7. Explain Pressurized Lubrication System in Four Wheeler.
8. What is the purpose of car battery? Explain about Lead-Acid battery.
9. Explain Fuel Injection system.
10. Explain construction and working of battery pack.
11. Explain about Thermosiphon Cooling System with a neat sketch.
12. Explain about Simple Carburetor with a neat sketch.

Section – III (Objective)

IV. Multiple Choice Questions: **10 x 1 = 10M**

1. What is the purpose of a catalytic converter in a vehicle?
   a. To regulate engine temperature b. To filter particulate matter from exhaust gases
   c. To reduce harmful emissions d. To increase engine horsepower
2. Which of the following components is part of the ignition system?
   a. Radiator b. Alternator c. Distributor d. Brake caliper
3. What is the purpose of the PCV valve in an engine?

a. To regulate tire pressure b. To control engine temperature
c. To maintain proper crankcase ventilation d. To adjust fuel-air mixture

4. Which component regulates the flow of air into the engine?
a. Throttle body b. Mass airflow sensor
c. EGR valve d. Oxygen sensor

5. Which of the following components is part of the HVAC system?
a. Alternator b. Radiator c. Compressor d. Differential

6. What is the purpose of a timing belt or timing chain in an engine?
a. To regulate engine temperature b. To adjust wheel alignment
c. To control valve timing d. To increase engine horsepower

7. What is the primary function of the serpentine belt in an engine?
a. To regulate tire pressure b. To control valve timing
c. To drive engine accessories d. To adjust wheel alignment

8. Which of the following components is part of the emission control system?
a. Muffler b. Radiator c. EGR valve d. Brake rotor

9. What is the purpose of the throttle position sensor (TPS)?
a. To regulate fuel flow b. To control engine temperature
c. To monitor brake pedal position d. To detect throttle plate position

10. Which component helps reduce engine vibration and noise?
a. Alternator b. Radiator c. Motor mount d. Fuel injector

****

MODULE - I

PRACTICAL QUESTION BANK

Time: 3Hrs Maximum Marks: 50

Section – I 2 x 10 = 20 Marks

Note: Answer any two of the following.

1. Identify and explain the primary uses of a torque wrench, and demonstrate the proper technique for using it.
2. Describe the differences between open-end wrenches and box-end wrenches, and demonstrate when each type would be used.
3. Describe the diagnostic process for identifying and diagnosing unusual engine noises, such as knocking, tapping, or rattling sounds.
4. Demonstrate the procedure for testing a vehicle battery using a multimeter to measure voltage and perform a load test.
5. Describe the components of a vehicle's starting system, including the starter motor, ignition switch, and starter solenoid.
6. Demonstrate the procedure for testing fuel pressure using a fuel pressure gauge and inspecting the fuel system components (e.g., fuel pump, fuel filter, fuel injectors) for signs of wear or damage.
7. Describe the components of the evaporative emission control system, including the charcoal canister, purge valve, and fuel tank pressure sensor.
8. Using a scan tool to retrieve diagnostic trouble codes (DTCs) and perform a smoke test, demonstrate how to diagnose common evaporative emission system faults (e.g., EVAP system leak, malfunctioning purge valve), and discuss the repair procedures.
9. Explain the symptoms of engine performance issues caused by fuel system problems, such as poor acceleration, rough idling, or stalling.
10. Using a fuel injector tester or multimeter, demonstrate how to diagnose faulty fuel injectors by testing for injector resistance and spray pattern, and discuss the repair options available (e.g., cleaning, replacing injectors).
11. Demonstrate the procedure for testing the voltage and state of charge of the vehicle's battery pack using a multimeter or battery tester.

Section – II 1 x 20 = 20 Marks

Note: Answer any one of the following.

1. Identify common hazards in the workshop environment, such as slipping/tripping hazards and electrical hazards, and explain how to mitigate these risks.
2. Discuss the importance of tool organization in a workshop for efficiency and safety, and demonstrate how to properly store and organize hand tools on a pegboard or tool chest.
3. Describe the steps involved in diagnosing an engine overheating condition, including checking coolant level, inspecting hoses and connections for leaks, and testing the thermostat and radiator cap.
4. Explain the common areas where engine oil leaks may occur (e.g., oil pan gasket, valve cover gasket, rear main seal), and demonstrate how to visually inspect these components for signs of leakage.
5. Describe the steps involved in testing the charging system using a multimeter to measure alternator output voltage and current.
6. Describe the function of the catalytic converter in reducing harmful emissions, and explain the symptoms of a failing catalytic converter (e.g., decreased engine performance, illuminated check engine light).
7. Using a scan tool to monitor oxygen sensor readings and perform a visual inspection of the exhaust system, demonstrate how to diagnose catalytic converter and exhaust system faults, and discuss the repair procedures (e.g., replacing the catalytic converter, repairing exhaust leaks).
8. Explain the symptoms of motor or controller problems in an electric vehicle, such as loss of power, abnormal noises, or jerky acceleration.
9. Describe the auxiliary electrical systems commonly found in electric vehicles, such as the HVAC system, power windows, and infotainment system.

Section – III

Record / Mini Project	& Viva	10 Marks
Internship/ OJT		50 Marks

COURSE SYLLABUS
MODULE - II

THEORY (60Hrs) **Total Marks: 80**

S.No	THEORY SYLLABUS	Hours	Marks			TOTAL MARKS
			LAQ	SAQ	MCQ	
1	**Suspension and Steering Systems:** Suspension types and components (struts, shocks, control arms). Steering system components (rack and pinion, steering linkage). Wheel alignment and steering geometry.	4 Hrs	1Q (10 M)	1Q (5M)	2Q (2M)	7
2	**Transmission and Drivetrain Systems:** Types of transmissions (manual, automatic, CVT). Transmission components and operation. Clutch operation and service (for manual transmissions). Wheels and tyres. Wheel alignment.	16 Hrs	1Q (10 M)	2Q (10 M)	2Q (2M)	22
3	**Brake systems:** Types of braking systems (disc brakes, drum brakes, anti-lock braking systems). Brake components and operation. Brake service and repair procedures.	14 Hrs	1Q (10 M)	1Q (5M)	2Q (2M)	17
4	**Diagnostic Techniques:** Using diagnostic tools and equipment (scan tools, multimeters). Diagnostic trouble code (DTC) interpretation. On-board diagnostics (OBD) systems.	14 Hrs	-	1Q (5M)	2Q (2M)	17
5	**Workshop Practices and Ethics:** Workplace safety practices and procedures. Environmental considerations (e.g.,	12 Hrs	1Q (10 M)	1Q (5M)	2Q (2M)	17

	hazardous waste disposal). Ethical and professional conduct in the automotive industry.					

MODULE-II

ON THE JOB TRAINING AND PRACTICALS: 140 Hrs

Maximum Marks: 100 (OJT: 50 & External Exam: 50)

S.No.	Name of the topic for OJT/Practical	Time in Hrs
1.	Diagnosis and repair of suspension and steering issues.	10
2.	Diagnosis and repair of transmission and drivetrain issues.	40
3.	Brake system diagnosis and trouble shooting.	30
4.	Developing systematic diagnostic strategies.	20
5.	Servicing and Maintenance of four wheeler vehicle	40

MODEL QUESTION PAPER (Theory)
MODLE-II

Time: 3hrs **Max. Marks : 100**

Section – I (Language)
(Communicative English) 20M

Section – II (Subject)

II. Answer all the following: 6 x 5 = 30M

1. Describe the function of the suspension system in a vehicle.
2. How does a manual transmission differ from an automatic transmission?
3. What is the difference between wet clutch and dry clutch?
4. What is Anti-Lock Braking system?
5. What does the acronym OBD-II stand for, and what is its purpose?
6. Write a note on Professional & Ethical practices to be taken in Automotive Industry.

III. Answer any four of the following questions: 4 x 10 = 40M

1. Explain Mac-Pherson Strut suspension system with a neat sketch.

2. How does a CVT (Continuously Variable Transmission) differ from a traditional automatic transmission?
3. Explain the purpose of the brake booster in a vehicle's braking system.
4. What are the environmental considerations to be taken into account for hazardous waste disposal in automotive sector?
5. Explain Ackermann Steering System.
6. What is the purpose of wheel alignment? Explain the procedure of wheel Alignment?

Section – III (Objective)

IV. Multiple Choice Questions: 10 x 1 = 10M

1. What is the primary function of the power steering pump?
   a. To cool the engine b. To increase engine power
   c. To assist in steering effort d. To regulate fuel flow

2. What does the acronym ABS stand for?
   a. Automatic Brake System b. Anti-Bounce Suspension
   c. Anti-Lock Braking System d. Accelerated Braking System

3. What does the OBD-II system primarily monitor?
   a. Fuel efficiency b. Engine emissions
   c. Tire pressure d. Engine oil level

4. What is the function of the master cylinder in a hydraulic brake system?
   a. To engage the brakes b. To regulate fuel flow
   c. To convert hydraulic pressure into mechanical force
   d. To adjust wheel alignment

5. What is the purpose of the brake booster in a vehicle's braking system?
   a. To increase engine power b. To regulate tire pressure
   c. To reduce braking effort d. To adjust wheel alignment

6. What type of transmission allows for seamless gear ratio adjustments?
   a. Manual transmission b. Automatic transmission
   c. CVT (continuously variable transmission) d. Dual-clutch transmission

7. What is the primary purpose of wearing personal protective equipment (PPE) in an automotive workshop?
   a. To improve work efficiency
   b. To enhance communication with colleagues

c. To comply with workplace regulations and standards
d. To increase workshop aesthetics

8. Which of the following is a key aspect of maintaining a safe working environment in an automotive workshop?
a. Ignoring safety protocols to save time
b. Regularly inspecting and maintaining tools and equipment
c. Leaving hazardous materials unattended
d. Using makeshift tools instead of proper equipment

9. Why is it important to follow proper waste disposal procedures in an automotive workshop?
a. To save money on waste management
b. To minimize environmental impact and prevent pollution
c. To maximize workshop productivity
d. To avoid fines from regulatory authorities

10. What should a technician do if they encounter a task beyond their skill level or expertise in an automotive workshop?
a. Attempt the task anyway to gain experience
b. Ask a colleague for help or guidance
c. Ignore the task and move on to something else
d. Proceed with the task and figure it out as they go

****

MODULE - II

PRACTICAL QUESTION BANK

Time : 3Hrs Maximum Marks : 50

Section – I 2 x 10 = 20 Marks

Note: Answer any two of the following.

1. Demonstrate the procedure for measuring wheel alignment using a wheel alignment machine or alignment gauges.
2. Describe the symptoms of worn ball joints or tie rod ends, such as excessive play, uneven tire wear, or steering instability.
3. Explain the signs of worn or failed shock absorbers or struts, such as excessive bouncing, uneven tire wear, or bottoming out.
4. Describe the possible causes of steering system noise or vibration, such as worn steering components, loose connections, or damaged power steering system.
5. Demonstrate the procedure for visually inspecting the transmission and drivetrain components for signs of fluid leaks, such as transmission fluid puddles or wet spots.
6. Describe the symptoms of a failing clutch system, such as slipping, difficulty shifting gears, or unusual noises during clutch engagement.
7. Explain the possible causes of differential noise or vibration, such as worn bearings, gear misalignment, or insufficient lubrication.

Section – II 1 x 20 = 20 Marks

Note: Answer any one of the following.

8. Describe the symptoms of driveline vibration or imbalance, such as shaking or shuddering during acceleration or deceleration.
9. Demonstrate the procedure for visually inspecting the brake system components, including brake lines, calipers, and wheel cylinders, for signs of fluid leaks.

10. Describe the symptoms of worn brake pads, such as squealing noises, reduced braking performance, or visible wear indicators.

11. Explain the possible causes of brake system vibration or pulsation, such as warped brake rotors, uneven brake pad deposits, or worn suspension components.

12. Describe the symptoms of contaminated brake fluid, such as a spongy brake pedal feel, reduced braking performance, or fluid discoloration.

Section – III

Record / Mini Project & Viva	10 Marks
Internship/ OJT	50 Marks