w.e.f. Academic Year 2011-12

STATE BOARD OF TECHNICAL EDUCATION, JHARKHAND

TEACHING AND EXAMINATION SCHEME FOR POST S.S.C. DIPLOMA COURSES

COURSE NAME : DIPLOMA IN AUTOMOBILE ENGINEERING

COURSE CODE : AE

DURATION OF COURSE : 6 SEMESTERS **WITH EFFECT FROM 2011-12**

SEMESTER : FIFTH **DURATION : 16 WEEKS**

PATTERN : FULL TIME - SEMETER

SR. NO.	SUBJECT TITLE	Abbreviation	SUB CODE	TEACHING SCHEME			EXAMINATION SCHEME									
				TH	TU	PR	PAPER HRS	TH (01)		PR (04)		OR (08)		TW (09)		SW (16005)
								Max	Min	Max	Min	Max	Min	Max	Min	
1	Automobile Component Design	ACD	12167	04	--	02	04	100	40	--	--	25#	10	25@	10	50
2	Advanced Automobile Engines	AAE	12168	03	--	02	03	100	40	50#	20	--	--	25@	10	
3	Basic Electrical & Electronics	BEE	12169	04	--	02	03	100	40	--	--	25@	10	--	--	
4	Hydraulics & Pneumatics	HPN	12170	03	--	02	03	100	40	--	--	25#	10	25@	10	
5	**Elective-I (Any One)**															
	Mechatronics	MEC	12161	03	--	02	03	100	40	--	--	--	--	25@	10	
	Vehicle Aerodynamics and Design	VAD	12171	03	--	02	03	100	40	--	--	--	--	25@	10	
	Vehicle Testing	VTE	12172	03	--	02	03	100	40	--	--	--	--	25@	10	
	Environmental Pollution and Control	EPC	12173	03	--	02	03	100	40	--	--	--	--	25@	10	
6	Industrial Project & Entrepreneurship Development Ø	IPE	12162	01	01	02	--	--	--	--	--	--	--	25@	10	
7	Professional Practices-V (AE)	PPA	12174	--	--	04	--	--	--	--	--	--	--	50@	20	
			TOTAL	**18**	**01**	**16**	--	**500**	--	**50**	--	**75**	--	**175**	--	**50**

Student Contact Hours Per Week: **35 Hrs.**

THEORY AND PRACTICAL PERIODS OF 60 MINUTES EACH.

Total Marks **: 850**

@ Internal Assessment, # External Assessment, No Theory Examination, Ø - common to ME / PT / PG / MI / MH

Abbreviations: TH-Theory, TU- Tutorial, PR-Pr Oral, TW- Termwork, SW- Sessional Work

- Conduct two class tests each of 25 marks for each theory subject. Sum of the total test marks of all subjects is to be converted out of 50 marks as sessional work (SW).
- Progressive evaluation is to be done by subject teacher as per the prevailing curriculum implementation and assessment norms.
- Code number for TH, PR, OR, TW are to be given as suffix 1, 4, 8, 9 respectively to the subject code.

COURSE NAME : DIPLOMA IN AUTOMOBILE ENGINEERING

COURSE CODE : AE

SEMESTER : FIFTH

SUBJECT TITLE : AUTOMOBILE COMPONENT DESIGN

SUBJECT CODE : 12167

Teaching and Examination Scheme:

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS	TH	PR	OR	TW	TOTAL
04	--	02	04	100	--	25 #	25@	150

NOTE:

Two tests each of 25 marks to be conducted as per the schedule given by SBTE.

Total of tests marks for all theory subjects are to be converted out of 50 and to be entered in mark sheet under the head Sessional Work. (SW)

Rationale:

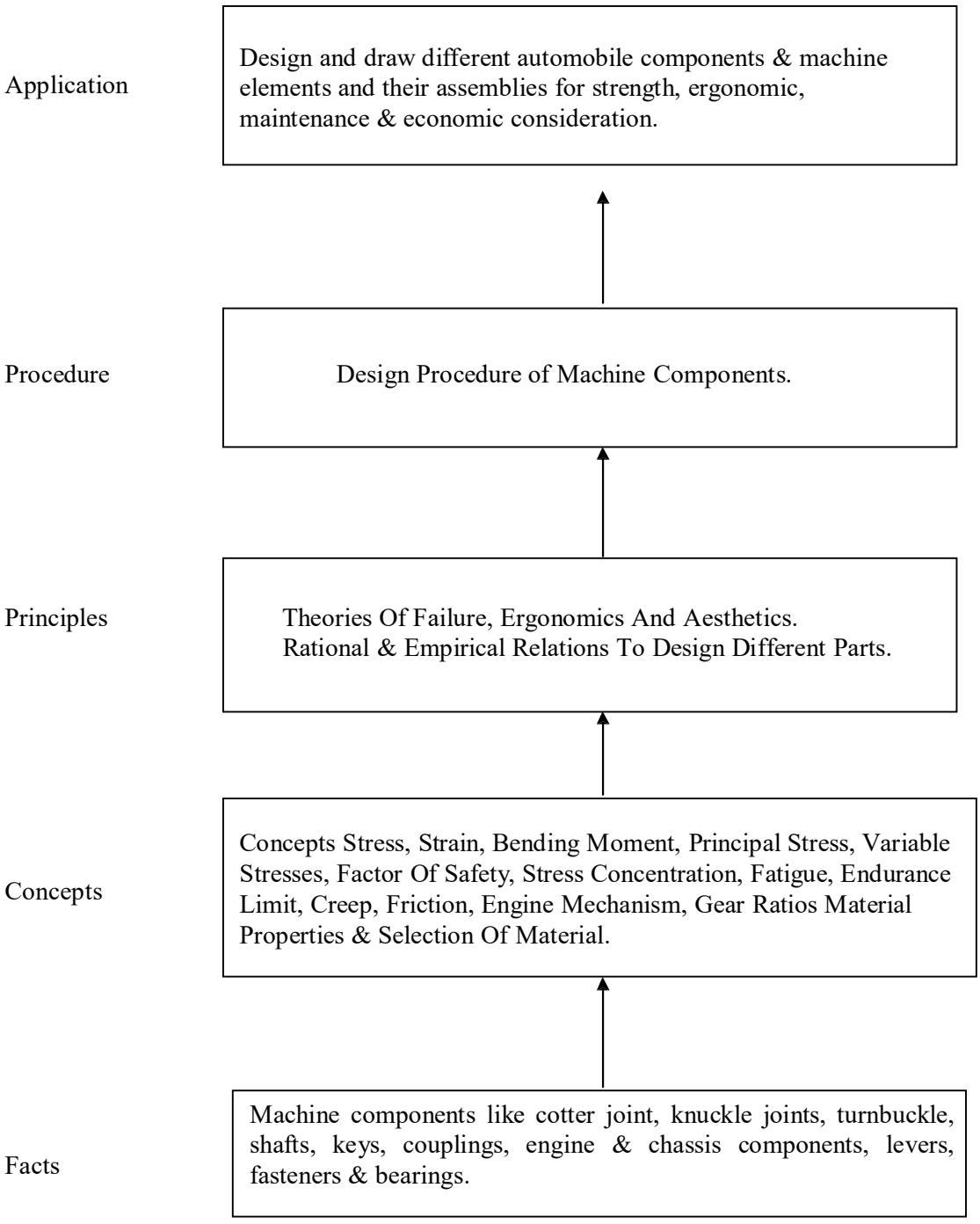
Automobile component design is applied technology subject, which requires study of Mechanisms, Strength of materials, Material sciences- Manufacturing processes & Mechanical engineering drawing. This subject deals with fundamental principles of machine design applied to automobile components. It also gives exposure to standard codes of practices, CAD & Use of Design Data Book.

Objectives:

Students should able to –

1. Analyze the loads, type of induced stresses, resisting areas & hence the modes of failure.
2. Identify modes of failure & relevant theory for problem solving.
3. Analyze practical problems & make use of materials, strength equations, factor of safety etc.
4. Use design data book to standardize component dimensions, and to select dimensional tolerances.

Learning Structure:



Contents: Theory

Chapter	Name of the Topic	Hours	Marks
01	**Basic concepts of Design** 1.1 Introduction to design 1.2 Classification of design 1.3 Design consideration 1.4 Design procedure 1.5 Stress analysis: 1.5.1 Types of external loads 1.5.2 Types of induced stresses: tensile, compressive, shear, Crushing and bearing pressure, bending, torsion, thermal stresses, creep, proof stresses, resilience, principal stresses 1.5.3 Stress – strain diagram for ductile & brittle material & it's importance 1.5.4 Variable stresses in machine parts, fatigue & endurance limit, stress – time diagrams for variable stresses 1.5.5 Working stresses for static load, variable or fatigue load 1.5.6 Factor of safety, selection of factor of safety. 1.5.7 Stress concentration causes and remedies 1.5.8 Introduction to theories of failure –Maximum principle stress theory, Maximum shear stress theory, Distortion energy theory. 1.5.9 Selection of material and justifications for Automobile components. Advanced Materials for automotive components 1.6.0 Concept of standardization , Preferred numbers & interchangeability in design practice. 1.6.1 Common types of fasteners with their applications - Through Bolts, tap bolts, studs, cap screws , and machine screws ,designation of screw thread according to I.S., stresses in screw fasteners , Bolts of uniform strength. 1.6.2 Bearings-Classification ,location in Automobiles systems & selection of bearings 1.6.3 Post design aspects - Ergonomic aspect, Aesthetic consideration (shape, color, surface finish) for Automobile	**14**	**20**
02	**Design of machine elements** 2.1 Design of socket & spigot type cotter joint. 2.2 Design of knuckle joint 2.3 Design of Turn buckle 2.4 Applications of above machine elements in an automobile.	**08**	**12**

03	**Design of shafts, keys & Couplings**. **3.1 Conceptual understanding of shaft, axles & spindles.** 3.2 Design of shaft for torsion, rigidity, bending, combined Torsion & bending. 3.3 Comparison of solid & hollow shafts. 3.4 Design of propeller shaft, whirling & critical speed. 3.5 Design of rear axle. 3.6 Types of keys and their applications, design of sunk rectangular key. 3.7 Effect of keyways on shaft. 3.8 Design of couplings- muff, flange, and bush pin type flexible.	**10**	**16**
04	**Design of levers.** 4.1 Types of levers 4.2 Design of following levers for rectangular cross-section & fulcrum pin only. 4.2.1 rocker arm, 4.2.2 bell crank lever, 4.2.3 hand lever	**06**	**10**
05	**Design of Chassis Component** 5.1 Design of clutch- Single plate & Multi plate. 5.2 Teeth calculation of gears for sliding mesh/constant mesh gear box for given data. 5.3 Design of semi elliptical leaf spring , helical spring - torsion & compression	**10**	**18**
06	**Design of engine components** 6.1 Data of engine specifications and calculations of cylinder dimensions for given power 6.2 Design of cylinder head thickness and bolts 6.3 Design of valve seat & valve lift 6.4 Design of piston crown by bending strength and thermal considerations. 6.5 Design of piston rings and skirt length 6.6 Design of piston pin for bearing, bending & shear considerations 6.7 Design of connecting rod cross -section (I section). 6.8 Design of big end, cap and bolts. 6.9 Design of overhung crank shaft.	**16**	**24**
	Total	**64**	**100**

Practical:

Skills to be developed:

Intellectual Skills:

1) Analyze the loads, resisting areas, types of induced stresses on automobile components.
2) Analyze the modes of failure of different automobile components & identify the methods, strength equations to overcome the failures.
3) Calculate the dimensions of automobile components.
4) Identify different engine & chassis components.

5) Identify different fasteners & bearings used in automobiles.

Motor Skills:

1) Draw various automobile components as per the designed dimensions.
2) Use advanced materials for automobile components.
3) Use design data book to standardize component dimensions.
4) Prepare bill of materials.
5) Use various CAD software to draw automobile components.

List of Practical:

1. Identify & classify the different engine & chassis components according to the type of load to which they are subjected. Also state the types of induced stresses in them.
2. Identify the different engine & chassis components which may fail due to stress concentration, observe & state remedy to reduce stress concentration
3. Use of advanced materials with justifications for components like gears, piston, piston rings, leaf springs, cylinder head & block etc.
4. Identify different fasteners & bearings used in an automobile, justify their locations.
5. Design any machine element & coupling for specified data, select suitable materials, prepare assembly-detail drawing on CAD indicating overall dimensions, tolerances, hardness & surface finish, also Prepare bill of material.
6. DESIGN PROJECT
   Design of Power train(Piston, Piston rings, piston pin, connecting rod, crankshaft)/ transmission train (clutch, teeth calculations of gear box, propeller shaft and rear axle)/ leaf spring /coil spring for specified data, select suitable materials, prepare drawing indicating overall dimensions, tolerances, hardness & surface finish.

NOTES:

- Design project activity should be completed in a group of 5-6 students
- Use of design data book is compulsory.

Learning Resources:

Books:

Sr. No	Author	Title	Publication
01	R.K.Jain	Machine Design	Khanna publication
02	R.S.Khurmi & J.K.Gupta	Machine Design	Eurasia Publication House .
03	Pandya & shah	Machine Design	Dhanpat rai & sons
04	P C Sharma D K Aggarwal	Machine Design	S K KATARIA & sons
05	R B Gupta	Auto design	Satya prakashan
06	N.K Giri.	Problems in Automobile Engineering	Khanna publication
07	K M Aggarwal	Auto design problems	Satya prakashan
08	Griles	Automobile Design Vol,2,3	--
09	J.E. Shigley	Machine Design	McGraw Hill
10	--	Machine tool design Handbook	CMTI
11	Design data Book	--	P S G Coimbatore
12	Robert L. Norton	Machine Design An integrated approach	Prentice-Hall.

COURSE NAME : DIPLOMA IN AUTOMOBILE ENGINEERING

COURSE CODE : AE

SEMESTER : FIFTH

SUBJECT TITLE : ADVANCED AUTOMOBILE ENGINES

SUBJECT CODE : 12168

Teaching and Examination Scheme:

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS	TH	PR	OR	TW	TOTAL
03	--	02	03	100	50#	--	25@	175

NOTE:

Two tests each of 25 marks to be conducted as per the schedule given by SBTE.

Total of tests marks for all theory subjects are to be converted out of 50 and to be entered in mark sheet under the head Sessional Work. (SW)

Rationale:

This is a technology subject. This subject forms basis for Sixth Semester Subject of Vehicle Maintenance and Garage Practice.

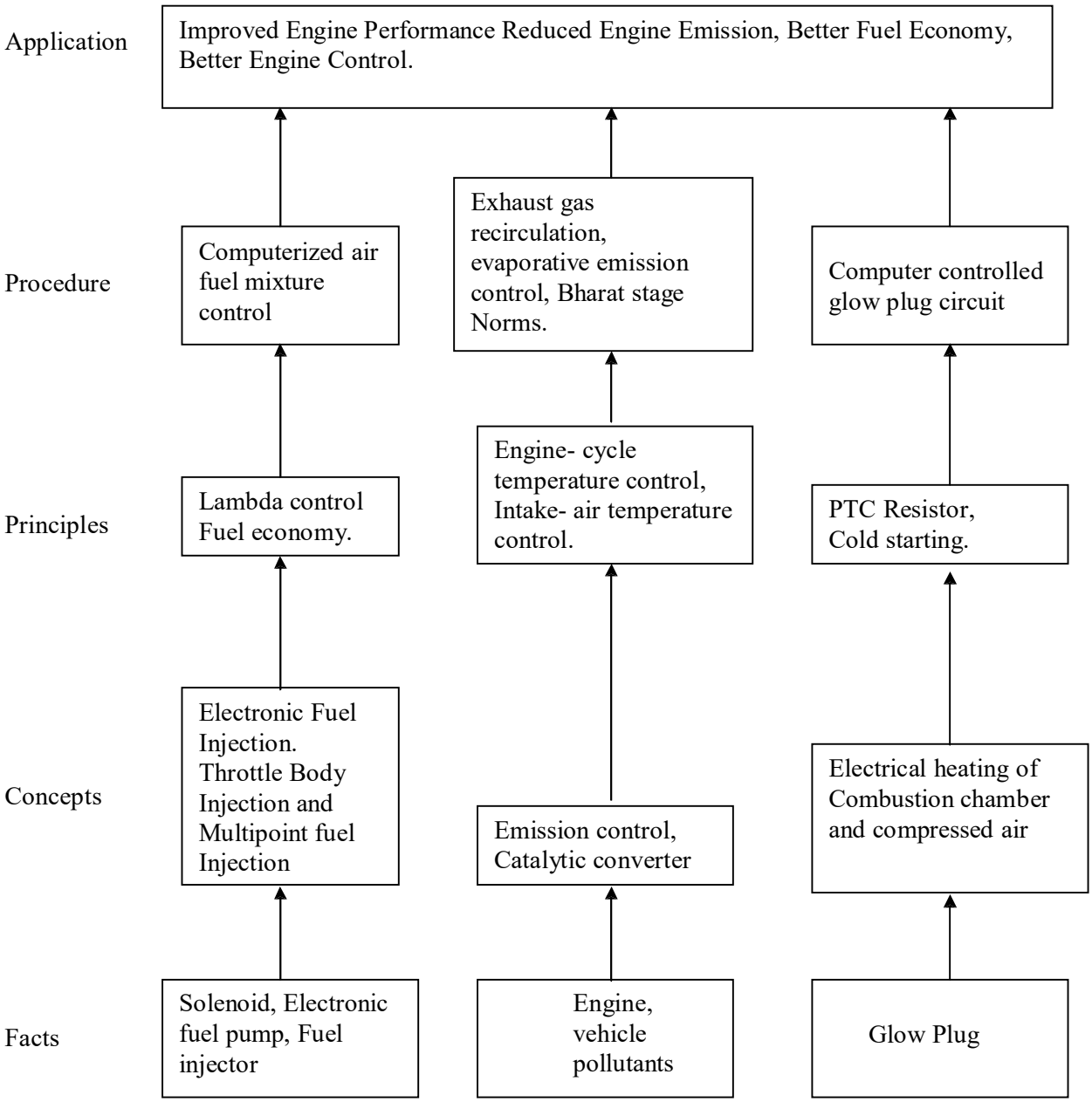
In the era of globalization and open economy, many Indian and foreign manufacturers are producing high technology vehicles. This subject enables a candidate to understand advanced engine technologies. With shortage of conventional petroleum fuels, all alternative fuels and sources of energy are becoming increasingly popular, and significant. This course will enable a candidate to understand the alternative energy sources and fuels of future.

Understanding advanced engine technology will enable an engineer to test and service such engines. Advanced auto technology engines include certain features like MPFI, CRDI, and hybrid drives. This course will enable candidates to diagnose engine condition including On-board diagnosis and stand-alone diagnosis.

Objectives: Students will be able to:

1. Compare the performance characteristics of SI and CI engines.
2. Understand, describe and draw the stages of combustion in SI and CI engines.
3. Understand, describe and differentiate between TBI and MPFI systems.
4. Understand, draw and describe the construction and working of electronic fuel injector, electric fuel pump and diesel electronic fuel injection system.
5. Understand draw and describe the glow plug construction and circuit with electronic control.
6. Understand and describe the pollutants emitted from S.I. and C.I. engines, list emission norms and describe the methods of pollution control.
7. Understand the drive cycle for measurement of pollutants.
8. Use manufacturer's workshop manual, conclude system/component condition.

Learning Structure:



Contents: Theory

Chapter	Name of the Topic	Hours	Marks
01	**Engine Selection** 1.1 Comparison of SI and CI engines on the basis Thermal efficiency and fuel consumption 1.2 Comparison of SI and CI engines on the basis of thermodynamic and operating variables. 1.3 Comparison of performance characteristics. 1.4 S.I. and C.I. Engine application- with purpose of selection. Note: - assignment on comparative study of engine specification and it rating on basis of various parameters.	04	12
02	**Fuels and Alternative Energy Options for Auto Engines** 2.1 Different types of fuels, calorific value 2.2 Properties of S.I. Engine fuel 2.3 Properties of C.I. Engine fuel 2.4 Fuel additives and their effects 2.5 LPG as SI engine fuel. 2.6 Alcohol as gasoline fuel blends. 2.7 Alcohol as CI engine fuel. 2.8 Natural gas as a Transport fuel. 2.9 Electric cars and hybrid vehicles.	08	16
03	**Theory of Combustion** 3.1 Ignition limits 3.2 Stages of combustion in SI engine 3.3 Effect of engine variables on Ignition lag. 3.4 Effects of engine variables on flame propagation 3.5 Abnormal combustion- Detonation, pre-ignition, surface ignition, Effects of detonation. 3.6 Control of detonation. 3.7 SI engine combustion Chambers 3.8 Stages of combustion in CI engine 3.9 Air Fuel ratio in Diesel engines 3.10 Delay period and variables affecting delay period. 3.11 Diesel knock and its control. 3.12 CI engine combustion chambers.	08	18
04	**Computer Controlled Fuel-Injection System Part I** 4.1 Throttle body injection (TBI) system, comparison with carbureted engine fuel supply system. 4.2 Multi-Point fuel Injection system (MPFI)/ Port fuel injection (PFI) system: - D-MPFI & L-MPFI systems. Types of injection- sequential, grouped and simultaneous injections. Comparison of MPFI and TBI systems. 4.3 Electronic control module (ECM) control functions. 4.4 Inputs and outputs of electronic control module (ECM). 4.5 Output control functions- Fuel Injection control, Spark advance control, Idle speed control, Exhaust gas recirculation control and other controls. Part II 4.6 Construction and working of top feed electronic fuel Injector	10	18

	and in-tank fuel pump. 4.7 Diesel Engine Glow plug Construction and circuit. . 4.8 Common rail direct injection system • Features of CRDI system. Block diagram of CRDI system. • Major Components-Fuel injector, EDC Electronic diesel control unit, High pressure fuel pump, High pressure accumulator, and input from sensors (Camshaft position, coolant temperature, Intake air temperature, crankshaft speed, Boost pressure, Rail pressure sensor, Air Mass meter)(Location, Construction and working of sensors is not expected). • CRDI System operation and advantages	08	18
05	Fuel Economy, Air pollution and Emission Control 5.1 Fuel Economy standards. 5.2 Methods of improving fuel economy. 5.3 Pollutants from gasoline engines. 5.4 Effect of engine maintenance on exhaust emission 5.5 Gasoline engine emission control, Catalytic Converters. 5.6 Diesel emission, Diesel smoke and control 5.7 Exhaust-Gas recirculation (EGR) - EGR Valve and control 5.8 Early fuel evaporation system 5.9 Positive crankcase ventilation (PCV) system 5.10 Electric assist choke system 5.11 Evaporation emission control system 5.12 Euro Norms and Bharat stage Norms. Equipment for checking Exhaust emission from vehicles. 5.13 Comparison of diesel and gasoline emission	10	18
	Total	**48**	**100**

Practical:

Skills to be developed:

Intellectual Skills:

1. Identify types of combustion chamber.
2. Locate faults in MPFI system.
3. Identify components of electronic fuel injection system (EFI).
4. Diagnose EFI system.
5. Diagnose engine condition from exhaust gas analysis. To interpret results.

Motor Skills:

1) Observe combustion chamber.
2) Observe EFI system components & their locations.
3) Use diagnostic tester for Electronic fuel injection system diagnosis.
4) Set carburetor for proper / reduced exhaust emission.
5) Set valve clearance by adopting proper procedure.
6) Draw valve-timing diagram.
7) Adopt recommended service manual procedure for testing EFI system & exhaust gas analyzer application.

List of Practical:

1. Cylinder Head Observation and Combustion Chamber Identification:
   Remove the cylinder head of an engine. Observe the combustion chamber, location of valves, spark plug or Injector.
   - Procedure to Decarbonise & clean combustion chamber and refit.
   - Use any four engines: - a) Bullet, b) Luna, c) Multi cylinder Petrol Engine, d) Multi-cylinder Diesel engine, e) Scooter Engine.
   - Interpret the type of combustion chamber. Sketch them and describe the construction. State the characteristics of the combustion chamber.
   - Check the valve-valve seats for leakage. Check the condition of Spark Plug or fuel injector. Check the glow plug operation.

2. Valve Clearance Adjustment and Valve Timing Investigation:
   - Perform Tappet setting of a single cylinder four-stroke engine.
   - Perform Tappet setting of a multi cylinder engine.
   - Construct the Port timing diagram of a two- stroke engine.
   - Construct the Valve timing diagram of a four-stroke engine.

3. Electronic Fuel Injection System Diagnosis: Arrange an industrial visit to a modern service station.
   Diagnose Electronic fuel Injection system with diagnostic tester/ engine scanner.
   - Perform On-Board diagnosis.
   - Read trouble code at engine check Light/Malfunction Indicator light.
   - Use Engine scanning tool for diagnosis
   - Locate various Components of Electronic fuel injection system.
   - Identify components of EFI system.
   - Perform stand –alone diagnosis using a Multi-meter and test lamp.

4. Exhaust Gas Analysis:
   Perform Exhaust gas analysis of an engine exhaust using 4-gas analyzer:
   Diagnose engine condition from exhaust gas analysis.

Learning Resources:
Books:

Sr. No.	Author	Title	Publisher
01	Anthony Schwaller	Motor Automotive Technology	Delmar Publisher Inc.
02	Tim Gills	Automotive Service	Delmar Publisher Inc.
03	M.L Mathur R.P.Sharma	A Course in Internal Combustion engine	Dhanpat Rai Publication
04	Identified Experts	Santro & Accent Basic training Book	Hyundai Motors India Ltd.
05	Identified Experts	Service Manuals of all Euro –II vehicles.	Maruti motors India Ltd.
06	Dr. Kirpal Singh	Automobile Engg. Vol.-2	Standard Publishers.
07	Anil Chhikara	Automobile Engineering Vol.i -- Engines.	Satya Prakashan, New Delhi
08	Crouse / Anglin.	Automobile Mechanics	TATA McGRAW – HILL

COURSE NAME : DIPLOMA IN AUTOMOBILE ENGINEERING

COURSE CODE : AE

SEMESTER : FIFTH

SUBJECT TITLE : BASIC ELECTRICAL AND ELECTRONICS

SUBJECT CODE : 12169

Teaching and Examination Scheme:

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS	TH	PR	OR	TW	TOTAL
04	--	02	03	100	--	25@	--	125

NOTE:

Two tests each of 25 marks to be conducted as per the schedule given by SBTE. Total of tests marks for all theory subjects are to be converted out of 50 and to be entered in mark sheet under the head Sessional Work. (SW)

Rationale:

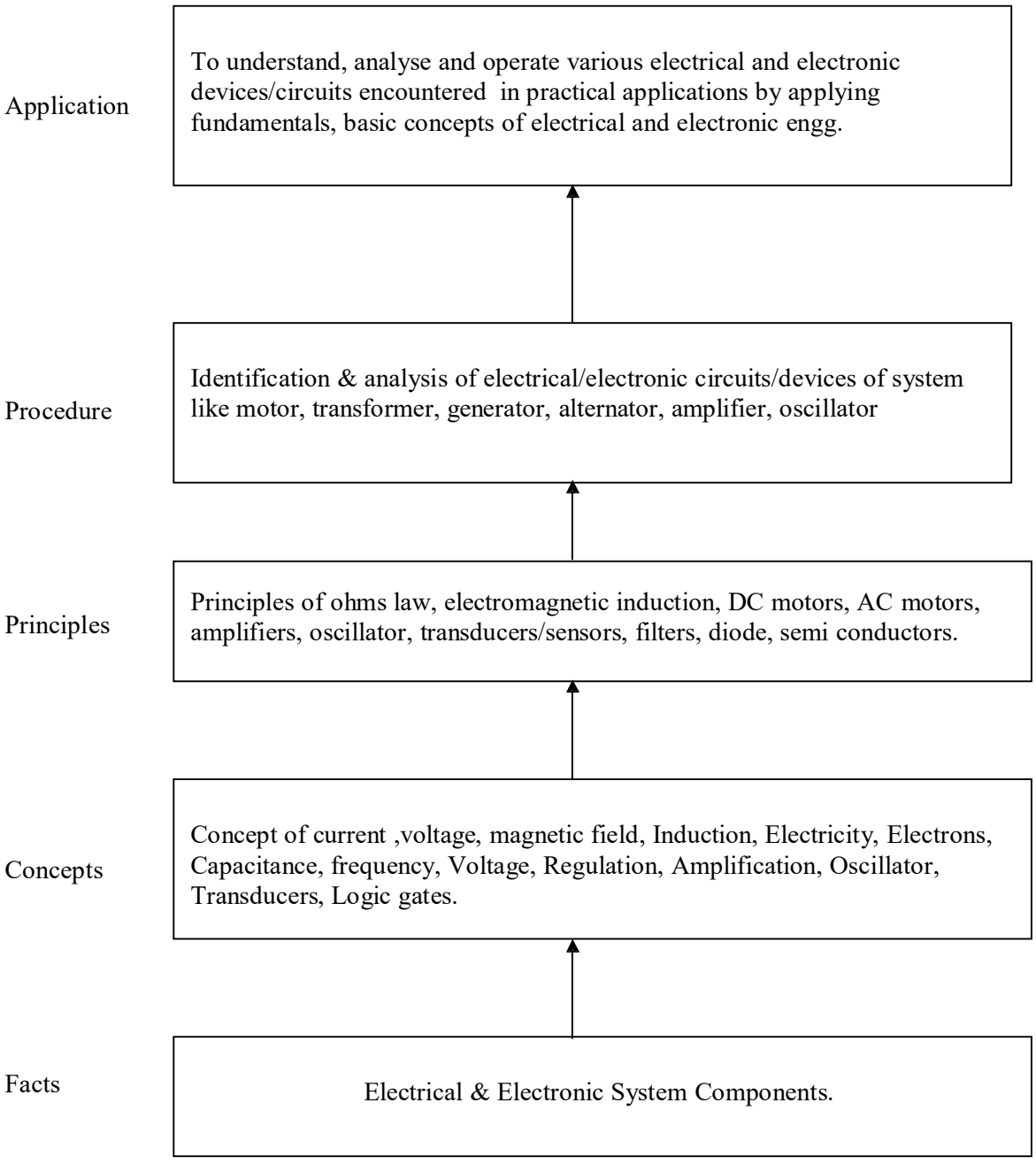
In automobile or mechanical system there is application of electric and electronic engineering. For effective maintenance and operation of these components as well as circuits, automobile engineer must have perfect knowledge of fundamentals of electrical technology and electronics.

Objectives:

Students will be able to:

1. Understand the basic concepts of electrons, electricity, magnetism, transformer, measuring instruments that will be useful while troubleshooting/ maintenance of electrical circuits.
2. Understand principle and working of electric motors.
3. Identify various electrical symbols and their operation in automotive wiring.
4. Know the working of electronic components like semiconductors, diodes, rectifiers, filters, regulators, transistors, amplifiers, oscillators, & their operation.
5. Understand the operation & application of transducer in automobile.
6. Understand operation of signals, gates, flip-flops, encoder, decoder, counter, multiplexer used in electronic circuits of an automobile

Learning Structure:



CONTENTS: Theory

Chapter	Name of the Topic	Hours	Marks
01	**Basic concepts & principles of Electrical Engineering** 1.1 Voltage, Current, Resistance, Definition, symbols, units, Ohm's law 1.2 Magnetism - field lines ,magnetic flux , flux density , magnetic potential ,field intensity , permeability , reluctance Electromagnetism, Law of Electromagnetic Induction - faraday's law of electromagnetic induction , right hand rule to determine direction of induced e.m.f. & current , lenz's law , self inductance ,mutual inductance 1.3 AC fundamentals – generation of alternating voltage & current , angular & radian measure , voltage & current values for a sine wave ,Time period, frequency, phase , phase difference , phasor diagram , 1.4 Concept of active and reactive power, a.c. through resistance,capacitance & inductance(with phasor diagram) , power factor , active , reactive , apparent power 1.5 Application of measuring Instruments – voltmeter, ammeter,Wattmeter,(Symbols & applications only) inductive/ tongue tester and multimeters. **Precautions to use above** 1.6 Principles of transformers (Single phase). Types, Ampere turns ratio(Simple numerical only) . 1.7 Construction of transformer. 1.8 Core and shell type transformer. 1.9 Auto transformer-types. comparison between autotransformer & conventional transformer.	**18**	**20**
02	**Electric Motors and Generators** 2.1 DC motors:-Principle, Construction, Symbols, types – Characteristics, Applications , **speed control methods** of **series & shunt motor . Dc compound motor (only concept)** 2.2 AC motors:-Principle, Construction (only types) and applications 2.3 Stepper motor-Types of stepper motor, principle, construction , applications and specifications. 2.4 Only Concept and working principle of D.C. generator and alternator.	**08**	**14**
03	**Wiring and Lighting Circuit** 3.1 Symbols of electrical circuits and wiring colour code, size, comparison of insulated & ground return system, Positive & negative return system, their comparison. 3.2 Need of wiring Harness, Wiring diagram of :- Head light, Turn indicator, Horn, Windshield wiper, Power window, Power seat, Battery ignition, Magneto ignition.	**06**	**12**
04	**Basic Electronics** 4.1 Semiconductors – Types, Doping, Energy bands 4.2 Diode :-PN junction, zener diode **construction** symbol, Characteristics and application.	**12**	**20**

	4.3 Rectifier type--half, full, Bridge, Circuit diagram, working, waveforms, Comparison, with Filters-Necessity, Types (C,LC,Π type) (no working). 4.4 Transistor:- BJT:-NPN, PNP transistor- Construction, symbol, working of NPN transistor only, Applications. 4.5 TRIAC, DIAC, Silicon control rectifier (SCR):-Symbol, working, Applications Comparison between Transistor and SCR. 4.6 Amplifier:-Common emitter configuration only 4.7 Photo devices:-photodiode, LED, LDR, phototransistor working, Symbols, Applications. 4.8 Concept of Oscillators		
05	**Transducers/Sensors and their applications** 5.1 Electromechanical type transducers: -Potentiometric resistances type, Inductive (LVDT), Capacitive, Piezoelectric. 5.2 Photoelectric type transducers: Photoemissive ,Photovoltaic, Photoconductive 5.3 AC/DC Electronic timer block diagram study 5.4 Concept of General measurement system & difference between mechanical and electrical/electronic instruments 5.5 Measurement of Pressure:- 5.6 Vacuum gauge: Pirani vacuum gauge, Varying pressure measurement; 5.7 Measurement of Flow:- Hot wire anemometer, Ultrasonic flow meter; 5.8 Measurement of Temperature:- Working of thermocouple ,Working of Thermopiles, Thermistor ; 5.9 Measurement of Speed:- contactless electrical tachometer:- Inductive, Capacity type tachometer, Stroboscope; 5.10 Measurement of Force:- Strain gauge load cell; 5.11 Electrical method for moisture measurement (only concept)	**14**	**22**
06	**Digital Electronics** 6.1 Define analog signal and digital signal 6.2 Study of logic gates(NOT,OR, NOR, AND, NAND) symbols and truth table 6.3 Flip Flop - Study of flip flops : only RS (using NAND gate) & D Flip flop , symbols and truth table 6.4 Working principle with General block diagram of shift register & counter 6.5 Working principle with block/ logic diagram of encoder & decoder 6.6 Working principle with block/logic diagram of Multiplexer (4:1) and demultiplexer (1:4) 6.7 Working of seven segment LED display, Introduction to LCD Display	**06**	**12**
	Total	**64**	**100**

Practical:

Skills to be developed:

Intellectual Skills:

- Select equipment such as motors, meters & components.
- To interpret circuits.

Motor Skills:

- To draw circuits.
- To measure various parameters.

List of Practical:

1) For a given resistive & inductive series & parallel circuit, select ammeter, voltmeter & wattmeter. Make the connections and measure current, voltage and power drawn by the circuit. Measure it by clip on meter & compare it.
2) For a given DC Shunt/Series motor, select suitable meters, make connections as per diagram, check the connections and run the motor. Take the meter readings to draw speed torque characteristics. Make suitable changes in the connections to reverse the direction of rotation.
3) For the above given motor prepare a circuit to control its speed above & below normal, plot its graph.
4) Testing of components like diode, LED, SCR, diac, triac, Zener diode, inductor, capacitor using a multimeter
5) Verify truth tables for logic gates- . NOT, AND, OR, NAND, NOR.
6) Calculation of Vdc of half and full wave rectifier with and without filter.
7) Line & load regulation of alternator output using Zener diode
8) To measure shaft speed by using Stroboscope.
9) Study and observe the characteristics of LVDT.
10) Study of strain gauge.

Learning Resources:

Books:

Sr. No	Author	Title	Publisher
01	Sedha	Applied Electronics	S. Chand & company LTD
02	Thomas. Malvino	Electronic Principles	Tata Mc-Graw hill publishing company LTD
03	Theraja BL	Fundamentals of Electrical & Electronics Engineering	Nirja Construction & Development Co Ltd Nirja Construction & Development Co Ltd
04	Albert Paul Malvino, Donald Leach	Digital principles & Applications,	Mc-Graw hill & company
05	Thomas. G.Beckwith, N.Lewis Buckwith, Roy. D.Marangoni forward by G.K. Sharma	Mechanical Measurement	Narosa Publishing House
06	Ernest Doebelin	Measurement System-Application & design	Mc-Graw-Hill-International Edition
07	A K Sawney.	Electrical and Electronic Measuring Instruments	Dhanpat Rai and sons.
08	P L Kohli	Automotive Electrical Equipments	Tata McGraw Hill.

COURSE NAME : DIPLOMA IN AUTOMOBILE ENGINEERING

COURSE CODE : AE

SEMESTER : FIFTH.

SUBJECT TITLE : HYDRAULICS & PNEUMATICS

SUBJECT CODE : 12170

Teaching and Examination Scheme:

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS	TH	PR	OR	TW	TOTAL
03	--	02	03	100	--	25#	25@	150

NOTE:

Two tests each of 25 marks to be conducted as per the schedule given by SBTE.

Total of tests marks for all theory subjects are to be converted out of 50 and to be entered in mark sheet under the head Sessional Work. (SW)

Rationale:

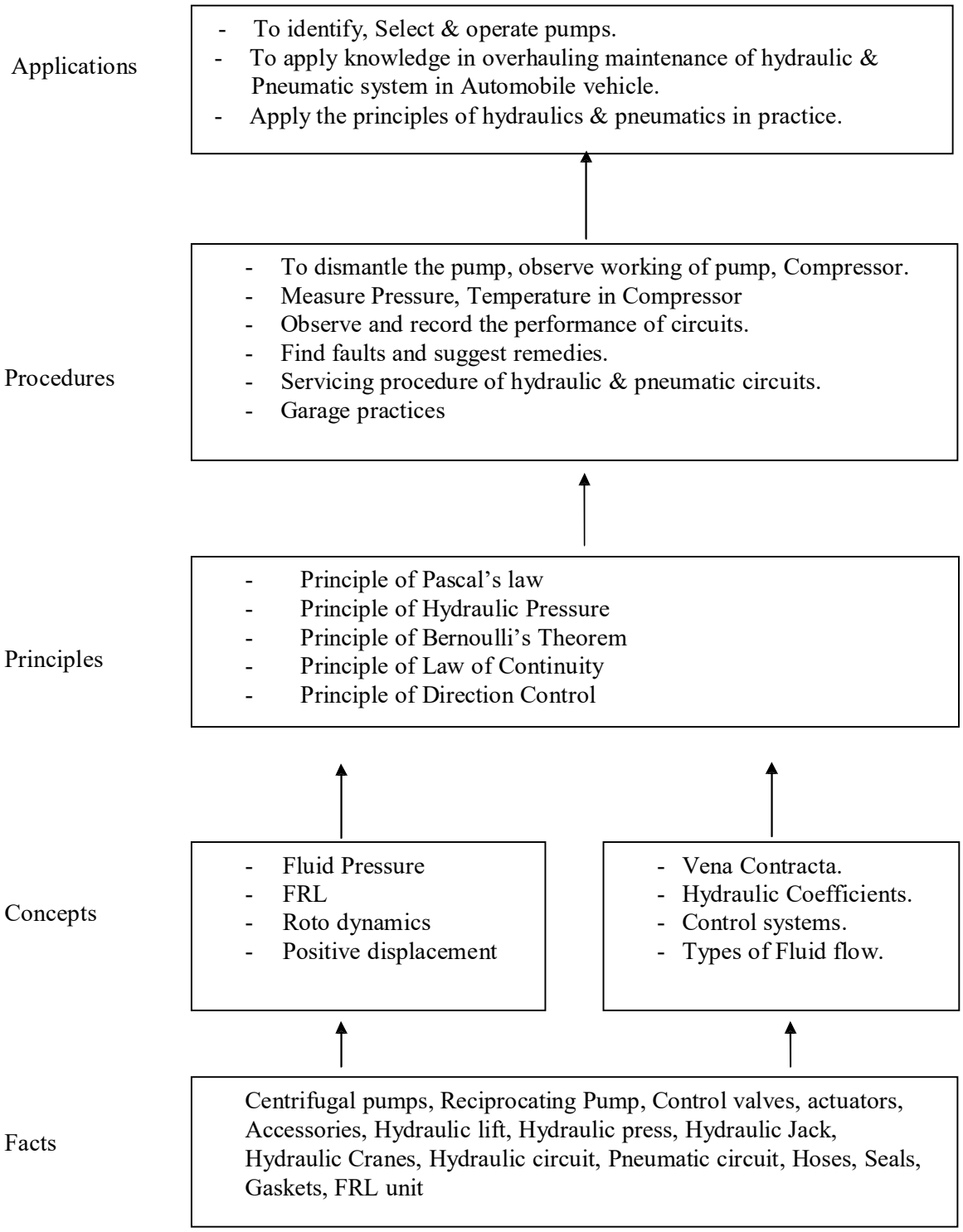
Hydraulics and Pneumatics systems are widely used in automobiles as well as in manufacturing and automobile service stations. This is core technology subject and the knowledge of which is absolutely essential for automobile diploma engineers. This subject will provide insight to the students in understanding fundamentals of fluid mechanics and its applications to industrial and mobile hydraulics and pneumatics. The diploma engineers are required to work with these systems, its components and their trouble-shooting. It provides knowledge to construct the hydraulics and pneumatics circuits for various applications. This subject will be directly useful to the students in the industrial environment.

Objectives:

Student will be able to:

1) Understand the basic properties of fluid, important principles of hydraulics with their applications and hydraulic devices used in practice.
2) Identify fluid power system components.
3) Select appropriate tools to dismantle and assemble the components.
4) Diagnose probable causes of failure of components of hydraulic and pneumatic circuits.
5) Verifying the conditions of fittings, oil, pipes, seals & packing of hydraulic systems in automobile vehicles.
6) Construct the Hydraulic and Pneumatic circuits for various applications.

Learning Structure:



Contents: Theory

Chapter	Name of the Topic	Hours	Marks
01	**Fluid Mechanics** 1.1 Overview of fluid properties Ideal fluid , Real Fluid, Specific Weight, Specific gravity, Surface tension, Capillarity, Viscosity. Definitions and applications only. Specifications and standards of hydraulic fluids. Pascal's law. 1.2 Measurement of Pressure Concept of atmospheric pressure, gauge pressure, absolute Pressure. Pressure Gauges - Piezometer tube, simple and differential manometer, micro – manometer. (Theoretical Treatment only, No Analytical treatment / Problems on Manometers.) Bourdon tube pressure gauge.	**06**	**12**
02	**Hydrodynamics** 2.1 Law of continuity. Law of continuity and its applications. 2.2 Bernoulli's Theorem. Energy possessed by the liquid in motion. Bernoulli's theorem and its applications such as Venturimeter, Orifice meter and pitot tube. (Analytical treatment with derivation for measurement of discharge is expected). 2.3 Hydraulic coefficients Concept of Vena Contracta. Coefficient of contraction, coefficient of velocity, coefficient of discharge, Coefficient of resistance. Relation between the hydraulic coefficients. 2.4 Types of fluid flow Steady, unsteady, rotational, irrotational, laminar, turbulent, one, two & three dimensional flow, Uniform & non uniform flow.	**08**	**16**

03	**Hydraulic Devices** 3.1 Simple Hydraulic Devices. Working principles, construction and applications of Hydraulic jack, Hydraulic ram, Hydraulic lift, Hydraulic press. 3.2 Centrifugal Pumps. Types, Construction and working of centrifugal pump Types of casing. Need of priming. Heads, Losses and Efficiencies of Centrifugal Pump. (No Analytical Treatment.) Net positive suction head, Fault findings and remedies. Pump selection. 3.3 Reciprocating Pumps Construction & Working of single & Double Acting Reciprocating pump. Positive & Negative slip. Air vessels - their function & Advantage. Power and Efficiencies of Reciprocation Pump. (No Analytical Treatment.)	**12**	**24**
	Power and Efficiencies of Reciprocation Pump. (No Analytical Treatment.) Reasons of cavitations and separation. 3.4 Other Pumping Devices. Gear pumps used in hydraulic circuits, Vane type, Screw pumps, Swash plate pump. Comparison of above pumps for various characteristics. 3.5 Air Compressors. Reciprocating Compressors. Rotary compressor used in pneumatic circuits		
04	**Basic Components of Hydraulic & Pneumatic Systems** 4.1 Hydraulic & Pneumatic symbols 4.2 Air Motors: Type, construction, working. 4.3 Hydraulic Motors: Type, construction, working. 4.4 Valves: Classifications of valves, poppet, ball, needle, throttle, pressure control directional control, sequencing synchronizing ,rotary spool, sliding spool two position, multi position. Non-return valves. Construction & operation of above valves.	**08**	**18**
05	**Accessories of Hydraulic & Pneumatic circuit** 5.1 Filters: Types, function, construction. 5.2 Hoses & Connectors: Type, construction and applications. 5.3 Seals & Gaskets: Types, function, construction.	**06**	**08**

06	**Hydro Pneumatic Systems & Circuits** 6.1 Comparison of Hydraulic and pneumatic circuits. 6.2 Hydraulic Circuits: Meter in, Meter out, Bleed off, Sequencing. Applications of hydraulic circuits: Hydraulic power steering – Reaction piston type, Mobile Hydraulic system and Earthmovers, Hydraulic brake circuit, Hydraulic circuits in shaper and milling machine. 6.3 Simple Pneumatic Circuits. Speed control circuits. Sequencing circuits. Applications of pneumatic circuits – Air brake, Low cost Automation in industries, Pneumatic power tools.	**08**	**22**
	TOTAL	**48**	**100**

Practical:
Skills to be developed:

Intellectual Skills:

1. Understand the basic principles of Hydraulics and their applications.
2. Measure discharge, pressure head and velocity of flow.
3. Understand the working of hydraulic & pneumatic system.
4. Identify the component used in Hydraulic and Pneumatic Circuit. Design small circuits using these components.
5. Co-relate the performance hydraulic & pneumatic system.
6. Identify the faults and suggest remedies.
7. Write report.

Motor Skills:

1. Connect different components as per hydraulic & Pneumatic circuit.
2. Construct & assemble centrifugal, reciprocating pump & procedure of testing.
3. Assemble & dismantle centrifugal & gear pump.
4. Use & operate pressure gauge, venturi- meter, stopwatch & orifice meter.

List of Practical:

1) Experimental Verification of Bernoulli's Theorem.
2) Experimental determination of Coefficient of Discharge of Venturimeter / Orifice-meter.
3) Symptoms, faults, causes and remedies in general hydraulic components and circuits.

4) Dismantling and assembly of centrifugal pump and gear pump used in automobile.
5) Construct two simple hydraulic circuits like meter in, meter out, bleed off and involving different valves etc. using trainer kit and observe the working of those circuits.
6) Construct any two simple pneumatic circuits using trainer kit observe the working of those circuits.
7) Trial on centrifugal pump to determine its discharge and efficiency.
8) Trial on reciprocating pump to determine efficiency.

Learning Resources:

Books:

Sr. No.	Author	Name of Book	Publication
01	Pippengen & Hicks	Industrial Hydraulics	Tata McGraw Hill Int.
02	S. R. Mujumdar	Oil Hydraulic System – Principle and Maintenance	Tata McGraw Hill Co.
03	S. R. Mujumdar	Pneumatics Systems – Principle and Maintenance	Tata McGraw Hill Co.
04	Dr. P. N. Modi Dr. S.M. Seth	Hydraulic and Fluid Mechanics	Standard book house, Delhi
05	V. Thanikacha T.T.T.I. - Chennai	Hydraulics and Hydraulic Machinery	Tata McGraw Hill Co.
06	Harry L. Stewart.	Pneumatics and Hydraulics	D. B. Taraporevala sons & co. private Ltd. Mumbai
07	S. Ramamrutham	Hydraulics, Fluid Mechanics & Fluid Machinery	Dhanpat Rai publishing company
08	Dr. Jagdish Lal	Fluid Mechanics and Hydraulics	Metropolitan books Co. private Ltd. Delhi
09	----------	Vicker's Industrial Hydraulic Manual	Vicker's system international Ltd. Pimpri, Pune – 411018
10	Sameer Shaikh Iliyas Khan	Treaties on Hydraulics Pneumatics Fluid system	R. K. Publication, Kolhapur

COURSE NAME : MECHANICAL ENGINEERING GROUP

COURSE CODE : ME/PT/AE/PG/MH/MI

SEMESTER : FIFTH FOR ME / PT / AE / PG AND SIXTH FOR MH/MI

SUBJECT TITLE : MECHATRONICS (ELECTIVE-I)

SUBJECT CODE : 12161

Teaching and Examination Scheme:

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS	TH	PR	OR	TW	TOTAL
03	--	02	03	100	--	--	25@	125

NOTE:

Two tests each of 25 marks to be conducted as per the schedule given by SBTE.

Total of tests marks for all theory subjects are to be converted out of 50 and to be entered in mark sheet under the head Sessional Work. (SW)

Rationale:

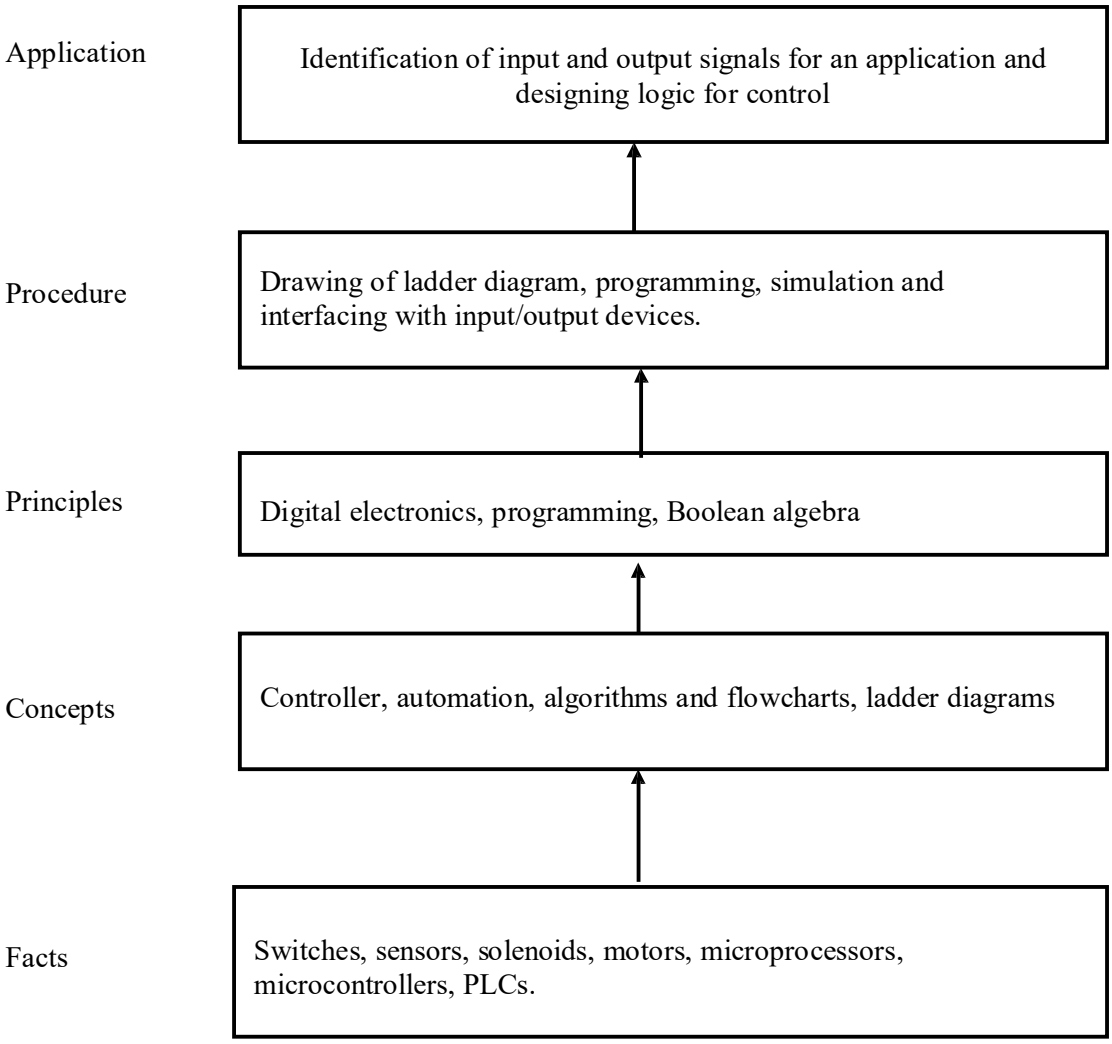
The integration of electronics engineering, electrical engineering, computer technology and control engineering with mechanical engineering is increasingly forming a crucial part in the design, manufacture and maintenance of wide range of engineering products and processes. As a consequence there is a need for a diploma engineers to understand systems used in automation

Objectives:

Students should be able to:

1. Identify various input and output devices in an automated system.
2. Understand and draw ladder diagrams.
3. Write simple programs for PLCs.
4. Interpret and use operations manual of a PLC manufacturer.
5. Use simulation software provided with the PLC.
6. Understand interfacing of input and output devices.

Learning Structure:



CONTENTS: Theory

Chapter	Name of the Topic	Hours	Marks
1	**Introduction to Sensors, Transducers and Actuators** Principle, working and applications of-Limit switches, proximity switches like inductive, capacitive and optical (deflecting and through beam type), Thumb wheel switches, magnetic reed switches, Optical encoders-displacement measurement, rotary, incremental, opto-couplers. Actuator – solenoids – on-off applications, latching, triggering Types of relays- solid state Types of motors – DC motors, DC brushless motors, AC motors, stepper motors, servo motors.	06	12
2	**8085 Microprocessor** Architecture, Pin configuration, working of microprocessor, and applications. Introduction to ICs used for interfacing such as–Programmable peripheral devices, USART, memory, keyboard, display – LCD,LED,I/O device, ADC, DAC etc 8051 Microcontroller Architecture, Pin configuration, working of microcontroller, Applications. Comparison of microprocessor and microcontroller, advantages and disadvantages	08	18
3	**Programmable Logic Controller (PLC)** Introduction, PLC definition, PLC block diagram, Difference between relay panel and PLC, ,power supply, input/output modules (analog, digital) concepts of sink/source, set/reset, latch/unlatch, advantages and disadvantages, installation , troubleshooting and maintenance	08	18
4	**Selection of a PLC Programming equipment, Programming formats** Ladder diagrams and sequence listing, large process ladder diagram construction, flowcharting as a programming method, Basic PLC functions, Register basics, timer functions, counter functions, Intermediate functions – Arithmetic functions, number comparison and number conversion functions. Data handling functions- SKIP, Master control relay, Jump, Move, Block move, Table to register and register to table move functions. FIFO and LIFO functions, File Arithmetic and Logic function	16	26
5	**ONS and CLR functions and their applications** PLC digital bit functions and applications Sequencer functions and cascading of sequencers PLC matrix functions Discrete and analog operation of PLC, Networking of PLCs. PLC auxiliary commands and functions,	06	12
6	Online, offline, stop/run modes of operations, uploading/downloading between PLC and PC, Introduction to SCADA and DCS	04	14
	Total	**48**	**100**

Practical

Intellectual Skills:

1. Identification of various sensors and transducers used in automated systems
2. Interpretation of circuits in automation
3. Interpretation and use

Motor Skills:

1. Use of simulation software for PLCs
2. Preparation of ladder diagrams
3. Testing of interfacing ICs

List of Practical:

Term work shall consist of detailed report on the following experiments:

1. Identification and demonstration of different sensors and actuators.
2. Demonstration of the working of various digital to analog and analog to digital converters.
3. Development of ladder diagram, programming using PLC for
   a) Measurement of speed of a motor
   b) Motor start and stop by using two different sensors
   c) Simulation of a pedestrian traffic controller
   d) Simulation of four road junction traffic controller
   e) Lift / elevator control
   f) Washing machine control
   g) Tank level control
   h) Soft drink vending machine control
4. Trace, interpret and demonstrate working of at least two electro pneumatic systems.
5. Trace, interpret and demonstrate working of at least two electro hydraulic systems.

Learning Resources:

Books:

Sr. No.	Author	Title	Publication
1	Bolton W.	Mechatronics- Electronic control systems in Mechanical and Electrical Engineering	Pearson Education Ltd.
2	Histand B.H. and Alciatore D.G.	Introduction to Mechatronics and Measurement systems	Tata McGraw Hill Publishing
3	John W. Webb and Ronald Reis	Programmable Logic Controllers	Prentice Hall of India
4	NIIT	Programmable Logic Control – Principles and Applications	Prentice Hall of India
5	Kolk R.A. and Shetty D.	Mechatronics systems design	Vikas Publishing, New Delhi
6	Mahalik N.P.	Mechatronics principles, concepts and applications	Tata McGraw Hill Publishing

COURSE NAME : DIPLOMA IN AUTOMOBILE ENGINEERING

COURSE CODE : AE

SEMESTER : FIFTH

SUBJECT TITLE : VEHICLE AERODYNAMICS AND DESIGN (ELECTIVE-I)

SUBJECT CODE : 12171

Teaching and Examination scheme:

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS	TH	PR	OR	TW	TOTAL
03	--	02	03	100	--	--	25@	125

NOTE:

Two tests each of 25 marks to be conducted as per the schedule given by SBTE.

Total of tests marks for all theory subjects are to be converted out of 50 and to be entered in mark sheet under the head Sessional Work. (SW)

Rationale:

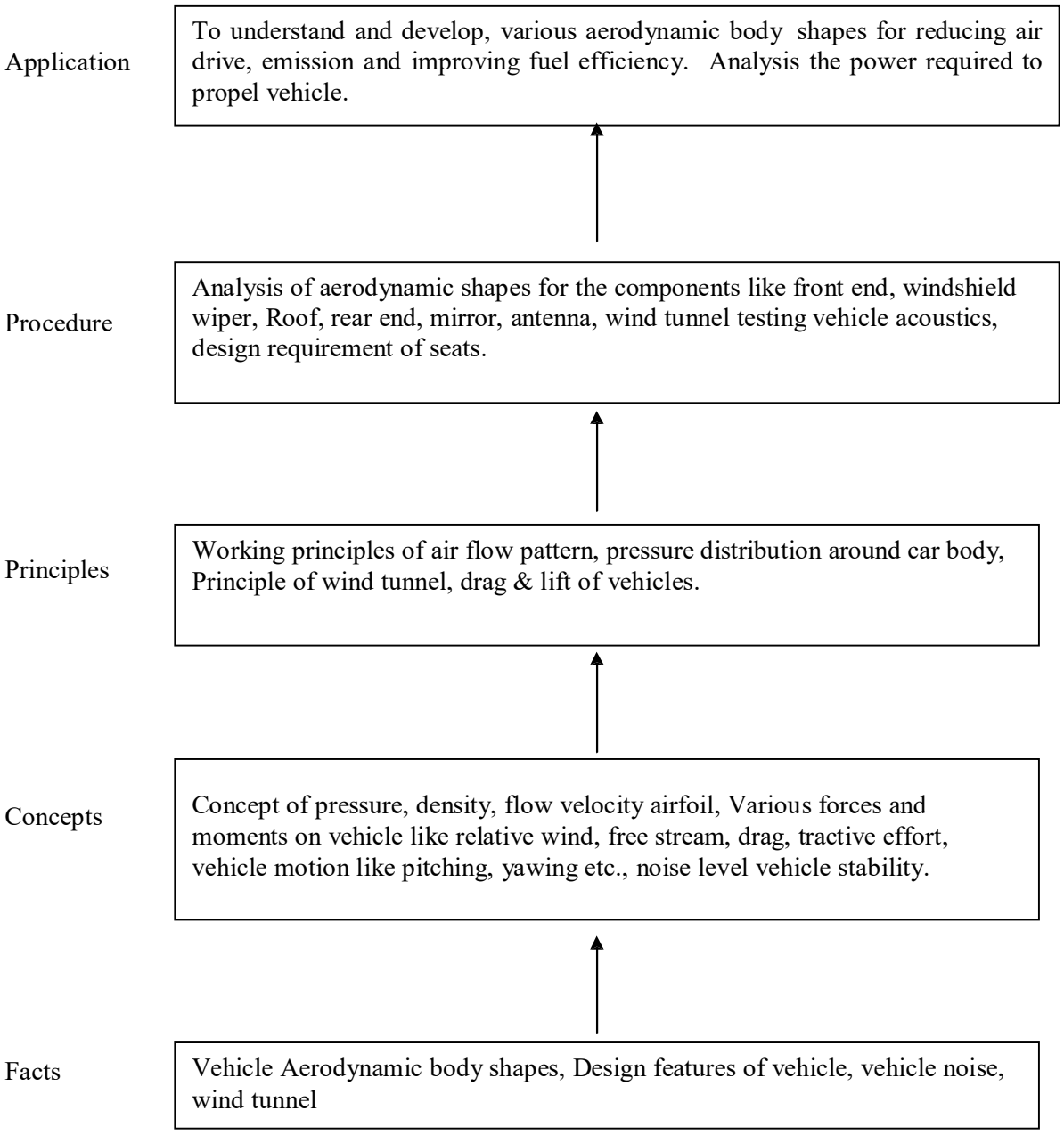
Use of aerodynamic shape in automobile are essential to increase fuel efficiency and allowing driving high speed with minimum air drag. The prerequisite subject like- auto systems, auto chassis, transmission etc. have been studied earlier. This subject is application of prerequisite knowledge involving vehicle stability & vehicle dynamics. Design of vehicles needs the knowledge of aerodynamics. The vehicle performance depends upon aerodynamics principles used which highlights importance of this subject. The knowledge of this subject can be used in vehicle body-work and rework.

Objectives:

Students will be able to:

1 Understand concepts of aerodynamics
2 Calculate various forces & moments acting on moving vehicles
3 Know the stability of vehicle on slope & turns.
4 Get concepts of vehicle model testing in wind tunnel for estimating drag coefficients.
5 Estimate tractive effort required to propel the vehicle & parameters which decide vehicle performance.
6 Apply the knowledge in vehicle body work and rework.

Learning Structure:



Contents: Theory

Chapter	Name of the Topic	Hours	Marks
01	**Aerodynamics:** 1.1 Introduction of aerodynamics: Historical Examples and future trends. 1.2 Classification & practical objectives of aerodynamics 1.3 Fundamental aerodynamic variables like Pressure, Density, Temperature, Flow velocity. 1.4 Aerodynamic forces & moments like Relative Wind, Free Stream, Lift, Drag. 1.5 Concept of airfoil and air dam.	06	16
02	**PART A: Ergonomic consideration 12 Marks** 2.1 Concept of Visibility 2.2 Concept of Blind spot 2.3 Driver seat design requirement 2.4 Passenger seat design requirement 2.5 Child seat design requirement 2.6 Aerodynamic properties **PART B: Concepts in Aerodynamic 04 Marks** 2.7 Lift & pitching. 2.8 Side forces & yaw moment. 2.9 Rolling moment.	04 02	16
03	**Fundamentals of Aerodynamic Drag** **Part A 16 Marks** 3.1 Types of car bodies. 3.2 Flow field around the car -Air flow pattern, Pressure distribution 3.3 Local origins of flow field - Front end, windshield wiper, A-pillar, Roof, Rear end 3.4 Water and dirt accumulation on the body -Safety, water flow, Dirt Deposits **Part B 14Marks** 3.5 Wind tunnels: 3.5.1 Concept (no analytical treatment) 3.5.2 Construction 3.5.3 Existing wind tunnels:- Large, Small full scale wind tunnel, Wind tunnel for scale model, Climatic tunnel, Climatic wind chamber 3.6. Wind noise: 3.6.1 Wind noise sources: - Leak noise, Cavity noise, Wind-rush noise; 3.6.2 Design features of A-pillar, Outside rear view mirror, Wind shield wipers, Radio antenna, Roof racks, Doors.	08 12	30
04	**Directional Stability** 4.1 Concept of aerodynamic stability 4.2 Distribution of weight : i) In case of three wheeled vehicle	08	20

	ii)In case of four wheeled vehicle 4.3 Driving with trailer 4.4 Stability of vehicle on slope (derivation & numerical problems) 4.5 Stability of vehicle on turns (derivation & numerical problems)		
05	**Vehicle Performance (numerical problems)** 5.1 Various resistances faced by vehicle (air, rolling, gradient) 5.2 Power required to propel the vehicle 5.3 Maximum Drawbar pull 5.4 Tractive efforts, Traction, 5.5 Relation between vehicle & engine speed. 5.6 Acceleration and gradeability.	**08**	**18**
	Total	**48**	**100**

List of Assignments:

1. Study of ergonomics of human body & hence the design of driver's and passenger's seat.
2. Comparison of visibility of different vehicles. Prepare a report.
3. Procedure for measurement of various aerodynamic forces and moments.
4. Study of wind tunnel and procedure for wind load distribution on various body structures.
5. Case study of an accidental vehicle, which took place due to improper body rework /body building.
6. Procedure of measurement of air drag in wind tunnel.
7. Prepare aerodynamic shape with the help of Graphics Software.
8. Simple sketches of modern passenger car, truck, bus etc with suitable design showing importance of Aerodynamics.
9. Simple sketches of airflow patterns on various types of vehicle.

Learning Resources:

Books:

Sr. No.	Author	Title	Publisher
01	John. D Anderson, Jr.	Fundamentals of aerodynamics	McGraw-Hill Books Company
02	Wolf-Heinrich Hucho	Aerodynamics of road vehicles from fluid mechanics to vehicle	SAE International
03	Butlerworths, by Wolf-Heinrich Hucho	Aerodynamics of road vehicles from fluid mechanics to vehicle	SAE International
04	Richard stone, Jeffrey k. Ball	Automotive Eng. Fundamentals	SAE International
05	John Fenton	Vehicle body layout and analysis	Hutchinson, London
06	Joseph Heitner	Automotive mechanics	--
07	William H. Crouze	Automotive mechanics	--
08	Lanusz Powloski	Vehicle body engineering	Business books Ltd., London
09	N.K Giri.	Problems in Automobile Engineering	Khanna publication

COURSE NAME : DILOMA IN AUTOMOBILE ENGINEERING

COURSE CODE : AE

SEMESTER : FIFTH

SUBJECT TITLE : VEHICLE TESTING (ELECTIVE-I)

SUBJECT CODE : 12172

Teaching and Examination Scheme:

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS	TH	PR	OR	TW	TOTAL
03	--	02	03	100	----	---	25@	125

NOTE:

Two tests each of 25 marks to be conducted as per the schedule given by SBTE.

Total of tests marks for all theory subjects are to be converted out of 50 and to be entered in mark sheet under the head Sessional Work. (SW)

Rationale:

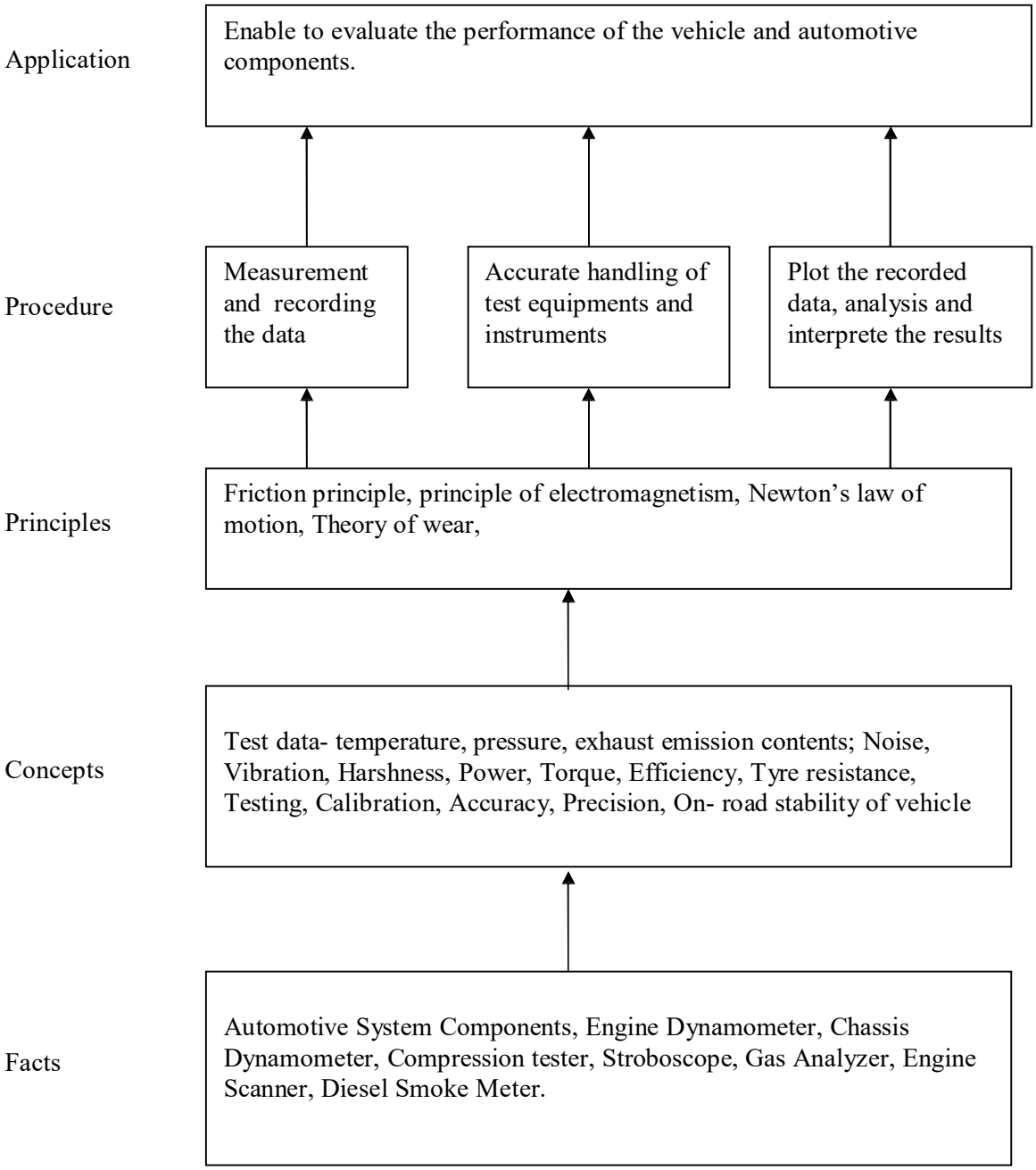
Vehicle testing is a vital part of an automobile manufacturing industry. To ensure maximum performance and achieve quality standards every automotive manufacturer is required to undergo testing and assure the quality of product. The subject intends to understand the general test procedure for vehicle; its components and various quality standards. By studying this subject students would get familiar with various instruments and equipments needed for testing as well as their use and capabilities.

Objectives:

The students will able to:

1. Define and understand the terms efficiency, Vehicle performance, testing.
2. Understand the meaning of vehicle testing and quality assurance.
3. Classify vehicle testing as Component level and Vehicle level testing.
4. Identify the various instruments and equipments required for testing and know their use and capabilities and analyze the parameters to be recorded.
5. Use the proper instrument/equipment and measure the required quantity accurately.
6. Use appropriate correlations to calculate efficiency, power, torque, fuel consumption etc.
7. Get acquainted with standard test procedures and conduct the same.
8. Evaluate and tabulate the test data in appropriate manner.
9. Plot the performance Characteristics graphically and interpret the results.

Learning Structure:



Contents: Theory

Chapter	Name of the Topic	Hours	Marks
01	**Overview of Vehicle Testing** 1.1 Need and importance of vehicle testing 1.2 Classification, Accuracy, Test data. 1.3 Basis of tests- driving cycles, Homologation 1.4 Requirements of test- 1. Test equipments, 2. Procedure, 3. Quality Personnel. 1.5 Testing instruments and equipments- Use, capabilities and Parameters of the following equipments to be recorded…. 1. Engine dynamometer, 2. Compression tester, 3. Stroboscope, 4. Computerized engine analyzer, 5. Petrol/Diesel engine scanner, 6. Infrared exhaust gas analyzer, 7. Diesel smoke meter, 8. Vacuum tester, 9. Chassis dynamometer. 1.6 Testing Standards- 1. SAE standards, 2. ASMT standards; 3. ARAI standards, 4. CMVI regulations. 1.7 Significance of test. 1.8 Production part approval process	**14**	**22**
02	**Laboratory Testing of Vehicle Subsystems** 2.1 Engine Performance parameters testing- 1. Power, 2. Torque, 3. Efficiency, 4. Fuel consumption, 5. Dry and wet compression test, 6. Charging system test, 7. Regulated voltage test, 8. Starter motor voltage drop test, 9. Ignition system oscilloscope test. 2.2 Cooling system tests- 1. Leakage test, 2. Pressure test, 3. Vacuum test of pressure cap, 4. Corrosion test- Hot spots and cold spots. 2.3 Fuel Injection pump tests – 1. Pressure test, 2. Injector testing,	**07**	**20**

	3. Spray pattern tests, 4. Leakage tests, 5. Calibration and Phasing. 2.4 Engine emission testing as per Indian driving cycles. 2.5 Lubricating oil pump pressure test.		
03	**Vehicle comfort testing** 3.1 a) Vehicle ride and handling parameters b) Effect of change in steering geometry, c) Change in suspension and handling characteristics- d) Definitions of – Ride and comfort, Roll, Lurch, Tramp, Yaw, pitching, bouncing, Steady-state cornering, e) Steering characteristics. 3.2 Tyre Testing- 1. Tyre wear patterns, its identification and causes, 3. Endurance test, 4. Strength test, 5. High speed performance test, 6. Tubeless tyre resistance to bead unseating.	**07**	**20**
04	**Testing of Vehicles on road** 4.1 Introduction of sampling technique. 4.2 Vehicle level performance parameters- 1. Acceleration, 2. Driveability, 3. Gradeability, 4. Restartability, 5. Brakes testing, 6. Steering effort Testing, 7. Speedometer and odometer testing. 4.3 Accelerated endurance testing procedures- 1. Torture tracks (e.g. Belgian Pave, Corrugated, Long wave pitching, Pot hole, Sand patch, Mud patch, Steering pad, High speed, Serpentine courses, Gradient, Shallow water trough, Deep wading trough, Cross Country, Step Climbing), 2. Draw bar or winch pull test.	**08**	**20**
05	**Impact Testing** 5.1. Noise, Vibration and Harshness (NVH) testing, 2. Types of NVH- a) Pass by noise, b) In cab noise, c) Floor vibrations. 5.2 Moving barrier collision test- 1. Frontal impact, 2. Rear impact, 3. Side impact, 4. Roof crash.	**09**	**18**

	5.3 Barrier Collision test with vehicle acceleration and occupant loading. 5.4 Roll over test without collision. 5.5 Inverted vehicle drop test		
	Total	**48**	**100**

Practical:

Skills to be developed:

Intellectual Skills:

- Understand methods of temperature and pressure measurement of cooling system.
- Understand performance characteristics/ parameters of a motor vehicle and to analyze the same after a test drive.
- Understand the fuel measurement methods.
- Understand the use of exhaust gas analyzer and to analyze the exhaust gas constituents.

Motor Skills:

- Observe the measurement of temperature and pressure of cooling system.
- Observe various test facilities at organizations like ARAI, VRDE, TATA MOTORS and alike.

List of Practical/ Assignments:

1. Use of any three test instruments and three equipments
2. NVH testing.
3. Testing procedures of any three engine performance parameters.
4. Check exhaust emission of petrol/ diesel vehicle.
5. Prepare a report based on industrial visit to test tracks of any organization like VRDE, ARAI, TATA Motors.

Learning Resources:

Books:

Sr. No.	Name of Author	Title	Publisher
01	R.B. Gupta	Automobile Engineering	Satya Prakashan
02	SAE International Handbook	-----	SAE Publication
03	W.H. Crouse, D.L. Anglin	Automotive Mechanics	Tata Mc Graw Hill
04	Anil Chikkara	Automobile Engineering	Satya Prakashan

		Vol. III	
05	M. L. Mathur, R.P. Sharma	Internal Combustion Engines	Dhanpat Rai & Sons
06	N. K. Giri	Automobile Mechanics	Khanna Publication.
07	Ken Layne	Automotive Engine Performance	Prentice Hall career Technology
08	Don Knowles	Automobile Mechanics: Understanding New Techniques	Prentice Hall career Technology
09	VRDE & CIRT Manuals		

COURSE NAME : DIPLOMA IN AUTOMOBILE ENGINEERING

COURSE CODE : AE

SEMESTER : FIFTH

SUBJECT TITLE : ENVIRONMENTAL POLLUTION & CONTROL (ELECTIVE I)

SUBJECT CODE : 12173

Teaching and Examination Scheme:

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS	TH	PR	OR	TW	TOTAL
03	--	02	03	100	--	--	25@	125

NOTE:

Two tests each of 25 marks to be conducted as per the schedule given by SBTE.

Total of tests marks for all theory subjects are to be converted out of 50 and to be entered in mark sheet under the head Sessional Work. (SW)

Rationale:

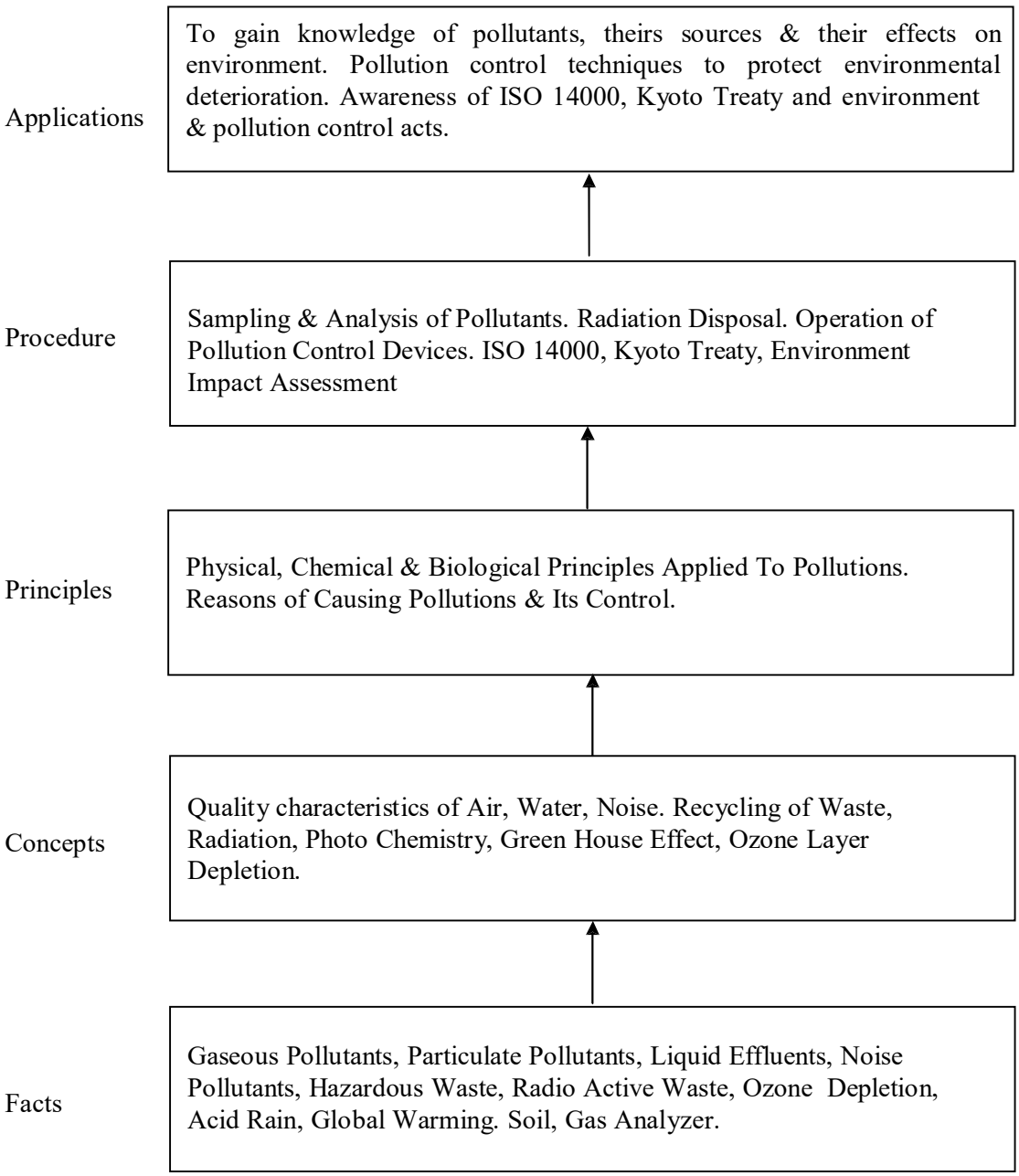
The subject aims at providing students the knowledge of various pollutants, their effects, sampling and analyzing control techniques, emission pollution control and requirements and operation of pollution control system for clean environment. The thrust area of the subject is air pollution due to automobiles.

Objectives:

Students should able be to:

1. Know the global importance of clean environment.
2. Classify the pollutants
3. Know the sources of pollutants.
4. Understand effect of pollutants on environment & economy.
5. Know about environment & control acts & ISO 14000 standards.
6. Operate pollution control devices.
7. Measure level of pollutants with the help of experimental investigation.

Learning Structure:



Contents: Theory

Note – Detailing of topic number 1,2(II) has been done

Chapter	Name of the Topic	Hours	Marks
01	**Introduction** 1.1 Environment: Introduction, concept of hydrosphere, Lithosphere, atmosphere and biosphere and their Interrelationships. 1.2 Ecosystem: Concept, biotic and abiotic components of Ecosystem, biological pyramids, fresh water ecosystem and estuarine ecosystem, forest ecosystem, tropical rain forests, grassland ecosystem, temperate deciduous forest ecosystem. 1.3 Biodiversity: introduction, levels of biodiversity, Importance of biodiversity, value of biodiversity, causes Of biodiversity loss, conservation strategies for Biodiversity. 1.4 Classification of pollution & pollutants 1.5 Environment & pollution control acts: 1.6 ISO 14OOO standards, 1.6 Kyoto treaty / protocol, carbon units.	**09**	**16**
02	**Air Pollution** **Part I** 2.1 Sources & classification of air pollution 2.2 Effects of air pollution on human health 2.3 Effects of air pollution on economy 2.4 Photochemical air pollution 2.5 Air pollution from major Industrial operations e.g. Fertilizer industries aluminum manufacturing plants, Cement industries, paper industries, **Part II** Air pollution due to Automobiles-design and operating parameters and methods of control 2.6 Pollution due to S. I. Engines. Design & operating parameters responsible for emission 2.7 Pollution due to C. I. Engines. Design & operating parameters responsible for emission 2.8 Methods of pollution control like E.G.R., Turbocharger, Catalytic converter, CRDI, Canister, P.C.V. system etc. 2.9 Air quality & emission standards of India & Europe 2.10 Air pollution in Indian metro cities- Delhi, Mumbai,	**09** **10**	**18** **22**
03	**Water Pollution** 3.1 Sources of water pollution. 3.2 Effects of water pollution. 3.3 Water pollution analysis 3.3.1 Physical examination of water 3.3.2 Chemical characteristics of water 3.3.3 Biological investigation of water 3.4 Definitions of Important terms used in water pollution –	**06**	**16**

	Dissolved O_2 ,Chemical O_2 demand, Biological O2		
	demand, Theoretical O2 demand, Total solids, Total suspended solids, Total dissolved solids, Turbidity, Alkalinity, Acidity. 3.5 Water quality standards 3.6 Steps in Water treatment 3.7 Sampling & analysis of water pollution		
04	**Noise Pollution** 4.1 Definition of noise 4.2 Sources of noise 4.3 Types of noise - Impulsive & sonic noise 4.4 Effects of noise on health 4.5 Noise measurement: Acceptable noise levels at various locations like residential buildings, schools, banks, libraries, factories, light and heavy vehicles, etc. Ambient noise standards in day and night time Noise pollution levels and it's harmful effects. 4.6 Noise mapping	**05**	**10**
05	**Other Types Of Pollution** 5.1 Solid waste 5.1.1 Classification of solids 5.1.2 Solid waste management 5.1.3 Method of solid waste disposal 5.1.4 Reuse, Recycling & recovery of materials from refuse 5.2 Soil pollution 5.2.1 Chemistry of soil 5.2.2 Soil irrigation by effluents 5.2.3 Agricultural pollution 5.3 Radiation pollution 5.3.1 Sources & effects of radiation 5.3.2 Radiation exposure standards 5.3.3 Radiation protection 5.3.4 Treatment & disposal of radiation waste 5.4 Global pollution 5.4.1 Green house effect 5.4.2 Acid rain 5.4.3 Ozone depletion problem	**09**	**18**
	Total	**48**	**100**

Practical:
Skills to be developed:

Intellectual Skills:

- Understand various types of pollutants in air and water.
- Know the safe levels of pollutants in air/ water.
- Understand the concept of noise pollution.
- Write report on pollution level and suggest remedial measures.

Motor Skills:

- Measure the different pollutants by using the exhaust gas analyzer.
- Determine acidity/ alkalinity of water sample.
- Measure the noise level at different sites/ public places like Bus stand, air-port, railway station etc.
- Determine quality of water with reference to turbidity, hardness, suspended particles, dissolved pollutants etc.

List of Practical:

1. Measure CO, HC from the S.I. engine exhaust using gas analyzer & compare it with pollution norms.
2. Measure particulate matter, from C.I. engine exhaust using smoke meter & compare it with pollution norms.
3. Determine SPM, NO_X, SO_X in ambient air using high volume sampler.
4. Determine turbidity, chlorides & sulphates of a given raw water sample.
5. Determination of hardness of given raw water sample.
6. Determine solids, total suspended solids, total dissolved solids in a given water sample.
7. Determine acidity / alkalinity of a given water sample.
8. Visit site where actual recycling & recovery of materials is done from refuse. eg. Plastics, Glass, Paper, Agricultural waste etc. & prepare a report.
9. Case study: Air pollution due to automobiles at different places in your city. Prepare a report & suggest methods & steps to reduce it.
10. Case study : Measure noise level in your city at different places like Bus stand, Railway station, Air port, Hospitals, Schools, Traffic jam conditions etc. & prepare a report on it.

Learning resources:
Books:

Sr.No.	Author	Title	Publisher
01	M.N. Rao & H.V.N. Rao	Air pollution	Tata McGraw Hill
02	William H. Course & Donald L. Anglin	Automotive Mechanics	Tata McGraw Hill
03	K.K. Ramlingam	Internal Combustion Engines	Scitech
04	G.S. Bilgi	Water Supply and Sanitary Engineering	Dhanpat Rai and Sons.
05	P. Meenakshi	Elements of Environment Science & Engineering	Prentice-Hall
06	S.Deswal & A. Deswal	A basic course in environmental studies	Dhanpat Rai and Sons.
07	P. Aarne Vesilind & Susan M. Morgan	Introduction to Environmental Engineering.	Thomson

COURSE NAME : MECHANICAL ENGINEERING GROUP

COURSE CODE : ME/PT/AE/PG/MH/MI

SEMESTER : FIFTH

SUBJECT TITLE : INDUSTRIAL PROJECT AND ENTREPRENEURSHIP DEVELOPMENT

SUBJECT CODE : 12162

Teaching and Examination Scheme:

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS	TH	PR	OR	TW	TOTAL
01	01	02	--	--	--	--	25@	25

Notes: 1. Two practical hours are for industrial project

2. One theory and one tutorial hours are for Entrepreneurship Development (EDP). Twenty five marks for term work are for report prepared under EDP

Content:

PART A) Industrial Project

Following activities related to project are required to be dealt with, during this semester

1. Form project batches & allot project guide to each batch. (Max. 4 students per batch)
2. Each project batch should select topic / problem / work by consulting the guide & / or industry. Topic / Problem / work should be approved by Head of department.
3. Each project batch should prepare action plan of project activities & submit the same to respective guide.
4. At the end of semester, each project batch should submit the action plan and abstract of the project along with list of materials required if project involves fabrication or other facilities required in other kinds of project.
5. Action Plan should be part of the project report.

Part B: Entrepreneurship Development

RATIONALE:

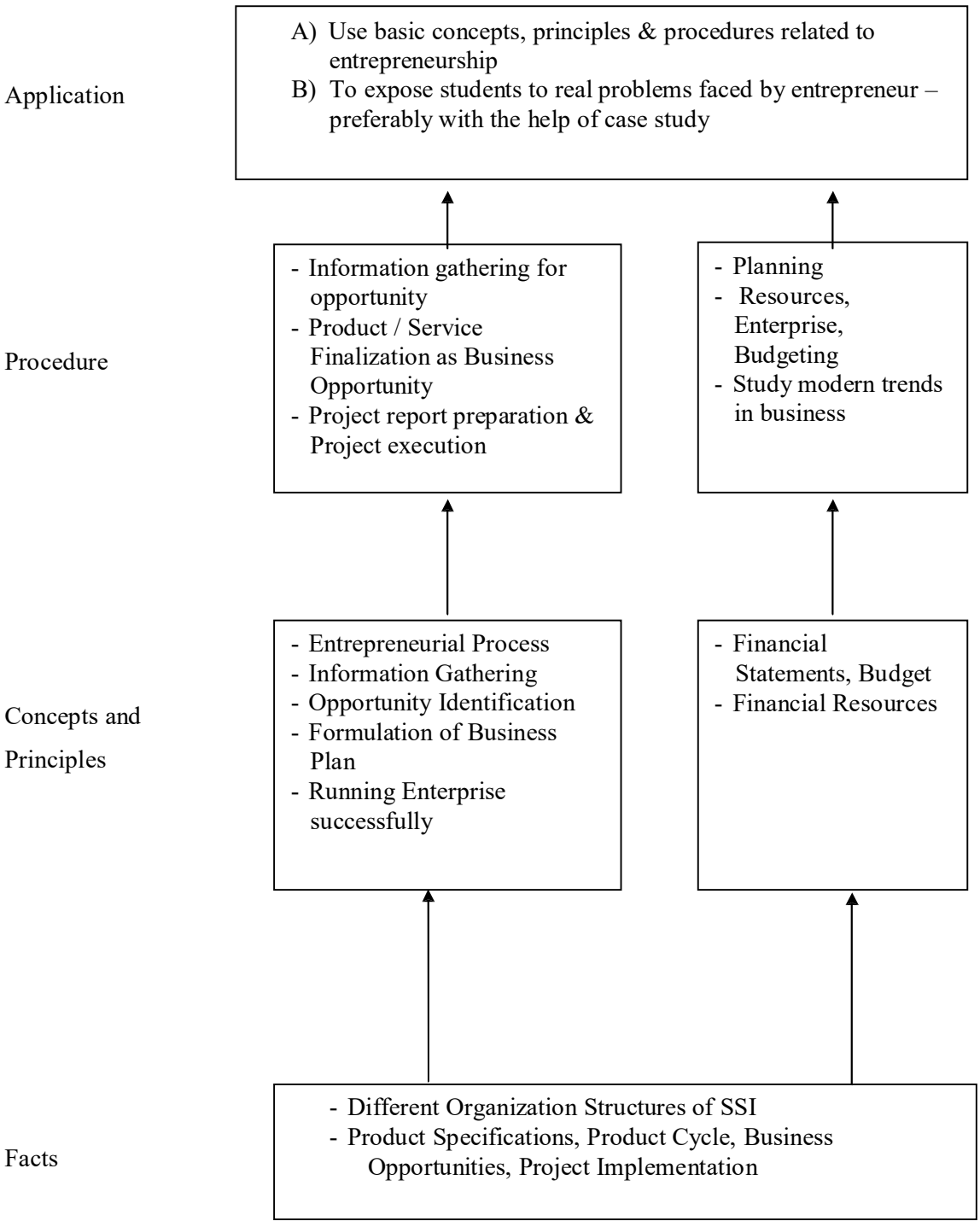
Globalization, liberalization & privatization along with revolution in Information Technology, have thrown up new opportunities that are transforming lives of the masses. Talented and enterprising personalities are exploring such opportunities & translating opportunities into business ventures such as- BPO, Contract Manufacturing, Trading, Service sectors etc. The student community also needs to explore the emerging opportunities. It is therefore necessary to inculcate the entrepreneurial values during their educational tenure. This will help the younger generation in changing their attitude and take the challenging growth oriented tasks instead of waiting for white- collar jobs. The educational institutions should also demonstrate their uniqueness in the creation of enterprising personalities in their colleges. This subject will help in developing the awareness and interest in entrepreneurship and create employment for others.

OBJECTIVES:

Students will be able to

1) Identify entrepreneurship opportunity.
2) Acquire entrepreneurial values and attitude.
3) Use the information to prepare project report for business venture.
4) Develop awareness about enterprise management.

Learning Structure:



Contents: Theory

Chapter	Name of the Topic	Hours
01	**Entrepreneurship, Creativity & Opportunities** 1.1) Concept, Classification & Characteristics of Entrepreneur 1.2) Creativity and Risk taking. 1.2.1) Concept of Creativity & Qualities of Creative person. 1.2.2) Risk Situation, Types of risk & risk takers. 1.3) Business Reforms. 1.3.1) Process of Liberalization. 1.3.2) Reform Policies. 1.3.3) Impact of Liberalization. 1.3.4) Emerging high growth areas. 1.4) Business Idea Methods and techniques to generate business idea. 1.5) Transforming Ideas in to opportunities transformation involves Assessment of idea &Feasibility of opportunity 1.6) SWOT Analysis	**03**
02	**Information and Support Systems** 2.1) Information Needed and Their Sources. Information related to project, Information related to support system, Information related to procedures and formalities **2.2) Support Systems** 1) Small Scale Business Planning, Requirements. 2) Govt. & Institutional Agencies, Formalities 3) Statutory Requirements and Agencies.	**03**
03	**Market Assessment** 3.1) Marketing -Concept and Importance 3.2) Market Identification, Survey Key components 3.3) Market Assessment	**02**
04	**Business Finance & Accounts** **Business Finance** 4.1) Cost of Project 1) Sources of Finance 2) Assessment of working capital 3) Product costing 4) Profitability 5) Break Even Analysis 6) Financial Ratios and Significance **Business Account** 4.2) Accounting Principles, Methodology 1) Book Keeping 2) Financial Statements 3) Concept of Audit,	**03**

05	**Business Plan & Project Report** 5.1) Business plan steps involved from concept to commissioning Activity Recourses, Time, Cost 5.2) **Project Report** 1) Meaning and Importance 2) Components of project report/profile **(Give list)** 5.3) **Project Apprisial** 1) Meaning and definition 2) Technical, Economic feasibility 3) Cost benefit Analysis	**03**
06	**Enterprise Management And Modern Trends** 6.1) **Enterprise Management**: - 1) Essential roles of Entrepreneur in managing enterprise 2) Product Cycle: Concept And Importance 3) Probable Causes Of Sickness 4) Quality Assurance Importance of Quality, Importance of testing 6.2) E-Commerce Concept and process 6.3) Global Entrepreneur	**02**
	Total	**16**

Sr. No	Assignments
1	Assess yourself-are you an entrepreneur?
2	Prepare a project report and study its feasibility.

Learning Resources:
1) Reference Books:

Sr.No.	Name of Book	Author	Publisher
1	Entrepreneurship Development	E. Gorden K.Natrajan	Himalaya Publishing. Mumbai
2	Entrepreneurship Development	Preferred by Colombo plan staff college for Technical education.	Tata Mc Graw Hill Publishing co. ltd. New Delhi.
3	A Manual on How to Prepare a Project Report	J.B.Patel D.G.Allampally	EDI STUDY MATERIAL Ahmadabad (Near Villaget ,

4	A Manual on Business Opportunity Identification & Selection	J.B.Patel S.S.Modi	Via Ahmadabad Airport & Indira Bridge), P.O. Bhat 382428 , Gujrat,India P.H. (079) 3969163, 3969153 E-mail : ediindia@sancharnet.in/olpe@ediindia.org Website : http://www.ediindia.org
5	National Derectory of Entrepreneur Motivator & Resource Persons.	S.B.Sareen H. Anil Kumar	
6	New Initiatives in Entrepreneurship Education & Training	Gautam Jain Debmuni Gupta	
7	A Handbook of New Enterpreneurs	P.C.Jain	
8	Evaluation of Enterpreneurship Development Programmes	D.N.Awasthi , Jose Sebeastian	
9	The Seven Business Crisis & How to Beat Them.	V.G.Patel	
10	Poornima M. Charantimath	Entrepreneurship Development of Small Business Enterprises	Pearson Education, New Delhi
11	Special Edition for SBTE	Entrepreneurship Development	McGraw Hill Publication
12	Entrepreneurship Theory and Practice	J.S. Saini B.S.Rathore	Wheeler Publisher New Delhi
13	Entrepreneurship Development	--	TTTI, Bhopal / Chandigadh

2) VIDEO CASSETTES

NO	SUBJECT	SOURCE
1	Five success Stories of First Generation Entrepreneurs	EDI STUDY MATERIAL Ahmedabad (Near Village Bhat , Via Ahmadabad Airport & Indira Bridge), P.O. Bhat 382428 , Gujrat,India P.H. (079) 3969163, 3969153 E-mail : ediindia@sancharnet.in/olpe@ediindia.org Website : http://www.ediindia.org
2	Assessing Entrepreneurial Competencies	
3	Business Opportunity Selection and Guidance	
4	Planning for completion & Growth	
5	Problem solving-An Entrepreneur skill	

GLOSSARY:
INDUSTRIAL TERMS
Terms related to finance, materials, purchase, sales and taxes.

Components of Project Report:

1. Project Summary (One page summary of entire project)
2. Introduction (Promoters, Market Scope/ requirement)
3. Project Concept & Product (Details of product)
4. Promoters (Details of all Promoters- Qualifications, Experience, Financial strength)
5. Manufacturing Process & Technology
6. Plant & Machinery Required
7. Location & Infrastructure required
8. Manpower (Skilled, unskilled)
9. Raw materials, Consumables & Utilities
10. Working Capital Requirement (Assumptions, requirements)
11. Market (Survey, Demand & Supply)
12. Cost of Project, Source of Finance
13. Projected Profitability & Break Even Analysis
14. Conclusion.

COURSE NAME : DIPLOMA IN AUTOMOBILE ENGINEERING

COURSE CODE : AE

SEMESTER : FIFTH

SUBJECT TITLE : PROFESSIONAL PRACTICES-V (AE)

SUBJECT CODE : 12174

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS	TH	PR	OR	TW	TOTAL
--	--	04	--	--	--	--	50@	50

Rationale:

Most of the diploma holders join industries. Due to globalization and competition in the industrial and service sectors the selection for the job is based on campus interviews or competitive tests.

While selecting candidates, a normal practice adopted is to see general confidence, ability to communicate and their attitude, in addition to basic technological concepts.

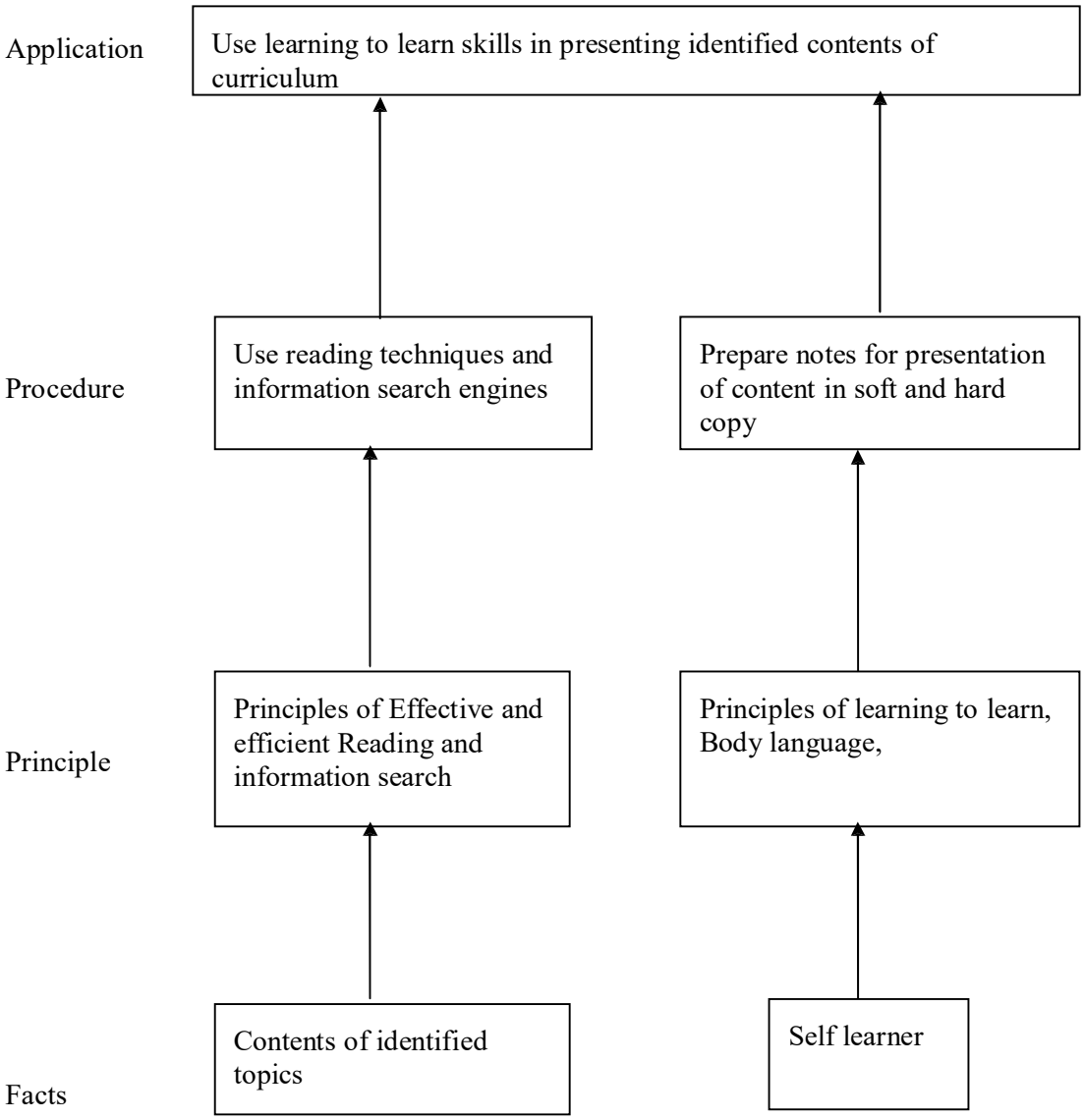
The purpose of introducing professional practices is to provide opportunities to students to undergo activities, which will enable them to develop confidence. Industrial visits, expert lectures, seminars on technical topics and group discussion are planned in a semester so that there will be increased participation of students in learning process.

Objectives:

Student will be able to:

1. Acquire information from different sources.
2. Prepare notes for given topic.
3. Present given topic in a seminar.
4. Interact with peers to share thoughts.
5. Prepare a report on industrial visit, expert lecture.

LEARNING STRUCTURE:



Contents:

Note: The topics suggested under various activities (Sr.No.1 to 4) are only suggestive and may serve as guidelines to the teachers. Any other equivalent topics or activities may be considered to improve professional skills of the learner.

Sr. No.	Activity	Hours.
01	**Industrial Visits** Structured industrial visits be arranged and report of the same should be submitted by the individual student, to form a part of the term work (2 visits). Following are the suggested type of Industries/ Fields - i) A modern garage with engine scanning facility (diagnosis of electronic fuel injection systems). ii) A vehicle manufacturing company (Exhaust gas analysis, vehicle testing). iii) Central Institute of Road Transport, Pune. iv) Vehicle Research, Development & Establishment, A'nagar. v) Automotive Research Association of India, Pune. vi) Hydroelectric power plant / sub-station. vii) Vehicle body building workshop. viii) A refuse, recycling / reclamation site. ix) Auto Engine Testing unit to gather details regarding the testing procedures/parameters etc. x) Wheel Balancing unit for light and/or heavy motor vehicles.	**12**
02	The Guest Lectures from field/industry experts, professionals to be arranged (2 Hrs duration), minimum 3 nos. from the following or alike topics. A brief report, on the guest lectures, is to be submitted by each student as a part of Term work. a) Electronic fuel injection systems. b) Exhaust gas analysis. c) Vehicle testing. d) Computer aided drafting. e) Electric motors & generators. f) Automotive wiring & lighting. g) Transducer application in automobiles. h) Environmental pollution & control. i) Vehicle aerodynamics & design. j) Earth moving machines. k) Automobile pollution, norms of pollution control**.**	**08**

03	**Information Search :-** Search information on **Any Two** of the following suggested topics and write a report (group size – 3 to 5 students, report – up to 10 pages) a) Common rail direct injection system / MPFI / TBI system. b) LPG conversion kit. c) CNG conversion kit. d) Vehicle pollution norms & pollution control methods. e) Alternative fuels & energy options. f) Vehicle / Engine tuning. (Tappet clearance values, injection timing, ignition timing, injector opening pressure, spark plug gap, trouble code of MPFI / CRDI system, Idling RPM, Clutch lining thickness, various clearances in clutches, differential backlash, brake lining thickness, various clearances in brakes, steering backlash). g) Vehicle aerodynamics & design. h) Vehicle testing. i) Laboratory testing of vehicle subsystems As per IS/SAE norms) j) Bio-diesel	**10**
04	**Group Discussion :** The students should discuss in-group of six to eight students and write a brief report on the same as a part of term work. The faculty members may select ANY TWO topics for group discussion. Some of the suggested topics are - i) CNG versus LPG as a fuel. ii) Petrol versus Diesel as a fuel for cars. iii) Trends in automobile market. iv) Load shading and remedial measures. v) Rain water harvesting. vi) Trends in energy. vii) Disaster management. viii) Safety in day-to-day life. ix) Energy Saving in Institute. x) Nano technology.	**06**
05	**Seminar :** Seminar topic should be related to the subjects of fifth semester / topics from information search & guest lectures given above. Each student shall submit a report of at least 10 pages and deliver a seminar (Presentation time – 10 minutes)	**12**
06	**Mini Project: Any other equivalent/Similar topics (any one) .** 1) Design / Drawing of engine component in a group of 4 students. 2) Prepare Models of Fuel injection pump components using suitable material. 3) Preparing preventive maintenance schedule for an automobile. **OR** Modular Courses on ANY One of the suggested or alike relevant topic be undertaken by a group of students (Min 10): **a) LPG/CNG conversion of vehicles b) Advance features in CAD.** Two Assignments be completed on the course work as a part of the Term Work.	**16**
	Total	**64**