

4-YEAR DIPLOMA IN ENGINEERING PROGRAM

AUTOMOBILE TECHNOLOGY

**SYLLABUS
(COURSE STRUCTURE-2010)**

**SEVENTH & EIGHTH
SEMESTER**

AUTOMOBILE TECHNOLOGY (62)

7th Semester

Sl. No	Subject code	Name of the subject	T P C			MARKS				
						Theory		Practical		Total
						Cont. assess	Final exam.	Cont. assess	Final exam.	
1.	6271	Automotive Engine System-4	2	3	3	20	80	25	25	150
2.	6272	Automotive Instrumentation & Testing	2	6	4	20	80	50	50	200
3.	6273	Automotive Trouble Shooting & Emission Control	2	6	4	20	80	50	50	200
4.	6274	Automotive Brake & Steering System	2	3	3	20	80	25	25	150
5.	6275	Automotive Electrical & Electronics System-2	2	6	4	20	80	50	50	200
6.	6276	Automotive Engineering Project	0	6	2	-	-	50	50	100
7.	5853	Entrepreneurship	2	0	2	20	80	-	-	100
Total			12	30	22	120	480	250	250	1100

AUTOMOBILE TECHNOLOGY (62)

8th Semester

Sl. No	Subject code	Name of the subject	T P C			MARKS				
						Theory		Practical		Total
						Cont. assess	Final exam.	Cont. assess	Final exam.	
1.	6281	Industrial Training		0	6			180	120	300
Total					6					300

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4-YEAR DIPLOMA IN ENGINEERING PROGRAM

AUTOMOBILE TECHNOLOGY

**SYLLABUS
(COURSE STRUCTURE-2010)**

SEVENTH SEMESTER

6271 AUTOMOTIVE ENGINE SYSTEM – IV

T	P	C
2	3	3

AIMS

To provide the student with an opportunity to acquire knowledge, skill and attitude in the area of automotive engines and their systems with special emphasis on:

- Construction and operation of EFI system.
- Service procedure of EFI system.
- Test and measurement of IC engine.
- Performance characteristic of IC engine.
- Heat balance sheet of IC engine
- Maintenance of IC engine.

SHORT DESCRIPTION

Electronic fuel system injection system; Air induction system of EFI engine; Fuel delivery system of EFI engine; Sensors and actuators of EFI engine; Electronic control system of EFI engine; Service procedure of EFI system; Friction power measurement of IC engine; Indicated power measurement; IC engine; Brake power measurement of IC engine; Engine efficiency; Fuel consumption test of IC engine; Air consumption measurement of IC engine; Performance characteristic of IC engine; Heat balance sheet of IC engine; Maintenance of IC engine.

DETAIL DESCRIPTION

Theory:

1 Understand the concept of electronic fuel injection (EFI) system.

- 1.1 State the meaning of EFI system.
- 1.2 Outline the importance of EFI system.
- 1.3 Mention the different types of EFI system.
- 1.4 Describe the operation of different types of EFI system.
- 1.5 Compare port fuel injection (PFI) and throttle body fuel injection (TBI) system.
- 1.6 Explain the operating principle of EFI system.
- 1.7 Describe basic construction of EFI system.
- 1.8 Mention the advantages and disadvantages of EFI system with respect to carburetor system.

2 Understand the air induction system of EFI engine.

- 2.1 State the meaning of air induction system.
- 2.2 List the components of EFI air induction system.
- 2.3 Mention the function of each components of air induction system.
- 2.4 Describe the operation of each components of air induction system.

3 Understand the fuel delivery system of EFI engine.

- 3.1 State the meaning of fuel delivery system of EFI engine.
- 3.2 List the components of fuel delivery system of EFI engine.

- 3.3 Mention the function of each components of fuel delivery system.
- 3.4 Describe the construction of each components of fuel delivery system.
- 3.5 Describe the operation of each components of fuel delivery system.
- 3.6 Describe the pulsed injection and continuous injection system.
- 3.7 Describe the operation of cold start value.

4 Understand the features of sensors & Actuator used in EFI engine.

- 4.1 Mention the function of sensors used in EFI engine.
- 4.2 Outline the importance of sensors in EFI engine.
- 4.3 List the common sensors used in EFI engine.
- 4.4 Describe the construction of each sensor used in EFI engine.
- 4.5 Describe the operation of each sensor used in EFI engine.
- 4.6 Mention the function of actuators used in EFI engine.
- 4.7 Describe the operation of Idle speed control (ISC) value.

5 Understand the electronic control system of EFI engine.

- 5.1 State the meaning of ECU/ECM OF EFI engine.
- 5.2 Mention the function of ECU/ECM of EFI engine.
- 5.3 State the meaning of stoichio metric ratio.
- 5.4 Outline the importance of stoichio metric ratio in EFI engine.
- 5.5 List different types electronic control system used in EFI engine.
- 5.6 Mention the function of each electronic control system.
- 5.7 Draw electronic control system with block diagram.
- 5.8 Describe the air fuel metering system of EFI engine.
- 5.9 Describe the fuel injection volume control system of EFI engine.

6 Understand the service procedure of EFI system.

- 6.1 Describe visual inspection procedure of EFI system.
- 6.2 Describe the cleaning procedure of throttle body.
- 6.3 Describe the service procedure of throttle body and port injection.
- 6.4 Describe the service procedure of air induction system of EFI engine.
- 6.5 Describe the service procedure of fuel delivery system of EFI engine.
- 6.6 Describe the trouble diagnosis procedure of EFI engine with the malfunction indicator light.
- 6.7 Describe the trouble diagnosis procedure of EFI engine with the scan tool.
- 6.8 Describe the on board diagnosis system (OBD) procedure of EFI engine.

7 Understand the concept of gasoline Direct injection (GDI) system.

- 7.1 Define GDI system.
- 7.2 Explain the operating principle of GDI system.
- 7.3 Compare the GDI system with EFI system.
- 7.4 Mention the advantages of GDI system.

8 Understand the concept of hybrid Vehicle.

- 8.1 Define hybrid vehicle.
- 8.2 Explain the operating principle of hybrid vehicle.
- 8.3 Mention the type of Hybrid vehicle.
- 8.4 Mention the advantages of hybrid vehicle.

9 Understand the concept of variable valve Timing intelligence (VVTI) system,

- 9.1 Define VVTI system.
- 9.2 Classify the VVTI system
- 9.3 Describe the operation of VVTI system.
- 9.4 Mention the advantages of VVTI system.

10 Understand the concepts of friction power measurement of IC engine.

- 10.1 State the meaning of friction power.
- 10.2 Mention the methods used to find the friction power.
- 10.3 Describe the methods used to find the friction power.
- 10.4 Compare the various methods used to find the friction power.

11 Understand the concepts of indicated power measurement of IC engine.

- 11.1 State the meaning of indicated power.
- 11.2 Mention the methods used to estimate the indicated power.
- 11.3 Describe the methods used to estimate the indicated power.
- 11.4 Mention the types of engine indicators used to estimate the indicated power.
- 11.5 Describe the working procedure of common engine indicators.
- 11.6 Express the derivation of formulae to calculate indicated power of four stroke and two stroke engine.
- 11.7 Describe the indicated power measurement procedure with the help of engine indicator.
- 11.8 Solve problems relating indicated power.

12 Understand the concepts of brake power measurement.

- 12.1 State the meaning of brake power.
- 12.2 State what is meant by PS.
- 12.3 Mention the classification of dynamometer used to measuring engine torque.
- 12.4 Distinguish between absorption dynamometer and transmission dynamometer.
- 12.5 Mention the advantages and disadvantages of different types of dynamometer.
- 12.6 Describe the procedure of brake power measurement with the prony brake dynamometer.
- 12.7 Describe the procedure of brake power measurement of a vehicle engine with the chassis dynamometer.
- 12.8 Solve problems relating engine power.

13 Understand the aspect of engine efficiencies.

- 13.1 Define efficiency.
- 13.2 Mention the different types of efficiency used in IC engine.
- 13.3 Explain air standard efficiency, indicated thermal efficiency and brake thermal efficiency.
- 13.4 Explain mechanical efficiency and relative efficiency.
- 13.5 Explain volumetric efficiency and scavenging efficiency.
- 13.6 Explain charge efficiency and combustion efficiency.
- 13.7 Solve problems relating efficiencies of internal combustion engine.

14 Understand the of fuel consumption test of IC engine.

- 14.1 State the meaning of fuel consumption.
- 14.2 Explain the factors which effect the fuel consumption of automobile engine.
- 14.3 Define specific fuel consumption.
- 14.4 Mention the type of specific fuel consumption.
- 14.5 Outline the importance of specific fuel consumption.
- 14.6 Describe the procedure of fuel consumption measurement with the volumetric type flow meters.
- 14.7 Describe the procedure of gravimeter fuel flow measurement.
- 14.8 Describe the procedure of fuel consumption measurement in vehicles.
- 14.9 Solve problems relating Specific fuel consumption.

15 Understand the concept of heat balance sheet.

- 15.1 State the meaning of heat balance sheet.
- 15.2 Identify the source of heat losses in IC engine.
- 15.3 Express the deduction of formula to calculate heat in various items of heat balance sheet.
- 15.4 Describe the method of preparing a heat balance sheet of IC engine.
- 15.5 Draw a heat balance sheet of IC engine.
- 15.6 Draw the heat balance diagram for a typical SI and CI engine.
- 15.7 Describe the method of heat balance by means of sankey diagram.
- 15.8 Solve problems relating heat balance.

Practical:

1 Study the EFI system.

- 1.1 Identify the components of air induction system.
- 1.2 Identify the components of fuel delivery system.
- 1.3 Identify the sensors.
- 1.4 Identify the actuators.
- 1.5 Identify the ECU/ECM/ ECA.

2 Clean the throttle body of EFI engine.

- 2.1 Disconnect the negative cable from the battery.
- 2.2 Disconnect the inlet air duct from the throttle body.
- 2.3 Cover the throttle sensor and idle air control valve with a shop towel.
- 2.4 Plug the air inlet passage with a shop towel.
- 2.5 Block the throttle lever for wide open.
- 2.6 Spray the cleaner (carburetor chock cleaner) around the throttle bore and on the back side of the throttle valves.
- 2.7 Remove heavy deposit by using a nylon parts cleaning brush.
- 2.8 Open and close the throttle lever several time to check for free movement.
- 2.9 Connect the disconnected parts.

3 Service the air cleaner of EFI engine.

- 3.1 Remove the cover from the air cleaner.
- 3.2 List out filter element.
- 3.3 Check the condition of filter elements.
- 3.4 Wipe the dust and oil out of the air cleaner housing or tray.
- 3.5 Make sure the plastic rings or seals on both side of the element are smooth and fit properly on top and bottom.
- 3.6 Install the filter element and cover.

4 Service the fuel system of EFI engine.

- 4.1 Make a visual inspection on fuel system.
- 4.2 Relieve fuel line pressure.
- 4.3 Check fuel filter.
- 4.4 Check fuel live.
- 4.5 Test fuel pump pressure and capacity.
- 4.6 Clean the fuel injectors.
- 4.7 Check the injector resistance (solenoid winding) for proper value.

5 Diagnose the troubles of EFI circuits and devices with malfunction indicator light.

- 5.1 Identify the diagnostic connector.
- 5.2 Identify the jumper terminals.
- 5.3 Insert a jumper wire in the terminals of diagnostic connector.
- 5.4 Turn the ignition key to on.
- 5.5 Retrieve and interpret trouble codesor.

6 Diagnose EFI system troubles with scantool.

- 6.1 Identify the diagnostic connector.
- 6.2 Connect the scantool with the diagnostic connector.
- 6.3 Perform road test of the car.
- 6.4 Operate the scantool.
- 6.5 Read out the trouble codes or scandata from scan tool display.
- 6.6 Compare the scan data with manufacture's service manual to interpret correctly.

7 Study the ECU/ ECM of EFI engine.

- 7.1 Identify the ECU/ECM of EFI engine.
- 7.2 Mark the terminals and connected wire of ECU/ECM.
- 7.3 Disconnect the wire from ECU/ ECM.
- 7.4 Remove the ECU/ECM.
- 7.5 Identify FROM chips in the ECU/ECM.
- 7.6 Install the ECU/ECM in the system accordingly.

8 Study the VVTI system.

- 8.1 Identify the components of VVTI system.
- 8.2 Disassemble & assemble the components.
- 8.3 Test the components.

9 Perform the fuel consumption of an engine/vehicle during rod test.

10 Test the brake power of an engine by prony brake.

- 10.1 Fit the prony brake with the engine.
- 10.2 Start the engine and warm up the engine.
- 10.3 Record the torque and RPM reading.
- 10.4 Stop the engine.
- 10.5 Calculate the break power in BHP and KW.

11 Test the brake power of an engine by chassis dynamometer.

- 11.1 Place the wheel of vehicle of the roller of dynamometer.
- 11.2 Start the engine and engage the clutch and gear.
- 11.3 Record the reading.
- 11.4 Stop the engine.
- 11.5 Determine brake power in BHP and KW.

12 Perform Morse test of an engine by the dynamometer.

- 12.1 Measure the break power of the engine.
- 12.2 Measure the friction power of each cylinder and total engine.
- 12.3 Measure the indicated power of each cylinder and total engine.
- 12.4 Determine mechanical efficiency of an engine.

13 Study the maintenance of IC engine.

- 13.1 Make a program of preventive maintenance of an engine.
- 13.2 Perform the preventive maintenance work as per program.
- 13.3 Make a program of daily maintenance of an engine.
- 13.4 Perform the daily maintenance work as per program.
- 13.5 Make a chart of schedule maintenance of an engine.
- 13.6 Perform the schedule maintenance work as per chart.

REFERENCE BOOKS

1. Automotive Mechanics
- Crouse Anglin
2. Auto Mechanics
- Mitchell
3. Thermal Engineering
- A. S. Sarao
4. A Course in Industrial Combustion Engine
- M. L. Mathur R. P. Sharma.
5. Industrial Combustion Engine
- V GANESAN

6272	AUTOMOTIVE INSTRUMENTATION AND TESTING	T	P	C
		2	6	4

AIMS

To provide the students with an opportunity to acquire knowledge, skill and attitude in the area of automotive instrumentation and testing with special emphasis on:

- fundamental of automotive instrument and instrumentation
- dash board instruments
- common mechanical, electrical and electronic instrument used in automotive troubles diagnosis
- combustion analyzer and oscilloscope
- chassis dynamometer and engines analyzer
- automotive battery testing and charging
- automotive electric system testing
- missing cylinder and valve sticking
- high pressure pump and injector testing

SHORT DESCRIPTION

Fundamentals of automotive instruments and instrumentation; Dash board instruments; Ammeter, voltmeter, Ohm meter and AVometer; Tachometer, Dwell angle meter and tach-dwell meter; Compression tester and cylinder leakage tester; Vacuum gage and fuel pump tester; Combustion analyzer; Automotive oscilloscope; Chassis dynamometer; Engine analyzer; Automotive battery testing and charging; Ignition system testing; Automotive electric starting system testing; Automotive charging system testing; Missing cylinder and valve sticking test; High pressure pump testing of diesel engine; Injector testing.

DETAIL DESCRIPTION

Theory:

1. Understand the fundamentals of automotive instruments and instrumentation.

- 1.1. State the meaning of automotive instrument and instrumentation.
- 1.2. Mention the purpose of automotive instrumentation.
- 1.3. Mention the types of instrument used in automotive field.
- 1.4. List the individual testing instruments used in the automotive field.
- 1.5. Name the combined testing instruments used in automotive field.

2. Understand the concept of dash board instruments.

- 2.1. State the meaning of dash board and dash board instrument.
- 2.2. Name the fundamental instruments used in modern automotive car dash board.

- 2.3. Name the signal lights & burgers used in modern automotive car dash board and mention its use.
- 2.4. Mention different types of dash board or panel board used in automotive car.
- 2.5. Describe the construction and operation of fuel gauge, oil pressure gauge and engine temperature gauge.
- 2.6. Describe the construction and operation of Speedo meter, odometer, trip meter, tachometer etc.
- 2.7. Mention the function of trip computer.

3. Understand the features of ammeter, voltmeter, ohm meter and AVO meter.

- 3.1. Mention the function of voltmeter, ammeter, ohmmeter and AVO meter.
- 3.2. Mention the types of voltmeter, ammeter and ohmmeter.
- 3.3. Describe the construction of voltmeter, ammeter and ohmmeter.
- 3.4. Describe the operation of voltmeter, ammeter and ohmmeter.
- 3.5. Compare voltmeter and ammeter.
- 3.6. State the meaning of multimeter or AVO meter .
- 3.7. Describe the operation of AVO meter.

4. Understand the features of tachometer, dwell angle meter and tach-dwell meter.

- 4.1. Mention the function of tachometer.
- 4.2. Mention different type of tachometer.
- 4.3. Describe the operation of different types of tachometer.
- 4.4. State the meaning of tach-dwell meter.
- 4.5. Mention the function of dwell angle meter.
- 4.6. Describe the procedure of measurement of idle rpm and dwell angle and adjustment of a petrol engine with the tachometer and dwell angle or tach-dwell meter.

5. Understand the features of compression tester and cylinder leakage tester.

- 5.1. Mention the function of compression tester and cylinder leakage tester.
- 5.2. Describe the compression test procedure of a gasoline engine and diesel engine.
- 5.3. Evaluate the test result of compression test.
- 5.4. Explain that the wet compression test of diesel engine is dangerous.
- 5.5. Describe the test procedure of engine leaks with a cylinder leakage tester.
- 5.6. Evaluate the test result of cylinder leakage test.

6. Understand the features of vacuum gage and fuel pump tester.

- 6.1. Mention the function of vacuum gage and fuel pump tester.
- 6.2. Describe the vacuum measurement procedure of a gasoline engine.
- 6.3. Explain the significance of different gauge reading.
- 6.4. Mention the test required to evaluate the performance of a gasoline pump.
- 6.5. Mention the test apparatus required for gasoline pump test.
- 6.6. Describe different test procedures of a gasoline fuel pump.
- 6.7. Evaluate the various test reading of gasoline pump tester.

7. Understand the features of Exhaust gas analyzer.

- 7.1. Mention the function of exhaust gas analyzer.
- 7.2. Describe the using procedure of exhaust gas analyzer.
- 7.3. Describe the carburetor adjustment procedure according to exhaust gas analyzer reading.
- 7.4. Describe the adjustment procedure of HC and CO.

8. Understand the features of automotive oscilloscope.

- 8.1. Mention the purpose of automotive oscilloscope.
- 8.2. State the meaning of trace or wave form of oscilloscope.
- 8.3. Mention different types of wave form of oscilloscope.
- 8.4. Identify the sections of wave form.
- 8.5. Explain primary and secondary wave form of oscilloscope.
- 8.6. Mention the types of trace sweep of automotive oscilloscope.
- 8.7. Describe different types of trace sweep.
- 8.8. Mention the significance of trace variation.
- 8.9. Describe different zone indications of oscilloscope trace.

9. Understand the features of chassis dynamometer.

- 9.1. Mention the purpose of chassis dynamometer.
- 9.2. Describe the construction of chassis dynamometer.
- 9.3. Describe the operation of chassis dynamometer.
- 9.4. Mention the use of chassis dynamometer.

10. Understand the features of engine analyzer.

- 10.1. State the meaning of engine analyzer.
- 10.2. Mention the function of engine analyzer.
- 10.3. Mention the facilities of an engine analyzer.
- 10.4. Illustrate the printing sheet of a typical engine trouble diagnosis from a computerized engine analyzer.
- 10.5. Illustrate different types of oscilloscope trace with possible troubles of electrical system.

11. Understand the concept of automotive battery testing and charging.

- 11.1. Name the automotive battery testing processes.
- 11.2. Describe the automotive battery testing processes.
- 11.3. State the meaning of battery charging.
- 11.4. Mention the causes of self discharge of lead acid battery.
- 11.5. Mention the battery charging methods out side the vehicle.
- 11.6. Describe different charging methods out side the vehicle.
- 11.7. State the meaning of maintenance free battery.
- 11.8. Mention the precautions for charging a maintenance free battery.

12. Understand the concept of ignition system testing.

- 12.1. Mention the causes of ignition failure.
- 12.2. Identify the troubles of ignition system.
- 12.3. Describe the testing procedure of ignition system components.
- 12.4. Outline the importance of correct ignition timing.
- 12.5. Describe the ignition timing test procedure with ignition timing light.
- 12.6. Mention the ignition timing adjustment process.
- 12.7. Describe the centrifugal and vacuum advance mechanism test procedure with the ignition timing light.
- 12.8. Describe the ignition timing set up procedure.
- 12.9. Describe the operation of a ignition timing light.

13. Understand the concept of automotive electrical starting system testing.

- 13.1. Define the terms open winding, shorted turns and grounded to core.
- 13.2. Describe the cranking voltage test procedure.
- 13.3. Describe the starting circuit test procedure.
- 13.4. Describe the solenoid switch hold in coil and pull in coil / winding test procedure.
- 13.5. Describe the disassemble procedure of a cranking motor.
- 13.6. Describe different components test procedure of cranking motor.
- 13.7. Describe the assemble procedure of a cranking motor.
- 13.8. Describe the performance test procedure of cranking motor and solenoid switch.
- 13.9. Describe the trouble-diagnosis chart of a cranking motor.

14. Understand the concept of automobile charging system testing.

- 14.1. List the charging system troubles.
- 14.2. Describe the charging system troubles.
- 14.3. Identify the terminals of alternators.
- 14.4. Describe the disassemble procedure of an alternator.
- 14.5. Describe the cleaning and visual inspection procedure of alternator components.
- 14.6. Mention the safety measure which should be taken during charging circuit test.
- 14.7. Describe the test procedure of alternator components.
- 14.8. Describe the assemble procedure of alternator.
- 14.9. Describe the output test procedure of an alternator.

15. Understand the concept of missing engine.

- 15.1. State the meaning of missing engine.
- 15.2. Mention the causes of missing engine at different engine speed.
- 15.3. Describe the finding procedures of missing cylinder.

16. Understand the concept of high pressure pump testing of diesel engine.

- 16.1. Mention the purpose of high pressure pump testing.
- 16.2. State the meaning of phasing and calibration of high pressure pump.

- 16.3. Mention the methods of phasing a high pressure pump.
- 16.4 Describe the high pressure pump phasing procedure by pump test bench.
- 16.5 Mention the methods of calibration a high pressure pump.
- 16.6 Describe the calibration procedure of high pressure pump with pump test bench.
- 16.7 Describe the governor setting procedure.

17. Understand the concept of injector testing.

- 17.1. Mention the purpose of injector testing.
- 17.2. Mention different types of injector testing.
- 17.3. Describe the various test procedure of injector testing.
- 17.4. Describe the construction of injector tester.
- 17.5. Describe the trouble-diagnosis chart of injector nozzles.

PRACTICAL:

1. Study the automotive dash board instruments.

- 1.1. Identify the common instrument used in modern automotive car dash board.
- 1.2. Identify the special instrument used in modern automotive car dash board.
- 1.3. Dismount the dash board from the car.
- 1.4. Dismount all the dash board instrument.
- 1.5. Disassemble all the dash board instrument to observe the construction.
- 1.6. Reassemble all the dash board instruments.
- 1.7. Remount the dash board instrument and dash board in the car.
- 1.8. Test the workability of the dash board instruments.

2. Study the AVO meter.

- 2.1. Disassemble an AVO meter.
- 2.2. Identify the components of an AVO meter.
- 2.3. Identify electrical circuit of an AVO meter.
- 2.4. Reassemble the AVO meter.
- 2.5. Select DC volt mode and measure the voltage of a storage battery.
- 2.6. Select AC volt mode and measure line voltage and phase the voltage of your work shop electric supply.
- 2.7. Select ohmmeter and measure resistance or continuity of a coil.

3. Study the tach-dwell meter.

- 3.1. Disassemble a tach-dwell meter.
- 3.2. Identify different component and electrical circuit of the meter.
- 3.3. Reassemble the tach-dwell meter.
- 3.4. Select the tachometer mode and measure idle rpm and maximum rpm of a petrol engine.
- 3.5. Select the dwell angle mode and measure dwell angle and dwell variation.
- 3.6. Adjust dwell angle if necessary.

4. Study the cylinder compression test.

- 4.1. Start and warm up the engine.
- 4.2. Prepare the engine for compression test.
- 4.3. Remove all spark plug / injector from the engine.

- 4.4. Select the compressor tester.
- 4.5. Set the compressor tester.
- 4.6. Crank the engine and record the reading of each cylinder.
- 4.7. Analyze the reading and find out the problems.

5. Study the cylinder leakage tester.

- 5.1. Start and warm up the engine.
- 5.2. Prepare the engine for cylinder leakage test.
- 5.3. Bring the piston of number one cylinder at TDC on compression stroke and hold that position.
- 5.4. Set the tester with the spark plug hole
- 5.5. Connect the compressed air source to the leakage tester at specified pressure.
- 5.6. Turn the air supply valve at on position.
- 5.7. Record the leakage percentage of the cylinder.
- 5.8. Test each cylinder accordingly.
- 5.9. Find the pin point of leakage if the meter reading indicates higher than specified reading.

6. Study the automotive engine vacuum test.

- 6.1. Start and warm up the automotive engine.
- 6.2. Set the vacuum gage with intake manifold or any other facilitated place of EFI engine.
- 6.3. Run the engine at different condition and record the data.
- 6.4. Analyze the record data and find out the problems.

7. Study the gasoline fuel pump testing.

- 7.1. Clean and test the fuel pump visually.
- 7.2. Test the pressure of fuel pump.
- 7.3. Test the vacuum of fuel pump.
- 7.4. Test the volume of fuel pump at 20 stroke.
- 7.5. Diagnose the trouble from test result.

8. Study the exhaust gas analyzer.

- 8.1. Identify the components of exhaust gas analyzer.
- 8.2. Connect exhaust gas analyzer.
- 8.3. Start the engine & collect data.

9. Study the automotive oscilloscope.

- 9.1. Identify the components of oscilloscope.
- 9.2. Ensure the function of control knobs of oscilloscope.
- 9.3. Connect the oscilloscope test probe to the engine.
- 9.4. Select the knob at desired test position.
- 9.5. Observe the wave form in the monitor.
- 9.6. Test the ignition system and alternator troubles by turn the selector knob at desired test position.

10. Study the engine power measurement by chassis dynamometer.

- 10.1. Place the drive wheel of the vehicle on roller of chassis dynamometer.
- 10.2. Start the engine and engage the clutch and gear.
- 10.3. Change the gear at different speed condition.
- 10.4. Record the reading and stop the engine.
- 10.5. Determine the brake power in BHP and KW.

11. Study the engine analyzer.

- 11.1. Identify the components of engine analyzer.
- 11.2. Connect the engine analyzer with engine.
- 11.3. Start the engine & collect data.

12. Study the testing and charging of automotive battery.

- 12.1. Perform specific gravity test of automotive lead acid battery.
- 12.2. Perform high discharge test of automotive lead acid battery.
- 12.3. Charge two automotive lead acid battery using constant current method at slow rate.
- 12.4. Charge two battery using constant voltage method at slow rate.
- 12.5. Charge a battery using constant voltage method at high rate (booster charging).
- 12.6. Charge a sulfated battery at trickle charge rate.

13. Study the ignition system trouble diagnosis.

- 13.1. Test the spark intensity of ignition system.
- 13.2. Test the ignition coil and high tension wire by ohmmeter.
- 13.3. Test the condenser.
- 13.4. Test and adjust the ignition timing and ignition advance mechanism by ignition timing light.
- 13.5. Clean and test the spark plug by spark plug cleaner and tester.
- 13.6. Set the ignition timing with the help of ignition timing light.

14. Study the automotive charging system troubles diagnosis.

- 14.1. Dismount the alternator from the engine.
- 14.2. Disassemble the alternator.
- 14.3. Test the components of alternator by suitable instruments.
- 14.4. Reassemble the alternator.
- 14.5. Remount the alternator to the engine.
- 14.6. Test the output of the alternator.
- 14.7. Perform the quick voltage regulator test by DC voltmeter during engine operation.

15. Study the electric starting system trouble diagnosis.

- 15.1. Dismount the cranking motor from the engine.
- 15.2. Perform the visual inspection of starting system components.
- 15.3. Disassemble the starting motor.
- 15.4. Test the components of starting motor by suitable instrument.
- 15.5. Reassemble the cranking motor.

- 15.6. Test the performance of solenoid switch.
- 15.7. Test the performance of cranking motor by no load test and lock torque test.
- 15.8. Test the performance of whole starting system.

16. Identify the missing engine cylinder.

- 16.1. Start the engine.
- 16.2. Check missing cylinder sequentially.

17. Study the high pressure pump diagnosis.

- 17.1. Dismount the high pressure pump from the engine.
- 17.2. Disassemble the high pressure pump.
- 17.3. Inspect the high pressure pump components.
- 17.4. Change the plunger set if necessary.
- 17.5. Reassemble the high pressure pump.
- 17.6. Set the pump with phasing calibration machine.
- 17.7. Perform phasing operation of the high pressure pump.
- 17.8. Perform calibration operation of the high pressure pump.
- 17.9. Remount the pump to the engine.

18. Study the diesel injector trouble diagnosis.

- 18.1. Dismount the injectors from the engine.
- 18.2. Disassemble the injector.
- 18.3. Clean the injector components.
- 18.4. Perform visual inspection of the injector components.
- 18.5. Replace nozzle set if necessary.
- 18.6. Assemble the injectors.
- 18.7. Perform pressure setting or pop test, dribble test, back leakage test and spray pattern test of the injectors by the injector tester.
- 18.8. Remount the injectors to the engine.

REFERENCE BOOKS

- | | | |
|--|---|----------------------|
| 1. Automotive electrical equipment | - | W.H. crouse |
| 2. Automobile electrical and electronic system | - | TONY TRANTER |
| 3. Engine Instrumentation and testing | - | Md. Radwanoor Rahman |

6273 AUTOMOTIVE TROUBLE SHOOTING & EMISSION CONTROL	T	P	C
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AIMS

To provide the students with an opportunity to acquire knowledge, skill and attitude in the area of automotive trouble shooting and diagnosis with special emphasis on:

- trouble-diagnosis of automotive engine and their system.
- trouble-diagnosis of automotive power trains.
- trouble-diagnosis of automotive chassis.
- the basic concepts of automobile emission
- harmful effects of emission on human and plants
- emission standards
- different emission control system and devices used in automobiles

SHORT DESCRIPTION

Trouble diagnosis of automotive engines; Trouble diagnosis of ignition systems; Trouble diagnosis of fuel systems; Trouble diagnosis of lubricating system; Trouble diagnosis of cooling system; Trouble diagnosis of automotive of power trains; Trouble diagnosis of automotive chassis; Trouble diagnosis Process with fault code; Emission fundamentals; Automotive emissions; Emission standards; Emission control system; Positive crankcase ventilation system; Controlling evaporative emission; Cleaning exhaust gas; Exhaust gas re-circulation, Treating exhaust gas; Catalytic converter.

DETAIL DESCRIPTION

Theory:

1. Understand trouble diagnosis of automotive engine.

- 1.1. State the meaning of troubleshooting.
- 1.2. Outline the importance of trouble shooting and diagnosis in automotive field.
- 1.3. Describe the symptom, possible cause and remedies of automotive engine failure.

2. Understand the trouble diagnosis of ignition system.

- 2.1. Describe the trouble diagnosis of conventional battery coil ignition system.
- 2.2. Describe the trouble diagnosis of magneto ignition system.
- 2.3. Describe the trouble diagnosis of CDI system.
- 2.4. Describe the trouble diagnosis of electronic ignition system.

3. Understand the trouble diagnosis of fuel system.

- 3.1. Describe the mechanical fuel-pump trouble diagnosis of carburetor engine.
- 3.2. Describe the symptom, possible causes and remedies of EFI pump failure.
- 3.3. Describe the symptom, possible cause and remedies of diesel injection pump failure.
- 3.4. Describe the trouble diagnosis chart of EFI system.
- 3.5. Describe the trouble diagnosis chart of diesel injection fuel system.

4. Understand the trouble diagnosis of lubricating system.

- 4.1. Describe the possible causes and remedies of oil pressure drop.

- 4.2. Describe the possible causes and remedies of main bearing noise.
- 4.3. Describe the possible causes and remedies of connecting rod noise.
- 4.4. Describe the possible causes and remedies of noisy valves.
- 4.5. Describe the possible causes and remedies of oil pump fault.

5. Understand the trouble diagnosis of cooling system.

- 5.1. Describe the symptom, possible causes and remedies of external leakage.
- 5.2. Describe the symptom, possible causes and remedies of internal leakage.
- 5.3. Describe the symptom, possible causes and remedies of poor coolant circulation.
- 5.4. Describe the symptom, possible causes and remedies of over heating.
- 5.5. Describe the symptom, possible causes and remedies of radiator over flow.
- 5.6. Describe the symptom, possible causes and remedies of corrosion.
- 5.7. Describe the symptom, possible causes and remedies of low engine temperature.
- 5.8. Mention the symptom, possible causes and remedies of noisy pump.

6. Understand the trouble diagnosis of automotive power trains.

- 6.1. Describe the trouble diagnosis of automotive clutch.
- 6.2. Describe the trouble diagnosis of automotive manual transmission.
- 6.3. Describe the diagnosis of automotive transaxle.
- 6.4. Describe the trouble diagnosis of automotive transfer case.
- 6.5. Describe the trouble diagnosis chart for automatic transmission and transaxles.
- 6.6. Describe the trouble diagnosis of drive-shaft and universal joint.
- 6.7. Describe the trouble diagnosis of differential.

7. Understand the trouble diagnosis of automotive steering & suspension system.

- 7.1. Describe the trouble diagnosis of steering and suspension.
- 7.2. Describe the symptom, possible causes and remedies of wheel alignment.
- 7.3. Describe the symptom possible causes and remedies of steering system problem.

8. Understand the trouble diagnosis of automotive brake system.

- 8.1 Describe the trouble diagnosis chart of brake system.
- 8.2 Identify the possible causes and remedies of different trouble of automotive brake system.
- 8.3 Identify the possible causes and remedies of brake failure.

9 Understand the trouble diagnosis with fault code.

- 9.1 Explain fault code of automobile.
- 9.2 Explain check engine lamp or mal function indication lamp.
- 9.3 Explain the OBD-I & OBD-II on board diagnosis system.
- 9.4 Describe the fault diagnosis process with manual command.
- 9.5 Describe the fault diagnosis process with scanner.

10. Understand the atmospheric pollution.

- 10.1 Define emission and pollution.
- 10.2 Describe the construction of earth's atmosphere.
- 10.3 List the automotive air pollutants.

- 10.4 Explain how the pollutants produced by automobile.
- 10.5 Name the possible sources of atmospheric pollution from the automobiles.
- 10.6 Explain the harmful action of automotive air pollutants to human and plants.

11 Understand the features of automotive emission control system.

- 11.1 Define emission standard.
- 11.2 Explain the chemical reaction takes place during combustion in the combustion chamber.
- 11.3 State what is meant by emission control.
- 11.4 Name the different emission control systems used in automobile.
- 11.5 Mention the purposes of emission control system.

12 Understand controlling crankcase emission.

- 12.1 Define the terms blow by and crankcase ventilation.
- 12.2 Mention the necessity of PCV system.
- 12.3 Describe the operation of PCV system.
- 12.4 Describe the construction of PCV valve.

13 Understand the controlling evaporative emission.

- 13.1 Define the term evaporative emission.
- 13.2 Describe the operation of evaporative emission control for carbureted engine.
- 13.3 Describe the operation of evaporative emission control for EFI engine.
- 13.4 Mention the function of fuel vapor return line and charcoal canister.
- 13.5 Describe the procedure of separating vapor from fuel.

14 Understand the cleaning of exhaust gas.

- 14.1 State the meaning of cleaning exhaust gas.
- 14.2 List the ways to reduce pollutants in exhaust gas.
- 14.3 Describe the process of controlling the air-fuel mixture.
- 14.4 Mention the factors which influence the combustion in the engine cylinder.
- 14.5 Explain the stratified charge combustion.

15 Understand the exhaust gas re-circulation (EGR) system.

- 15.1 Mention the purposes of exhaust gas re-circulation system.
- 15.2 Describe the construction of EGR system.
- 15.3 Describe the operation of EGR system.
- 15.4 Mention the purposes of EGR valve.
- 15.5 Describe the operation of EGR valve with back pressure sensor.
- 15.6 Describe the operation of ECM (Electronic Control Module) controlled EGR system.

16 Understand the treating of exhaust gas.

- 16.1 State the meaning of treating exhaust gas.
- 16.2 Mention the ways of treating exhaust gas.
- 16.3 Describe the operation of air injection system.
- 16.4 Describe the operation of air aspiration system.

17 Understand the features of catalytic converter.

- 17.1 Define the term catalytic converter.
- 17.2 Mention the purposes of catalytic converter.
- 17.3 Identify the different types of catalytic converter.
- 17.4 Describe the operation of oxidizing catalytic converter.
- 17.5 Describe the operation of three way catalytic converter.
- 17.6 Mention the servicing precaution of catalytic converter.

Practical:**1. Study the carbureted fuel system.**

- 1.1. Check the fuel pump pressure, vacuum and twenty stroke fuel volume.
- 1.2. Dismount the fuel pump from the engine.
- 1.3. Disassemble the fuel pump.
- 1.4. Repair / replace the faulty components.
- 1.5. Assemble the fuel pump and remount with the engine.
- 1.6. Check the delivery of carburetor.
- 1.7. Repair / replace or adjust the faulty components.
- 1.8. Assemble and fix the carburetor with the engine.
- 1.9. Diagnose carbureted fuel system troubles and rectify.

2. Study the trouble diagnosis of EFI system.

- 2.1. Check the EFI system for fuel leakage.
- 2.2. Check the EFI system for air leakage.
- 2.3. Check the performance of EFI fuel pump.
- 2.4. Check the fuel rail.
- 2.5. Check the fuel pressure regulator.
- 2.6. Check the performance of solenoid operated injection valve.
- 2.7. Diagnose the trouble of EFI system with built in electronic self-diagnostic system and rectify the troubles.

3. Study the trouble diagnosis of diesel engine fuel system.

- 3.1. Clean / change fuel filter.
- 3.2. Dismount high pressure pump from the engine.
- 3.3. Dismount the injectors from the engine.
- 3.4. Check the performance of high pressure pump with high pressure pump test bench.
- 3.5. Check the performance of injectors with injector tester.
- 3.6. Diagnose diesel engine fuel system troubles and rectify.

4. Study the trouble diagnosis of cooling system.

- 4.1. Check the pressure of cooling system with the cooling system pressure tester.
- 4.2. Check the radiator pressure cap with cooling system pressure tester.
- 4.3. Check the thermostat.
- 4.4. Check the hoses and hose connections.
- 4.5. Check the exhaust gas leakage into cooling system with a block-check tester.
- 4.6. Check the strength of antifreeze solution.
- 4.7. Check the water pump and replace it if necessary.

- 4.8. Check the tension of fan belt.
- 4.9. Reverse flush the radiator.
- 4.10. Diagnose the troubles of cooling system and rectify.

5. Study the trouble diagnosis of lubricating system.

- 5.1. Check oil level.
- 5.2. Change oil.
- 5.3. Change oil filter.
- 5.4. Service the oil pressure relief valve.
- 5.5. Service the oil pump and oil pressure indicator.
- 5.6. Diagnose and rectify the troubles of lubricating system.

6. Study the trouble diagnosis of ignition system.

- 6.1. Check the workability of ignition system component.
- 6.2. Check the spark intensity of ignition system.
- 6.3. Check ignition timing & advance mechanism with stroboscopic light and adjust if necessary.
- 6.4. Clean and check spark plug gap and adjustment if necessary.
- 6.5. Diagnose the conventional ignition system troubles and rectify it.
- 6.6. Diagnose and rectify the CDI ignition system troubles.
- 6.7. Diagnose magneto ignition system troubles and rectify.
- 6.8. Diagnose and rectify the electronic ignition system troubles.

7. Study the trouble diagnosis of clutch.

- 7.1. Remove clutch assembly from the vehicle.
- 7.2. Disassemble the clutch assembly.
- 7.3. Check the component of clutch assembly.
- 7.4. Replace the faulty components.
- 7.5. Reassemble and reinstall the clutch.
- 7.6. Adjust the clutch pedal free pedal.
- 7.7. Lubricate release-bearing.
- 7.8. Service and adjust clutch leakage.
- 7.9. Check for clutch disengagement.
- 7.10. Diagnose and rectify the clutch troubles.

8. Study the trouble diagnosis of manual transmission and transaxle.

- 8.1. Check oil leakage from a transmission.
- 8.2. Adjust manual transmission and transaxle leakage.
- 8.3. Check oil level of manual transmission and transaxle.
- 8.4. Diagnose and rectify the trouble of manual transmission.
- 8.5. Diagnose and rectify the troubles of manual transaxle.

9. Study the automatic transmission and transaxle.

- 9.1. Check the fluid in an automatic transmission and in an automatic transaxle.
- 9.2. Check the transmission or transaxle for fluid leaks.
- 9.3. Diagnose troubles in various models of automatic transmission and transaxle.
- 9.4. Test the pressure and interpret the result.

- 9.5. Make a stall test and interpret the result.
- 9.6. Perform linkage and band adjustment.
- 9.7. Remove and install an automatic transmission and transaxle.

10. Study the steering and suspension system trouble diagnosis.

- 10.1. Diagnose the troubles in manual and power steering system.
- 10.2. Diagnose the troubles in suspension system.
- 10.3. Inspect and lubricate the steering linkage.
- 10.4. Replace the defective parts in steering linkage.
- 10.5. Replace and adjust the front wheel bearings.
- 10.6. Inspect the suspension system and replace defective parts.
- 10.7. Perform the wheel alignment on vehicle.

11. Study the brake system troubles-diagnosis.

- 11.1. Diagnose the trouble in the drum brake system.
- 11.2. Diagnose the trouble in the disk brake system.
- 11.3. Adjust the drum brake.
- 11.4. Service the drum and disk brakes, master cylinder, brake lines and wheel cylinder.
- 11.5. Diagnose the troubles in power brake system and rectify.

12. Study the trouble diagnosis with fault code.

- 12.1 Diagnosis the trouble with manual command (without scanner)
- 12.2 diagnosis the trouble with the heap of scanner.

13. Study the emission control system.

- 13.1 Identify the different emission control devices used in modern automobiles.
- 13.2 Identify the main sources of automotive emission.

14 Study the positive crankcase ventilation (PCV) system.

- 14.1 Identify the different components of PCV system.
- 14.2 Check PCV valve for workability.
- 14.3 Check crankcase vacuum by PCV tester.
- 14.4 Service the PCV system.

15 Study the evaporative control system.

- 15.1 Identify the components of the system.
- 15.2 Replace filter in charcoal canister.
- 15.3 Test the system for fuel vapor leakage.

16 Study the air injection system.

- 16.1 Identify the components of the system.
- 16.2 Remove the air pump, diverted valve, check valve and injection tube.
- 16.3 Test and service the air pump, diverter valve, check valve and injection tube.
- 16.4 Install the air pump, diverter valve, check valve and injection valve.

17 Study the exhaust gas re-circulation (EGR) system.

- 17.1 Identify the components of EGR system.
- 17.2 Test the EGR system.
- 17.3 Remove the EGR valve.
- 17.4 Test the EGR valve.

18 Study the catalytic converter.

- 18.1 Test the catalytic converter for workability.
- 18.2 Remove the catalytic converter from vehicle.
- 18.3 Install the catalytic converter.

REFERENCE BOOKS

1. Automobile Guide
- Frederick E. Bricker.
2. Automotive Mechanics
- William H. Crouse
Donald L. Anglin
3. Advanced electronics Diagnosis of Automobile
- Don Khowles.
4. Automobile engineering
-R.B. Gupta.
5. The Automobile
- Harban Singh Rayet.
6. Manual of Different Auto Vehicle Companys.

6274	AUTOMOTIVE BRAKE AND STEERING SYSTEM	T 2	P 3	C 3
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AIMS

To provide the students with an opportunity to acquire knowledge, skill and attitude in the area of automotive brake and steering system with special emphasis on:

- construction and operation of brake system
- construction & operation of ABS & SBC system
- construction and operation of conventional steering system
- construction and operation of power steering system

SHORT DESCRIPTION

Features of mechanical, hydraulic, servo, servo-assisted hydraulic, air brake, anti lock brake system (ABS), sensotronic brake control (SBC) system and their components, such as: master cylinder, wheel cylinder, disc brake, drum brake modulator, air compressor, air valves etc. and servicing of brake system. Mechanical, hydraulic & electrical power steering and its components, steering geometry & servicing of steering system.

DETAIL DESCRIPTION

Theory:

1. Understand the features of brake system.

- 1.1 Mention the purposes of brake system.
- 1.2 Explain the principle of braking.
- 1.3 Mention the classification of automotive brake system.

2. Understand the features of mechanical brake (parking) system.

- 2.1 Define mechanical brake system.
- 2.2 List the components of mechanical brake system.
- 2.3 Describe the operation of mechanical brake system

3. Understand the features of hydraulic brake system.

- 3.1 Define hydraulic brake system.
- 3.2 Mention the characteristics of different type of brake fluid & its use.
- 3.3 List the components of hydraulic brake system.
- 3.4 Describe the construction of wheel cylinder, brake shoe, brake shoe lining and brake drum & calipers.
- 3.5 Describe the operation of hydraulic brake system (drum brake).
- 3.6 Describe the operation of hydraulic brake system (disc brake).
- 3.7 Compare disc brake with drum brake.
- 3.8 Mention the advantages & disadvantages of disc brake mechanism.

4. Understand the features of brake master cylinder.

- 4.1 Mention the function of brake master cylinder.

- 4.2 Describe the operation of brake master cylinder.
- 4.3 Mention the function of check valve, feeling hole and compensation port.
- 4.4 Mention the purposes of tandem master cylinder.
- 4.5 Describe operation of tandem master cylinder.
- 4.6 List the advantages of master cylinder.

5. Understand the vacuum assisted hydraulic brake.

- Define vacuum assisted hydraulic brake.
- List the components of vacuum assisted hydraulic brake.
- Describe operation of vacuum assisted hydraulic brake.
- Describe construction of servo unit.
- Describe the operation of servo unit.
- Mention the uses of vacuum pump.
- Mention the advantages of vacuum assisted hydraulic brake system.

6. Understand the air assisted hydraulic brake.

- Define air assisted hydraulic brake.
- List the components of air assisted hydraulic brake.
- Describe the operation of air assisted hydraulic brake.
- Mention the advantages of air assisted hydraulic brake.

7. Understand the air brake.

- Define air brake.
- Mention the purposes of air brake.
- Describe the construction of air brake.
- Describe the operation of air brake.
 - Explain the importance of air compressor, unloaded valve air regulator valve and brake valve.
- Mention the advantages of air brake.
 - Mention the difference between conventional air brake system and self locking air brake system.

8. Understand the feature of electronically controlled brake system.

- State the meaning of ABS, EBD & SBC.
- Describe the operation of anti lock brake (ABS) system.
- Describe the operation of Electronic brake Distribution (EBD) system.
- Describe the operation of sensotronic brake control (SBC) system.
- Mention the difference among ABC, EBD & SBC.
- Mention the advantages of ABC, EBD & SBC.

9. Understand the features of brake system servicing.

- Define the terms: brake shoe clearance brake pedal free play, spongy brake, brake bleeding, brake system flashing.
- Describe the adjusting procedure of brake shoe clearance and brake pedal free play.
- Describe the brake bleeding process.

Describe the process of brake system flashing.
 Describe the process of master cylinder servicing.
 Describe the process of brake disc and drum servicing.
 Describe the process of trouble shooting and diagnosis.
 Describe the self adjusting mechanism.

10. Understand the features of steering system.

- 10.1 Define steering system
- 10.2 Mention the purpose of steering system.
- 10.3 Mention the types of steering system
- 10.4 List the components of conventional (mechanical) steering system.
- 10.5 Describe the operation of conventional (mechanical) steering system.
- 10.6 Name the different types of steering gear box.
- 10.7 Describe the operation of steering gear of each type.
- 10.8 Describe the construction of steering linkage of different types.
- 10.9 Describe the construction of ball and socket joint.
- 10.10 Describe the operation of telescopic steering wheel.
- 10.11 Describe the operation of collapsible steering column.
- 10.12 Describe the construction of four wheel steering system.
- 10.13 Describe the trouble shooting and diagnosis process of steering system.

11 Understand the features of hydraulic power steering system.

- 11.1 State the meaning of power steering system.
- 11.2 Name the different types of power steering system.
- 11.3 Describe the operation of integral power steering system.
- 11.4 Describe the operation of linkage booster power steering system.
- 11.5 Name the types of power steering pump.
- 11.6 Describe the operation of vane type power steering pump.

12 Understand the features of electric power steering system

- 12.1 State the meaning of electric motor power steering (EMPS) system.
- 12.2 List the components of EMPS.
- 12.3 Describe the operation of EMPS system.
- 12.4 Mention the advantages EMPS.

13 Understand the features of front end geometry (Steering geometry).

- 13.1 Define the term front end geometry (steering geometry).
- 13.2 List the factor which affects the front end geometry.
- 13.3 List the advantages of accurate front end alignment.
- 13.4 Describe the terms: camber angle, castor angle, king pin inclination, included angle, toe-in and Toe-out on turn.
- 13.5 Identify the types of camber angle, castor angle, king pin inclination.
- 13.6 Mention the necessity of camber angle, caster angle, king pin inclination, Toe- in and Toe-out on turn.
- 13.7 Mention the approximate range of camber angle, caster angle, king pin inclination, Toe- in and Toe-out on turn.

13.8 Describe the adjusting procedure of camber angle, caster angle, Toe- in and Toe-out on turn.

Practical:

- 1 Study the mechanical brake system.
 - 1.1 Identify the components of mechanical brake system.
 - 1.2 Disassemble the mechanical brake system.
 - 1.3 Assemble the mechanical brake system.
 - 1.4 Adjust the mechanical brake system.
 - 1.5 Test the mechanical brake system.
- 2 Study the hydraulic brake system.
 - 2.1 Remove master cylinder, wheel cylinder, brake shoe, brake drum, brake disc, etc.
 - 2.2 Clean and install the components.
 - 2.3 Bleed the brake system.
 - 2.4 Adjust the brake shoe clearance.
 - 2.5 Test the performance of brake system.
- 3 Study the master cylinder (conventional type).
 - 3.1 Disassemble the master cylinder.
 - 3.2 Clean and test the workability of each component.
 - 3.3 Assemble the master cylinder.
- 4 Study the tandem master cylinder.
 - 4.1 Disassemble the tandem master cylinder.
 - 4.2 Clean and test the workability of each component.
 - 4.3 Assemble the tandem master cylinder.
- 5 Study the servo unit.
 - 5.1 Disassemble the servo unit.
 - 5.2 Identify the components.
 - 5.3 Assemble the servo unit.
 - 5.4 Test the performance of servo unit.
- 6 Study the air brake system.
 - 6.1 Identify the components of air brake system.
 - 6.2 Disassemble the system.
 - 6.3 Assemble the components.
 - 6.4 Test the performance.
- 7 Study the ABS & SBC system
 - 7.1 Identify the components of ABS & SBC system.
 - 7.2 Disassemble the system.
 - 7.3 Assemble the components.
 - 7.4 Test the performance.
- 8 Study the steering system.
 - 8.1 Identify the components of steering system.
 - 8.2 Disassemble the system.
 - 8.3 Clean and assemble the system.
 - 8.4 Test the performance of steering system.
- 9 Study the steering gearbox.
 - 9.1 Disassemble the steering gearbox.
 - 9.2 Clean and test the each component of steering gearbox.
 - 9.3 Assemble the gearbox.
- 10 Study the power steering system.
 - 10.1 Identify the components.

- 10.2 Disassemble the components and clean.
- 10.3 Assemble the system.
- 10.4 Test the performance.
- 11 Study the front end geometry.
 - 11.1 Check and adjust the comber angle.
 - 11.2 Check and adjust the castor angle.

REFERENCE BOOKS

1. Automotive Mechanics.
 - W. H Crouse and Angilin
2. Automobile Engineering
 - Dr. Kripal Singh.
3. Automobile Engineering
 - G. B. S Narang
4. Automobile Engineering
 - R.B. Gupta

5. Automobile Engineering
 - K.K. Ramalingam
6. Automobile Engineering
 - N.K. Gir

6275 AUTOMOTIVE ELECTRICAL AND ELECTRONIC SYSTEM II

T P C
2 6 4

AIMS

To provide the students with an opportunity to acquire knowledge, skill and attitude in the area of automotive electrical and electronic systems with special emphasis on:

- Function, construction and operation of electrical devices used in automobile.
- Function, construction and operation of electronic devices used in automobile.

SHORT DESCRIPTION

Lighting system; Head light circuit; Horn and horn relay; Windshield wiper and washer; Electronic fuel injection system; Sensors; Actuators; Body electronic control; Anti-lock braking system; Cruise control system; Electronic dash board instruments ; Electromagnetic interference, Advanced automotive lighting system.

DETAIL DESCRIPTION**Theory:****1. Understand the features of lighting system.**

- 1.1. Mention the purpose of lighting system of automobile.
- 1.2. List the lighting system used in automobile.
- 1.3. Draw a simplified complete lighting circuit of automobile.
- 1.4. List the typical electrical loads of automobile showing their electrical load in watt.
- 1.5. Identify the different types of bulb used in automobile.
- 1.6. Mention the uses of different lighting system used in automobile.
- 1.7. Explain the relation between engine immobilizer & tail lamp malfunction.

2. Understand the features of head light circuit.

- 2.1. Name the components of head light assembly.
- 2.2. Name different types of head lights used in automobile.
- 2.3. Describe the construction of head light.
- 2.4. Identify the different types of lens and reflector of head light.
- 2.5. Draw the head light circuit of automobile.
- 2.6. Mention the functions of head light relay and dimmer switch of head light circuit.
- 2.7. Mention the advantages of sealed beam head light.
- 2.8. Mention the disadvantages of separate bulb and reflector of head light.
- 2.9. Describe the method of head light aiming.
- 2.10. Explain the automotive head lamp control system.

3. Understand the features of side indicating light circuit.

- 3.1 Name the components of side indicating light circuit.
- 3.2 Draw a side indicating light circuit.
- 3.3 Name the different types of flasher used in automobile.
- 3.4 Describe the operation of thermostatic and electronic flasher.

4. Understand the features of horn and horn relay.

- 4.1 Mention the different types of horn used in automobile.
- 4.2 Illustrate the operation of horn circuit with relay.
- 4.3 Describe the operation of electric horns and air horns.

- 4.4 Mention the purpose of horn relay.
- 4.5 Describe the procedure of horn adjustment.

5. Understand the features of wind shield wiper and washer.

- 5.1 Mention the purpose of wind shield wiper and wind shield washer.
- 5.2 Name different types of wind shield wiper mechanism.
- 5.3 Explain the intermittent wiping principle.
- 5.4 Describe the operation of different types wind shield wiper & washer mechanism.

6. Understand the electronic fuel injection (EFI) system of Diesel engine.

- 6.1 Define the electronic fuel injection (EFI) system of diesel engine.
- 6.2 Mention the purpose of diesel EFI system.
- 6.3 Mention the name of different types of diesel EFI system.
- 6.4 List the components of diesel EFI system.
- 6.5 Explain the principle of operation of typical diesel EFI system with diagram.
- 6.6 Explain the advantages of diesel EFI system over conventional system.

7. Understand the features of sensors.

- 7.1 Define sensor.
- 7.2 Mention the purpose of sensor used in diesel & gasoline-EFI system.
- 7.3 Name different types of sensors used in automobile.
- 7.4 Describe the operation of lambda (oxygen) sensor, air flow sensor, engine temperature sensor, throttle positions sensor, manifold absolute pressure (MAP) sensor, knock sensor, intake air temperature sensor.
- 7.5 Mention the uses of brake pad wear sensor and fluid level sensor.

8. Understand the features of actuators.

- 8.1 Define actuator.
- 8.2 Identify different types of actuators used in automobile.
- 8.3 Describe the operation of different types of actuators such as idle speed control (ISC) valve, gasoline & diesel fuel injector, igniter, circuit opening relay & EFI main relay.

9. Understand the vehicle security system.

- 9.1 Describe the vehicle security system.
- 9.2 Describe the tire pressure control system.
- 9.3 Mention the advantages of tire pressure control system.
- 9.4 Describe the warning device used in automobile.
- 9.5 Describe the traction control system.

10. Understand the cruise control system.

- 10.1 Define cruise control system.
- 10.2 Mention the purpose of cruise control system.
- 10.3 Describe the operation of cruise control system with block diagram.

11. Understand the electronic dash board instruments.

- 11.1 Describe the operation of digital speedometer with block diagram.
- 11.2 Describe the operation of electronic tachometer.
- 11.3 Describe the operation of electronic engine temperature gauge with block diagram.
- 11.4 Describe the operation of electronic fuel gauge with block diagram.

- 11.5 Describe the operation of electronic oil pressure gauge with block diagram.
- 11.6 Describe the operation of trip computer with block diagram.

12. Understand the electromagnetic interference.

- 12.1 Define electromagnetic interference.
- 12.2 Mention the source of interference.
- 12.3 Explain the effects of electromagnetic interference.
- 12.4 Name the different methods of suppressing the interference.
- 12.5 Describe the methods of suppressing the interference.

13. Understand the advanced automotive lighting system.

- 13.1 Mention the different types of advanced automotive lighting system.
- 13.2 Explain fiber-optics lighting system.
- 13.3 Explain computer controlled lighting system with block diagram.
- 13.4 Explain distributed lighting system with block diagram

Practical:

1. Study the automotive lighting system.

- 1.1 Identify different lighting circuit of automobile.
- 1.2. Connect and complete the wiring on a board or vehicle.
- 1.3. Test the operation of lighting circuit.
- 1.4. Aiming the head light.

2. Study the automotive horn and horn circuit.

- 2.1. Identify the component of horn circuit.
- 2.2. Connect and complete the wiring of horn circuit on a circuit board or vehicle.
- 2.3. Test the operation of horn circuit.
- 2.4. Adjust the horn for proper tone.

3. Study the wind shield wiper & washer

- 3.1 Identify the components of wind shield wiper & washer mechanism.
- 3.2 Connect & complete the wiring of wind shield wiper
- 3.3 Test the operation of wind shield wiper & washer circuit.

4. Study the electronic fuel injection (EFI) system.

- 4.1. Identify different component of EFI system.
- 4.2. Remove the injector, sensor, air flow meters, etc.
- 4.3. Test the work ability of injector, sensor and air flow meter.
- 4.4. Reinstall the injector sensors and air flow meter.
- 4.5. Reinstall the air flow meter.
- 4.6. Test the operation of the system.

5. Study the sensors.

- 5.1. Identify the sensors used in automobile.
- 5.2. Remove all sensors from the vehicle.
- 5.3. Test the sensor for workability.
- 5.4. Reinstall the sensor.

6. Study the actuators.

- 6.1. Identify the actuators used in automobile.

- 6.2. Remove the common actuators.
- 6.3. Test the actuators for its workability.
- 6.4. Reinstall the actuators.

7. Study the vehicle security system.

- 7.1 Identify the components of different vehicle security system.
- 7.2 Connected the complete the warning of vehicle security system.
- 7.3 Test of operation of vehicle security system.

8. Study the cruise control system.

- 8.1 Identify the components of the cruise control system.
- 8.2 Remove the main components of cruise control system.
- 8.3 Test the components for workability.
- 8.4 Reinstall the components.
- 8.5 Test the operation of the system.

9. Study the electronic dash board instruments.

- 9.1 Identify the components of the dash board.
- 9.2 Remove complete dash board from vehicle.
- 9.3 Test and install the dash board.
- 9.4 Test the operation of dash board instruments.

10. Study the electromagnetic interference.

- 10.1 Observe the electromagnetic interference. in vehicle.

11. Study the advanced automotive lighting system.

- 11.1 Observe the fiber-optics lighting system.
- 11.2 Observe the computer control lighting system.
- 11.3 Observe the distributed lighting system.

REFERENCE BOOKS

- 1. Automobile Electrical and Electronic System
- A. Tranter.
- 2. Automotive Electronic System
- Trevor Mellard.
- 3. Automobile Electrical Equipment
- P.L. Kohle.
- 4. Automotive Electrical Equipment
- W.H. Crouse.
- 5. Understand Automotive Electronics
- Willium B. Ribben

6276 AUTOMOBILE ENGINEERING PROJECT

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AIMS

To provide the students with an opportunity to acquire skill and attitude in the area of automobile engineering project with special emphasis on:

- Build up a storage battery
- build up automobile electric system model
- build up automobile auxiliary system model
- Build up automobile battery charger.
- Reconditioning of automobile engine.

SHORT DESCRIPTION

Build up a storage battery; Build up a magneto ignition system; Build up a model of magneto CDI system; Build up a model of battery CDI system; Build up a model of conventional ignition system; Build up a model of electronic ignition system; Build up a model of automotive lighting system; Build up a model of automobile charging system; Build up a model of automobile electric starting system; Build up a model of automobile hydraulic brake system; Reconditioning of automobile spark ignition engine; Reconditioning of compression ignition engine.

DETAIL DESCRIPTION**1. Build up a 12 volt lead acid battery.**

- 1.1. Collect the materials of the battery.
- 1.2. Make the cells of the battery.
- 1.3. Install the cells in the battery case.
- 1.4. Connect the battery cells.
- 1.5. Covered the top of the battery.
- 1.6. Pour electrolyte in the battery cells.
- 1.7. Charge the battery.

2. Build up a model of magneto ignition system.

- 2.1. Collect the materials of magneto ignition system.
- 2.2. Make a board with portable frame.
- 2.3. Install the components of magneto ignition system on the portable frame board.
- 2.4. Connect the components.
- 2.5. Test the workability of the built unit.

3. Build up a model of magneto CDI system.

- 3.1. Collect the materials of magneto CDI system.
- 3.2. Make a board with portable frame.
- 3.3. Install the components of magneto CDI system on the portable board.
- 3.4. Connect the components.
- 3.5. Test the workability of the built unit.

4. Build up a model of battery CDI system.

- 4.1. Collect the materials of battery CDI system.
- 4.2. Make a board with portable frame.
- 4.3. Install the components of battery CDI system on the board.

- 4.4. Connect the components.
- 4.5. Test the workability of the built unit.

5. Build up a model of conventional battery coil ignition system.

- 5.1. Collect the materials of a conventional battery coil ignition system.
- 5.2. Make a board with portable frame.
- 5.3. Install the components on the board.
- 5.4. Connect the components.
- 5.5. Test the workability of the built unit.

6. Build up a model of electronic ignition system.

- 6.1. Collect the materials of an electronic ignition system.
- 6.2. Make a board with portable frame.
- 6.3. Install the components on the board.
- 6.4. Connect the components.
- 6.5. Test the workability of the built unit.

7. Build up a model of automobile lighting system.

- 7.1. Collect the materials of automobile lighting system.
- 7.2. Make a board with portable frame.
- 7.3. Install the components of the automobile lighting system on the board.
- 7.4. Connect the components.
- 7.5. Test the workability of the built unit.

8. Build up a model of automobile charging system.

- 8.1. Collect the materials of a automobile charging system.
- 8.2. Make a board with portable frame.
- 8.3. Install the components on the board.
- 8.4. Connect the components.
- 8.5. Test the workability of the built unit.

9. Build up a model of automobile electrical starting system.

- 9.1. Collect the materials of automobile electrical starting system.
- 9.2. Make a board with portable frame.
- 9.3. Install the components on the board.
- 9.4. Connect the components.
- 9.5. Test the workability of the built units.

10. Build up a model of automobile hydraulic brake system.

- 10.1. Collect the materials of an automobile hydraulic system.
- 10.2. Make a board with portable frame.
- 10.3. Install the components of brake system.
- 10.4. Connect the components.
- 10.5. Test the workability of the built unit.

11. Build up a model of battery charger.

- 11.1 Draw circuit diagram of battery charger.
- 11.2 Collect the components.
- 11.3 Make a wooden/steel box of required size.
- 11.4 Install the components of complete the ckt.
- 11.5 Test the workability.

12 Built up a model of car air-conditioning system.

- 12.1 Collect the materials of air-conditioning system.
- 12.2 Collect the wooden table for installing the materials.
- 12.3 Install the components on the table.
- 12.4 Connect the components.
- 12.5 Test the workability of the built model

13 Recondition a disorder automobile SI engine.

- 13.1 Perform the visual and instrumental inspection of the engine.
- 13.2 Identify the troubles of the engine.
- 13.3 Disassemble the engine.
- 13.4 Perform machining works.
- 13.5 Collect replaceable parts.
- 13.6 Reassemble the engine with new parts.
- 13.7 Test the engine for correct operation.

14 Recondition a disorder automobile CI engine.

- 14.1 Perform the visual and instrumental inspection of the engine.
- 14.2 Identify the troubles of the engine.
- 14.3 Disassemble the engine
- 14.4 Perform machining works.
- 14.5 Collect replaceable parts.
- 14.6 Reassemble the engine with new parts.
- 14.7 Test the engine for correct operation.

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ENTREPRENEURSHIP**T P C
2 0 2****AIMS**

- To be able to understand the concept of entrepreneurship & entrepreneur.
- To be able to understand the concept of environment for entrepreneurship.
- To be able to understand the sources of venture ideas in Bangladesh.
- To be able to understand the project selection.
- To be able to understand business planning.
- To be able to understand the case study

SHORT DESCRIPTION

Concepts of entrepreneurship & entrepreneur; Entrepreneurship & economic development; Environment for entrepreneurship; Entrepreneurship in the theories of economic growth; Sources of ventures ideas in Bangladesh; Evaluation of venture ideas; Financial planning; Project selection; Self employment; Entrepreneurial motivation; Business plan; Sources of assistance & industrial sanctioning procedure.

Insurance ; case study.

DETAIL DESCRIPTION**Theory :****1 Understand the basic concept of entrepreneurship & entrepreneur.**

- 1.1 Define entrepreneurship & entrepreneur.
- 1.2 Discuss the characteristics and qualities of entrepreneur.
- 1.3 Mention the classification of entrepreneur.
- 1.4 Discuss the case entrepreneurship and mass entrepreneurship.
- 1.5 Discuss the necessity of entrepreneurship as a career.
- 1.6 Discuss the function of entrepreneur in developing countries.
- 1.7 Discuss the prospect of entrepreneurship development in Bangladesh.

2 Understand the concept of entrepreneurship and economic development.

- 2.1 Define economic development.
- 2.2 Discuss that the economic development is a process.
- 2.3 Describe the entrepreneurship as a factor of economic development.
- 2.4 Discuss the capital accumulation or rate of savings.
- 2.5 Discuss the role of entrepreneur in the technological development and their introduction into production Process.
- 2.6 Discuss the entrepreneur in the discovery of new sources of resources.
- 2.7 Discuss the entrepreneur in the discovery of new product.
- 2.8 Discuss the discovery of new markets.

3 Understand the concept of entrepreneurship in the theories of economic growth.

- 3.1 Define entrepreneurship in the theories of economic growth.
- 3.2 Discuss the theory of need for achievement of Devid MacClelland.
- 3.3 Discuss the Malthusian theory of population and economic growth.
- 3.4 Discuss the labour theory of production and limit to growth.
- 3.5 Discuss the Keynesian theory of employment and output.
- 3.6 Discuss the stage theory of growth.
- 3.7 Discuss the Schumpeterian theory of economic development.
- 3.8 Discuss the entrepreneurship motive in economic development.

4 Understand the sources of venture ideas in Bangladesh.

- 4.1 Define sources of venture ideas in Bangladesh.
- 4.2 Discuss different types of sources of venture ideas in Bangladesh.
- 4.3 Discuss informal sources of venture ideas in Bangladesh.

5 Understand the evaluation of venture ideas.

- 5.1 Define evaluation of venture ideas.
- 5.2 Discuss the factors that influence the selection of venture ideas.
- 5.3 Discuss the evaluating financial aspects of business.
- 5.4 Discuss the determinants of the firm size.

6 Understand the concept of project selection and financial planning.

- 6.1 Define project.
- 6.2 Discuss the idea of project.
- 6.3 Describe the guide lines for project ideas.
- 6.4 Discuss the sources of project ideas.
- 6.5 Discuss the evaluation of project ideas.
- 6.6 Describe the technical aspect of project.
- 6.7 Define financial planning.
- 6.8 Discuss the long term financial plan.
- 6.9 Discuss the short term financial plan.

7 Understand the concept of self employment.

- 7.1 Define self employment.
- 7.2 Describe different types of employment.
- 7.3 Describe the importance of business as a profession.
- 7.4 Discuss the reasons for success and failure in business.
- 7.5 Discuss the self assessment of entrepreneurial qualities.

8 Understand the concept of entrepreneurial motivation.

- 8.1 Define entrepreneurial motivation.
- 8.2 Discuss the achievement motivation theory.
- 8.3 Describe the means of improving achievement motivation.
- 8.4 Discuss the background of high need achievement.
- 8.5 Describe the problems associated with high need achievement.

9 Understand the business plan and the concept of the environment for entrepreneurship.

- 9.1 Define business plan.
- 9.2 Describe the importance of business plan.
- 9.3 Discuss the contents of business plan.
- 9.4 Describe the business plan proforma.
- 9.5 Define environment of business.
- 9.6 Describe the factors which effect environment on entrepreneurship
- 9.7 Discuss the aspects of business environment

10 Understand the concept of sources of assistance & industrial sanctioning procedure.

- 10.1 Define sources of assistance.
- 10.2 Describe different types of sources of assistance.
- 10.3 Describe entrepreneurship development cycle.
- 10.4 Discuss the aid of sources.
- 10.5 Discuss the industrial policy.
- 10.6 Describe the technique of industrial policy.
- 10.7 Define foreign aid.

11 Understand the insurance and premium.

- 11.1 Define insurance and premium
- 11.2 Describe the essential conditions of insurance contract.
- 11.3 Discuss various types of insurance.
- 11.4 Distinguish between life insurance and general insurance.

12 Understand the concept of case studies.

- 12.1 Define case study.
- 12.2 Discuss the objectives of case study.
- 12.3 Describe the method of case analysis.
- 12.4 Discuss the importance of case study.
- 12.5 Mention the advantages and disadvantages of case study