 <b>MAHARASHTRA STATE BOARD OF TECHNICAL EDUCATION, MUMBAI</b> <b>TEACHING AND EXAMINATION SCHEME FOR POST S.S.C. DIPLOMA COURSES</b>																	
<b>COURSE NAME : DIPLOMA IN AUTOMOBILE ENGINEERING</b>																	
<b>COURSE CODE : AE</b>																	
<b>DURATION OF COURSE : 6 SEMESTERS</b>										<b>WITH EFFECT FROM 2012-13</b>							
<b>SEMESTER : SIXTH</b>										<b>DURATION : 16 WEEKS</b>							
<b>PATTERN : FULL TIME - SEMESTER</b>										<b>SCHEME : G</b>							
SR. NO	SUBJECT TITLE	Abbreviation	SUB CODE	TEACHING SCHEME			EXAMINATION SCHEME										SW (17600)
				TH	TU	PR	PAPER HRS.	TH (1)		PR (4)		OR (8)		TW (9)			
								Max	Min	Max	Min	Max	Min	Max	Min		
1	Management \$	MAN	17601	03	--	--	1&1/2	50#*	20	--	--	--	--	--	--		
2	Transport Management	TMA	17616	03	--	--	03	100	40	--	--	--	--	--	--		
3	Automotive Electrical and Electronic Systems	AEE	17617	04	--	02	03	100	40	--	--	25#	10	25@	10		
4	Vehicle Systems Maintenance	VSM	17618	04	--	04	03	100	40	25#	10	--	--	25@	10		
5	<b>Elective (Any One)</b>																<b>50</b>
	Autotronics	AUT	17619	03	--	02	03	100	40	--	--	--	--	25@	10		
	Automobile Air Conditioning	AAC	17620	03	--	02	03	100	40	--	--	--	--	25@	10		
6	Project β	PRO	17090	--	--	04	--	--	--	--	--	50#	20	50@	20		
7	Entrepreneurship Development β	EDE	17099	01	01	--	--	--	--	--	--	--	--	25@	10		
<b>TOTAL</b>				<b>18</b>	<b>01</b>	<b>12</b>	<b>--</b>	<b>450</b>	<b>--</b>	<b>25</b>	<b>--</b>	<b>75</b>	<b>--</b>	<b>150</b>	<b>--</b>	<b>50</b>	
Student Contact Hours Per Week: <b>31 Hrs.</b> <b>THEORY AND PRACTICAL PERIODS OF 60 MINUTES EACH.</b> Total Marks : <b>750</b> @ - Internal Assessment, # - External Assessment, <span style="background-color: #cccccc; padding: 2px;"> </span> No Theory Examination, \$ - Common to all branches, #* - Online Examination, β - Common to AE, PG, PT, MH, MI Abbreviations: TH-Theory, TU- Tutorial, PR-Practical, OR-Oral, TW- Term Work, SW- Sessional Work																	
<ul style="list-style-type: none"> <li>➤ 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).</li> <li>➤ Progressive evaluation is to be done by subject teacher as per the prevailing curriculum implementation and assessment norms.</li> <li>➤ Code number for TH, PR, OR, TW are to be given as suffix 1, 4, 8, 9 respectively to the subject code.</li> </ul>																	

**Course Name : All Branches of Diploma in Engineering / Technology**

**Course Code : EJ/EN/ET/EX/EV/IC/IE/IS/MU/DE/ME/PG/PT/AE/CE/CS/CR/CO/CM/IF/  
CW/EE/EP/EU/CH/CT/PS/CD/ED/EI/CV/FE/IU/MH/MI/TX/TC/FG**

**Semester : Sixth for EJ/EN/ET/EX/EV/IC/IE/IS/MU/DE/ME/PG/PT/AE/CE/CS/CR/  
CO/CM/IF/CW/EE/EP/EU/CH/CT/PS/TX/TC/FG and Seventh for  
MH/MI/CD/ED/EI/ CV/FE/IU**

**Subject Title : Management**

**Subject Code : 17601**

**Teaching and Examination Scheme:**

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS	TH	PR	OR	TW	TOTAL
03	--	--	1&½	50#*	--	--	--	50

**NOTE:**

- **Two tests each of 25 marks to be conducted as per the schedule given by MSBTE.**
- **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:**

Management concepts are universal and it is a multidisciplinary subject. They are equally applicable to different types industries like Manufacturing, Service and Trade as well as different kind of business activities like industry, army, school, hospital, retail shops etc. Also, at the end of diploma course polytechnic students are expected to enter in to the Industrial Environment. This environment is altogether different and new to the students. A proper introduction and understanding of management fundamentals is therefore essential for all these students.

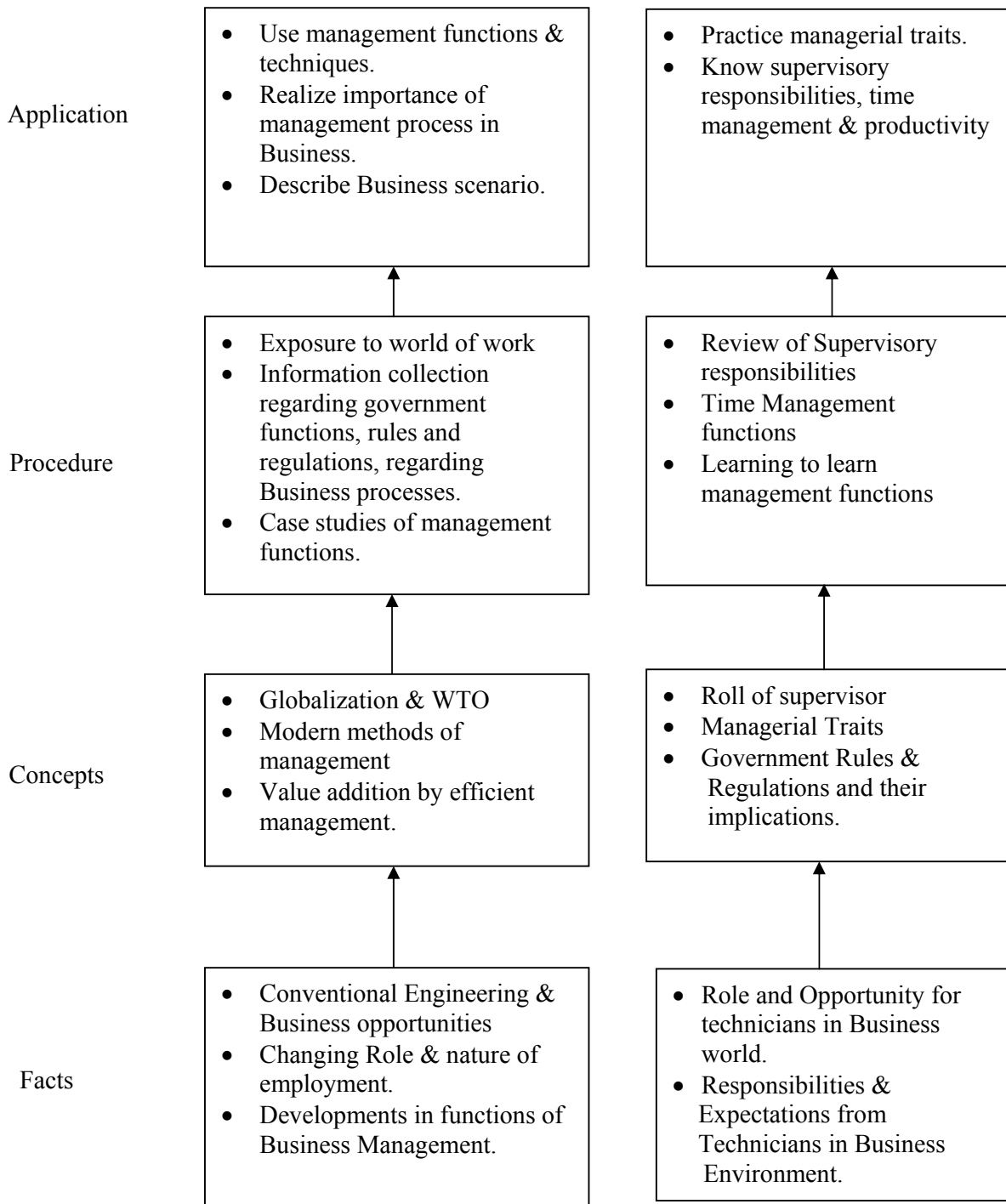
Contents of the this subject will enable the students to address various issues related to human resource, finance, materials, legislations etc. by use of basic principles of management. This will ensure that students will play their role effectively to enhance the quality of business output in total.

**Objective:**

The students will able to:

1. Get familiarized with environment related to business processes.
2. Know the management aspects of the organisations.
3. Understand Role & Responsibilities of a Diploma engineer.
4. Understand importance of quality improvement techniques.
5. Appreciate need and importance of safety in industries.
6. Understand process of Industrial finance and its management.
7. Know the latest trends in industrial management.

**Learning Structure:**



**Contents: Theory**

<b>Topic and contents</b>	<b>Hours</b>	<b>Marks</b>
<p><b>Topic 1: Overview of Business</b></p> <p><b>Specific Objectives</b></p> <ul style="list-style-type: none"> <li>➤ State various business types and sectors</li> <li>➤ Describe importance of globalisation</li> </ul> <p>1.1. Types of Business</p> <ul style="list-style-type: none"> <li>• Service</li> <li>• Manufacturing</li> <li>• Trade</li> </ul> <p>1.2. Industrial sectors Introduction to</p> <ul style="list-style-type: none"> <li>• Engineering industry</li> <li>• Process industry</li> <li>• Textile industry</li> <li>• Chemical industry</li> <li>• Agro industry</li> <li>• IT industry</li> <li>• Banking, Insurance, Retail, Hospitality, Health Care</li> </ul> <p>1.3 Globalization</p> <ul style="list-style-type: none"> <li>• Introduction</li> <li>• Advantages &amp; disadvantages with respect to India</li> </ul>	02	04
<p><b>Topic 2: Management Process</b></p> <p><b>Specific Objectives</b></p> <ul style="list-style-type: none"> <li>➤ State various management principles</li> <li>➤ Describe different management functions</li> </ul> <p>2.1 What is Management?</p> <ul style="list-style-type: none"> <li>• Evolution</li> <li>• Various definitions of management</li> <li>• Concept of management</li> <li>• Levels of management</li> <li>• Administration &amp; management</li> <li>• Scientific management by F.W.Taylor</li> </ul> <p>2.2 Principles of Management (14 principles of Henry Fayol)</p> <p>2.3 Functions of Management</p> <ul style="list-style-type: none"> <li>• Planning</li> <li>• Organizing</li> <li>• Directing</li> <li>• Controlling</li> <li>• Decision Making</li> </ul>	08	08
<p><b>Topic 3: Organisational Management</b></p> <p><b>Specific Objectives</b></p> <ul style="list-style-type: none"> <li>➤ Compare different forms of organisation , ownership for a specific business</li> <li>➤ Describe types of departmentation</li> </ul> <p>3.1 Organization:</p> <ul style="list-style-type: none"> <li>• Definition</li> </ul>	08	08

<ul style="list-style-type: none"> <li>• Steps in organization</li> </ul> <p>3.2 Types of organization</p> <ul style="list-style-type: none"> <li>• Line</li> <li>• Line &amp; staff</li> <li>• Functional</li> <li>• Project</li> </ul> <p>3.3 Departmentation</p> <ul style="list-style-type: none"> <li>• By product</li> <li>• By process</li> <li>• By function</li> </ul> <p>3.4 Principles of Organisation</p> <ul style="list-style-type: none"> <li>• Authority &amp; Responsibility</li> <li>• Span of Control</li> <li>• Effective Delegation</li> <li>• Balance, stability and flexibility</li> <li>• Communication</li> </ul> <p>3.5 Forms of ownership</p> <ul style="list-style-type: none"> <li>• Proprietorship</li> <li>• Partnership</li> <li>• Joint stock</li> <li>• Co-operative Society</li> <li>• Govt. Sector</li> </ul>		
<p><b>Topic 4: Industrial Safety and Legislative Acts</b></p> <p><b>Specific Objectives</b></p> <ul style="list-style-type: none"> <li>➤ Describe types of accidents &amp; safety measures</li> <li>➤ State provisions of industrial acts.</li> </ul> <p>4.1 Safety Management</p> <ul style="list-style-type: none"> <li>• Causes of accidents</li> <li>• Types of Industrial Accidents</li> <li>• Preventive measures</li> <li>• Safety procedures</li> </ul> <p>4.2 Industrial Legislation - Necessity of Acts</p> <p>Important Definitions &amp; Main Provisions of following acts:</p> <ul style="list-style-type: none"> <li>• Indian Factory Act</li> <li>• Workman Compensation Act</li> <li>• Minimum Wages Act</li> </ul>	08	06
<p><b>Topic 5: Financial Management (No Numerical)</b></p> <p><b>Specific Objectives</b></p> <ul style="list-style-type: none"> <li>➤ Explain functions of financial management</li> <li>➤ State the sources of finance &amp; types of budgets.</li> <li>➤ Describe concepts of direct &amp; indirect taxes.</li> </ul> <p>5.1 Financial Management- Objectives &amp; Functions</p> <p>5.2 Capital Generation &amp; Management</p> <ul style="list-style-type: none"> <li>• Types of Capitals - Fixed &amp; Working</li> <li>• Sources of raising Capital - Features of Short term, Medium Term &amp; Long Term Sources</li> </ul>	08	08

5.3 Budgets and accounts <ul style="list-style-type: none"> <li>• Types of Budgets</li> <li>• Fixed &amp; Variable Budget - Concept</li> <li>• Production Budget - Sample format</li> <li>• Labour Budget - Sample format</li> <li>• Profit &amp; Loss Account &amp; Balance Sheet - Meaning, sample format, meaning of different terms involved.</li> </ul> 5.4 Meaning & Examples of – <ul style="list-style-type: none"> <li>• Excise Tax</li> <li>• Service Tax</li> <li>• Income Tax</li> <li>• Value Added Tax</li> <li>• Custom Duty</li> </ul>		
<b>Topic 6: Materials Management (No Numerical)</b>  <b>Specific Objectives</b> <ul style="list-style-type: none"> <li>➤ Describe concept of inventory, ABC analysis &amp; EOQ.</li> <li>➤ Describe purchase functions &amp; procedures</li> <li>➤ State features of ERP &amp; MRP</li> </ul> 6.1 Inventory Concept, its classification, functions of inventory 6.2 ABC Analysis - Necessity & Steps 6.3 Economic Order Quantity Concept, graphical representation, determination of EOQ 6.4 Standard steps in Purchasing 6.5 Modern Techniques of Material Management <ul style="list-style-type: none"> <li>• Material Resource Planning (MRP) - Functions of MRP, Input to MRP, Benefits of MRP</li> <li>• Enterprise Resource Planning (ERP) - Concept, list of modules, advantages &amp; disadvantages of ERP</li> </ul>	08	08
<b>Topic 7: Quality Management</b>  <b>Specific Objectives</b> <ul style="list-style-type: none"> <li>➤ State Principles of Quality Management</li> <li>➤ Describe Modern Technique &amp; Systems of Quality Management</li> </ul> 7.1 Meaning of Quality Quality Management System - Activities, Benefits Quality Control - Objectives, Functions, Advantages Quality Circle - Concept, Characteristics & Objectives Quality Assurance - Concept, Quality Assurance System 7.2 Meaning of Total Quality and TQM Components of TQM - Concept, Elements of TQM, Benefits 7.3 Modern Technique & Systems of Quality Management like Kaizen, 5'S', 6 Sigma 7.4 ISO 9001:2000 - Benefits, Main clauses	06	08
<b>Total</b>	<b>48</b>	<b>50</b>

**Learning Resources:****Books:**

<b>Sr. No</b>	<b>Author</b>	<b>Name of Book</b>	<b>Publisher</b>
01	Dr. O.P. Khanna	Industrial Engineering & Management	Dhanpat Rai & Sons New Delhi
02	Banga & Sharma	Industrial Engineering & Management	Khanna Publication
03	Dr. S.C. Saksena	Business Administration & Management	Sahitya Bhavan Agra
04	W.H. Newman E. Kirby Warren Andrew R. McGill	The process of Management	Prentice- Hall

**E Source:**

[nptel.iitm.ac.in](http://nptel.iitm.ac.in)

<http://iete-elan.ac.in/subjects/amIndustrialMgmt.htm>

**Course Name : Diploma in Automobile Engineering****Course Code : AE****Semester : Sixth****Subject Title : Transport Management****Subject Code : 17616****Teaching and Examination Scheme**

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS	TH	PR	OR	TW	TOTAL
03	--	--	03	100	--	--	--	100

**NOTE:**

- **Two tests each of 25 marks to be conducted as per the schedule given by MSBTE.**
- **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 growth of any country mainly depends on transportation of the passengers as well as goods. The Automobile Engineer can play key role in management of various transport organization. The transport industry provides good employment opportunities for Automobile Diploma Engineer as service engineer, fleet manager, depot manager etc. The Automobile Diploma Engineer requires in-depth knowledge of Motor vehicle act, record keeping, estimation and valuation of vehicle, standard operating procedures and effective driving skills for deciding various transport related policies, fulfilling legal compliances, providing quality service, economic feasibility while working in transport industry.

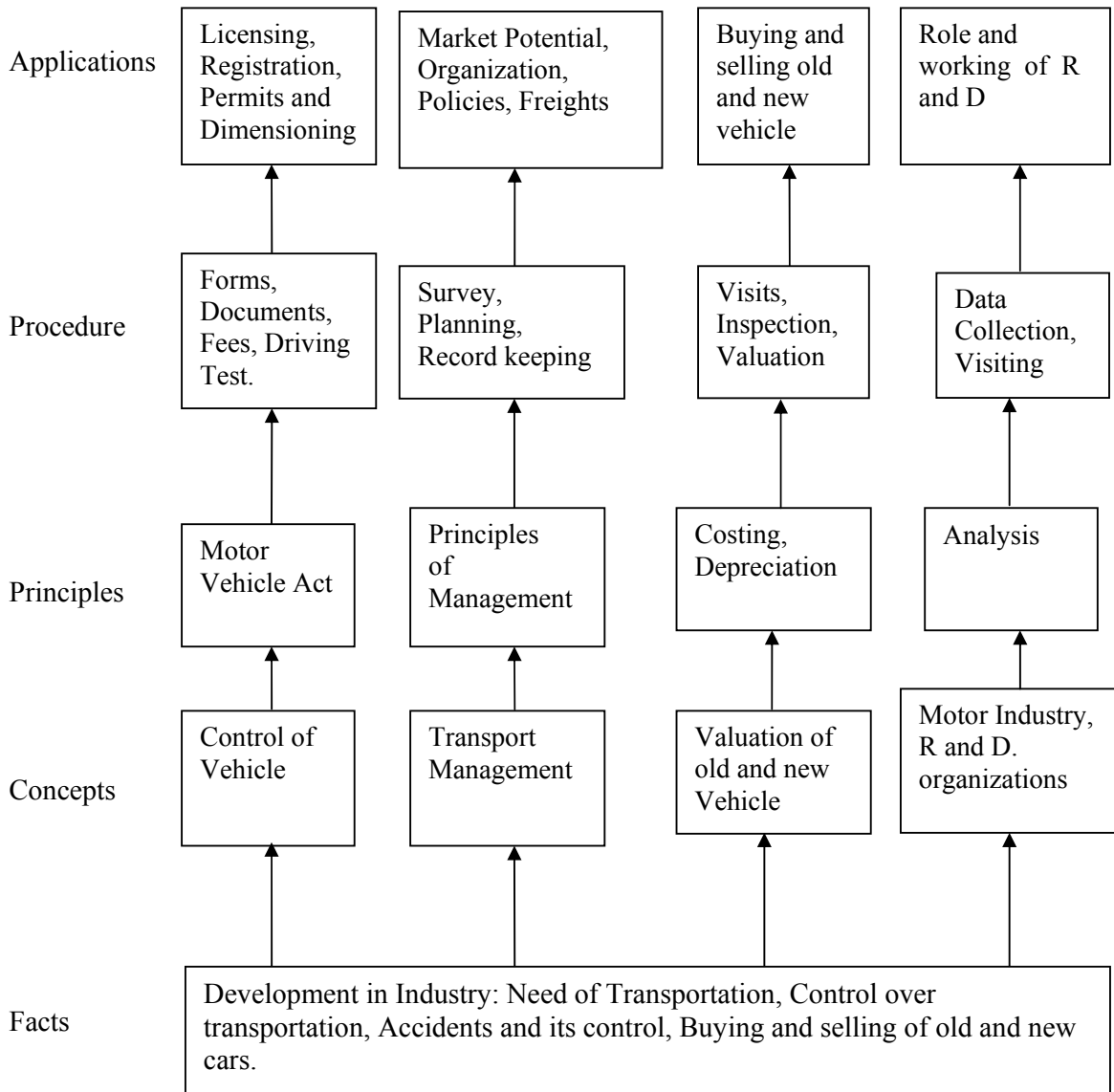
**General Objectives:**

The students will be able to:

- 1) Understand all the rules and regulations of Motor Vehicle Act.
- 2) Start own SSI unit as transport service provider and Enter in the business of buying and selling of old as well as new vehicles.
- 3) Understand the set-up, actual working and record keepings in various transport organizations.
- 4) Understand and create awareness regarding effective and safe driving skills.
- 5) Understand the purpose of research institutes in India, which are working on advancements of automobiles rather than adopting the idea of reverse engineering.
- 6) Analysis of the conditions of fittings, oil, pipes, seals and packing of hydraulic systems in automobile vehicles.



**Learning Structure:**



**Theory:**

<b>Topic and Contents</b>	<b>Hours</b>	<b>Marks</b>
<p><b>Topic 1. Introduction to Transport Management</b></p> <p>Specific Objectives:</p> <ul style="list-style-type: none"> <li>➤ Understand rules and regulations regarding Motor Vehicle Act</li> <li>➤ Describe taxation and insurance of Motor Vehicle</li> <li>➤ Understand functioning of transport authorities</li> </ul> <p>Contents:</p> <p><b>Part A]</b></p> <p>1.1 Motor Vehicle Act: <span style="float: right;">04 Marks</span></p> <ul style="list-style-type: none"> <li>• Short titles and different types of forms used in MVA</li> <li>• Definitions, Terms regarding vehicle.</li> </ul> <p>1.2 Licensing of Drivers and Conductors of Motor Vehicle: <span style="float: right;">08 Marks</span></p> <ul style="list-style-type: none"> <li>• Necessity, Eligibility, Documents required Age limit, Extent of effectiveness of licenses to drive motor vehicles, Restriction on holding a driving license.</li> <li>• Learners license, Driving license, Renewal of driving licenses, Addition of driving licenses</li> <li>• Suspension or cancellation of driving license in certain cases.</li> <li>• Duties and responsibilities of conductors.</li> </ul> <p>1.3 Registration of Vehicles: <span style="float: right;">04 Marks</span></p> <ul style="list-style-type: none"> <li>• Necessity, Where to be made, How to be made,</li> <li>• Temporary registration, Production of vehicle at the time of registration, Transfer of Ownership of Motor Vehicle, Certificate of fitness of transport vehicles</li> <li>• Suspension or cancellation of registration in certain cases.</li> <li>• Form and manner of display of registration mark, Size of letters and numerals of registration mark. High Security registration number plate</li> </ul> <p><b>Part B]</b></p> <p>1.4 Authorities and Control of Transport: <span style="float: right;">04 Marks</span></p> <ul style="list-style-type: none"> <li>• Transport authorities and their functioning, Difference between STA and RTA</li> <li>• Necessity of Permit, Types of Permit, Transfer of permit, Temporary permit, Tourist permit, National permit. Exemption from permit.</li> </ul> <p>1.5 Construction of Motor Vehicle: <span style="float: right;">04 Marks</span></p> <ul style="list-style-type: none"> <li>• Overall dimensions, General provision regarding construction and maintenance of motor vehicle.</li> <li>• Power of central government to make rules.</li> </ul> <p>1.6 Taxation: <span style="float: right;">04 Marks</span></p> <ul style="list-style-type: none"> <li>• Objectives, Basis of taxation</li> <li>• Methods of levying tax, Tax exemption.</li> </ul> <p>1.7 Insurance: <span style="float: right;">04 Marks</span></p> <ul style="list-style-type: none"> <li>• Motor Vehicle Insurance, No-fault liability</li> <li>• Procedure for accident claim, Motor Accident Claim Tribunal.</li> </ul>	15	32
<p><b>Topic 2. Passenger and Goods Transport Operation</b></p> <p>Specific Objectives:</p> <ul style="list-style-type: none"> <li>➤ Compare the modes of transportation, their scheduling and record keeping.</li> </ul> <p>Contents:</p> <p><b>Part A]</b></p>	12	24

<p>2.1 Terms used in transportation: 04 Marks Road transport service, Transport vehicle, Public service vehicle, Goods vehicle, Public place, Depot, Route, Trip, Time table, Vehicle schedule, Fare.</p> <p>2.2 Basic elements in Transport Management: 04 Marks</p> <ul style="list-style-type: none"> <li>• Market potential: Type of goods/availability of passengers, Period of use, Probable competition.</li> <li>• Selection of vehicle: Type of load, Class of passenger, Type of service.</li> <li>• Organization setup: Government, Semi Government, Private.</li> <li>• Legal compliance: Documents required as per MVA, Registration.</li> <li>• Policies of transport organization: Policies towards passenger, employees, like Long distance service, Express service, Night service and others.</li> </ul> <p><b>Part B]</b></p> <p>2.3 Layout of depot: 04 Marks</p> <ul style="list-style-type: none"> <li>• Location, elements considered in site selection</li> <li>• Passenger amenities, Infrastructural facilities required.</li> </ul> <p>2.4 Scheduling: 04 Marks</p> <ul style="list-style-type: none"> <li>• Basic factors in bus, crew (staff) and maintenance scheduling</li> <li>• Frequency, calculation of buses.</li> </ul> <p>2.5 Freight calculation: 04 Marks</p> <ul style="list-style-type: none"> <li>• Time base, Distance base, Contract, per passenger, Volume base, Weight Base method.</li> <li>• Structure of fare, fixed cost, Maintenance cost, depreciation cost, insurance, interest on capital, variable cost, Hiring of trucks, Toll, staff wages, Miscellaneous cost.</li> </ul> <p>2.6 Record keeping : 04 Marks</p> <ul style="list-style-type: none"> <li>• Log book, Trip operational sheet, Vehicle ledger, Truck history card</li> <li>• Monthly operational sheet, Goods consignment note, various types of bookings.</li> </ul>		
<p><b>Topic 3. Estimation and Valuation of Vehicle:</b></p> <p>Specific Objectives:</p> <ul style="list-style-type: none"> <li>➤ Understand various factors to be considered while buying/selling of new or old vehicle</li> </ul> <p>Contents:</p> <p>3.1 Role of surveyor- 04 Marks</p> <ul style="list-style-type: none"> <li>• Accident survey report</li> <li>• valuation of vehicle</li> </ul> <p>3.2 Buying a vehicle: 04 Marks</p> <ul style="list-style-type: none"> <li>• Buying a new vehicle: Factors to be considered -Ex-showroom price and on road price, use of vehicle, when and where to buy, Closing the deal, Running in. inspecting the vehicle, Points to check: test drive, Controls, Bonnet, Suspension, Switches, Seat, Noise, Ventilation, Safety, Boot, Interior Storage.</li> <li>• Buying a used vehicle: When and where to buy: Dealers, used car firms, Private sellers, Garages, Auctions.</li> </ul> <p>3.3 Factors to be considered: 04 Marks</p> <ul style="list-style-type: none"> <li>• Importance of warranty system and protection of law, Depreciation, Model and year, Oil leak, Oil Pressure, Exhaust, Battery, Odometer, Bonnet</li> <li>• Crash damage, ,Suspension damage, Tyres, Switches and accessories,</li> </ul>	07	16

Lights, Chrome, Wiring , Steering, Hydraulic System, Structural corrosion, Floor, Test drive. 3.4 Preparations for selling : 04 Marks <ul style="list-style-type: none"> <li>When to sell, How to sell, Auctions, Garages</li> <li>Private sale, preparing the car documentation, selling price.</li> </ul>		
<b>Topic 4. Advance Techniques in Traffic Management</b> Specific Objectives: <ul style="list-style-type: none"> <li>Apply effective and safe driving skills.</li> </ul> Contents: <ul style="list-style-type: none"> <li>Vehicle and traffic navigation system, Global positioning system</li> <li>Advanced traffic control devices, Traffic signs</li> <li>Intelligent Transport System, Smart card.</li> </ul>	06	12
<b>Topic 5. Motor Industry</b> Specific Objectives: <ul style="list-style-type: none"> <li>Understand current scenario of automobile industry.</li> </ul> Contents: <ul style="list-style-type: none"> <li>The Automobile Industry in India (Collection of Data of various companies) and Role of Automobile Engineer</li> <li>Working of various State Transport Organizations. (MSRTC, BEST)</li> </ul>	04	08
<b>Topic 6. Functions and Role of research organization in Automobile Industry:</b> Specific Objectives: <ul style="list-style-type: none"> <li>Understand current scenario of research organizations.</li> </ul> Contents: Various Research Organizations like <ul style="list-style-type: none"> <li>Central Institute of Road Transport.</li> <li>Automotive Research Association of India.</li> <li>Vehicle Research Development and Establishment.</li> <li>Central Road Research Institute.</li> <li>Petroleum Conservation and Research Association</li> </ul>	04	08
<b>Total</b>	<b>48</b>	<b>100</b>

**Note:**

- It is recommended that the eligible student as per Motor Vehicle Act should seek license up to Light Motor Vehicle.
- Staff member shall show relevant forms of R.T.O. and Insurance to students.

**Learning Resources:****1. Books:**

Sr. No.	Author	Title	Publication
01	Dr. P. Sudarsanam.	Passenger Amenities in STU	CIRT, Pune
02	Gupte and Dighe	Motor Vehicle Laws in Maharashtra	Hind Publications.
03	Dr. P. Sudarsanam.	Bus station Management	CIRT, Pune

04	Dr. P. Sudarsanam.	Bus and Crew Scheduling	CIRT, Pune
05	Bharat Kalaskar	Vahan Mitra	Sanjivini Prakashan, Pune

**M. V. Acts:**

<b>Sr. No.</b>	<b>Title</b>	<b>Publication</b>
01	Motor Vehicle Act, 1988	Home Department (M .S.)
02	Central M. V. Rules 1989	Home Department (M .S.)

**2. Websites:**

- [www.nptel.com](http://www.nptel.com)
- [www.rmctet.com](http://www.rmctet.com)

**Course Name : Diploma in Automobile Engineering**

**Course Code : AE**

**Semester : Sixth**

**Subject Title : Automotive Electrical and Electronics Systems**

**Subject Code : 17617**

**Teaching and Examination Scheme:**

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS	TH	PR	OR	TW	TOTAL
04	--	02	03	100	--	25 #	25 @	150

**NOTE:**

- Two tests each of 25 marks to be conducted as per the schedule given by MSBTE.
- 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:**

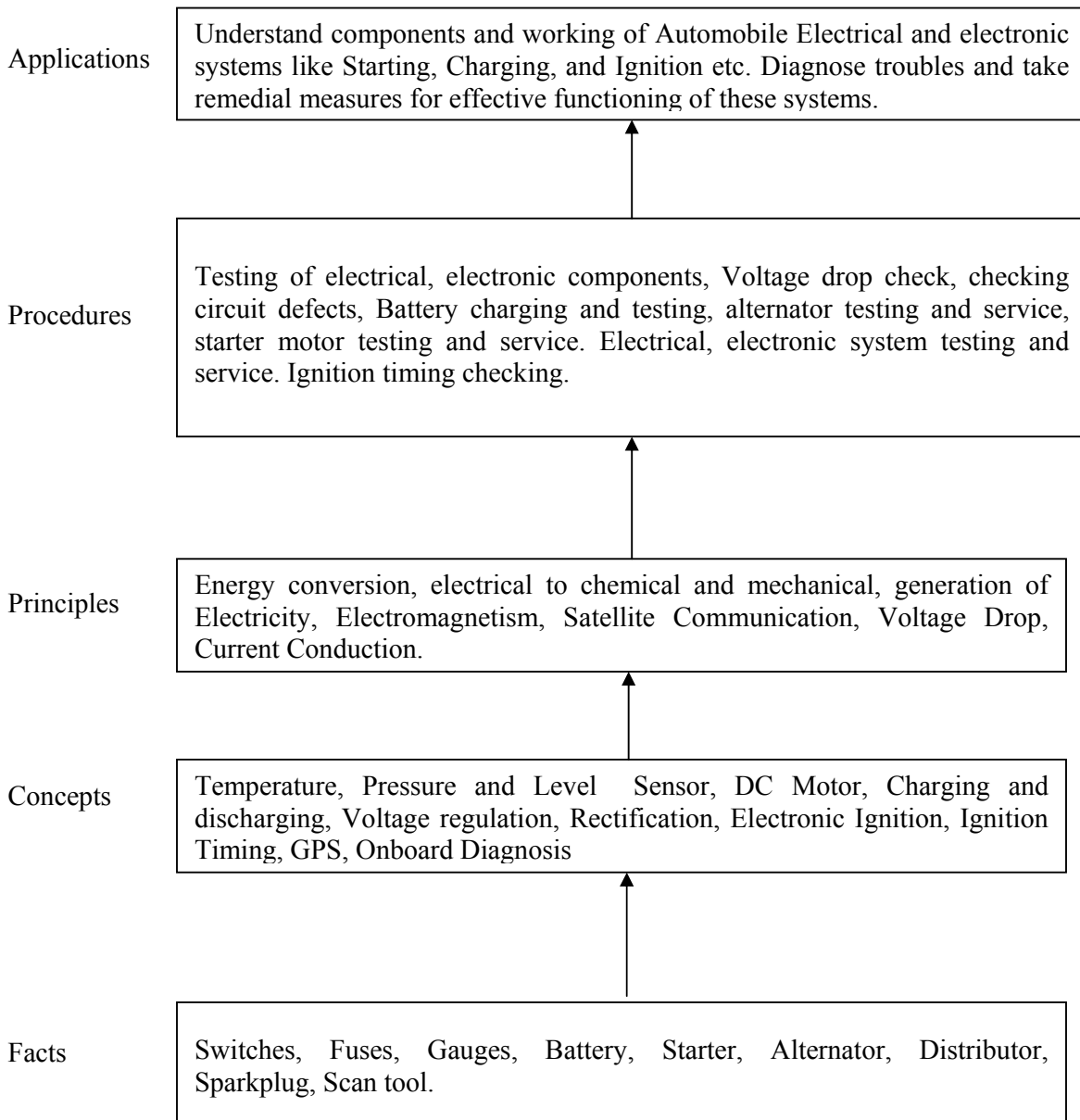
Basic Electrical and Electronics subject learnt in the previous semester forms a pre-requisite of this subject. Today majority of development in automobiles is taking place in field of automobile electrical and electronic systems. Microprocessors and Embedded systems are widely incorporated in modern vehicles. The knowledge of this subject is helpful in understanding functioning, application and maintenance of electrical and electronic circuits.

**General Objectives:**

**Students will be able to:**

- 1) Diagnose and repair the defects in the circuits, Know circuit protection devices and understand working of electromagnetic gauges as well as electrical accessories. Understand and apply onboard diagnosis.
- 2) Understand the purpose, construction, rating, testing of battery and major reasons of battery failure.
- 3) Identify components, operation and testing of starting, charging and ignition system.
- 4) Understand lighting system and accessories in modern vehicles.

**Learning Structure:**



**Theory:**

Topic and Contents	Hours	Marks
<p><b>Topic 1: Automotive Electrical and Electronic Components</b></p> <p><b>Specific Objectives:</b></p> <ul style="list-style-type: none"> <li>➤ Understand the purpose, operations and applications of various Automotive Electrical and Electronic Components.</li> <li>➤ Apply methods to test simple circuit defects.</li> <li>➤ Understand working of electrical accessories and Gauges.</li> </ul> <p><b>Contents:</b></p> <p><b>1.1</b> Purpose and operation of electrical components and circuit protection devices 08 Marks</p> <ul style="list-style-type: none"> <li>• Switches (SPST, SPDT, Ganged switch, mercury switch),</li> <li>• Relays, Solenoids, Buzzers, Resistors.</li> <li>• Fuses, Maxi fuses, Fusible links, Circuit breakers (Manual and automatic resetting types.)</li> </ul> <p><b>1.2</b> Testing of circuit defects 04 Marks</p> <ul style="list-style-type: none"> <li>• Open circuit, Short circuit, Shorts to grounds, Voltage drop.</li> </ul> <p><b>1.3</b> Working of Electromagnetic gauges and electrical accessories 08 Marks</p> <ul style="list-style-type: none"> <li>• Temp Gauges, Fuel gauge, Engine oil pressure gauge, Speedo-meter gauge</li> <li>• Washer pumps, Blower motor (only simplified wiring / block diagrams).</li> <li>• Electro chromic mirror, Power seat, Power window (only simplified wiring / block diagrams).</li> </ul>	12	20
<p><b>Topic 2: Automotive Battery</b></p> <p><b>Specific Objectives:</b></p> <ul style="list-style-type: none"> <li>➤ Identify components of automotive battery.</li> <li>➤ Understand working and types of batteries.</li> <li>➤ Apply different tests on battery and judge causes of failure.</li> <li>➤ Understand battery charging.</li> </ul> <p><b>2.1</b> Battery: Types and Testing 08 Marks</p> <ul style="list-style-type: none"> <li>• Construction and Working of following types: Lead acid battery, Maintenance free battery, Low maintenance battery, Hybrid Battery</li> <li>• Battery ratings and specifications.</li> <li>• Battery terminal test, Leakage test, Specific Gravity Test, Open circuit test, Battery drain test.</li> </ul> <p><b>2.2</b> Battery charging and Jump Starting 04 Marks</p> <ul style="list-style-type: none"> <li>• Initial charging procedure, Slow, fast rate charging and trickle charging. Precautions during charging.</li> <li>• Concept of dry charged battery.</li> <li>• Jump starting-Procedure and precautions.</li> </ul> <p><b>2.3</b> Factors affecting battery life and Battery failures 04 Marks</p> <ul style="list-style-type: none"> <li>• Cycle failure, internal short circuit, overcharging and sulphation.</li> <li>• Battery maintenance and safety precautions.</li> </ul>	09	16



<p><b>Topic 3: Starting And Charging System</b></p> <p><b>Specific Objectives:</b></p> <ul style="list-style-type: none"> <li>➤ Identify components of automotive starter and alternator.</li> <li>➤ Understand working and draw labeled circuit diagram of starting system and charging system.</li> <li>➤ Apply different tests on starter motor and alternator and judge reasons for failure.</li> <li>➤ Know importance of output Voltage regulation.</li> </ul> <p><b>Part A: Starting System</b> <span style="float: right;"><b>08 Marks</b></span></p> <p><b>3.1</b> Construction and working of starting system.</p> <p><b>3.2</b> Types of starter drive: construction and working.</p> <ul style="list-style-type: none"> <li>• Bendix and overrunning clutch types only</li> </ul> <p><b>3.3</b> Testing of starting system</p> <ul style="list-style-type: none"> <li>• Quick testing, Current draw test, Insulated circuit resistance test (voltage drop test), Ground circuit test, No crank test, free speed test.</li> </ul>	05	20
<p><b>Part B: Charging System</b> <span style="float: right;"><b>12 Marks</b></span></p> <p><b>3.4</b> Construction and operation of alternator. Initial excitation and self excitation.</p> <p><b>3.5</b> Alternator testing</p> <ul style="list-style-type: none"> <li>• Current output test, Field current draw test. Regulator output test, charging circuit resistance test (voltage drop test).</li> </ul> <p><b>3.6</b> Alternator components testing</p> <ul style="list-style-type: none"> <li>• Rotor, Stator, Internal regulator and rectifier.</li> </ul> <p><b>3.7</b> Regulation</p> <ul style="list-style-type: none"> <li>• Electronic, Computer Regulation circuit: layout and operation.</li> </ul> <p><b>3.8</b> Operation of charge indicator light circuit with simple wiring diagram</p>	08	
<p><b>Topic 4 : Ignition System</b></p> <p><b>Specific Objectives:</b></p> <ul style="list-style-type: none"> <li>➤ Identify components of ignition system and understand functions.</li> <li>➤ Understand operation of modern ignition systems.</li> </ul> <p><b>4.1</b> Conventional Ignition System- <span style="float: right;"><b>06 Marks</b></span></p> <ul style="list-style-type: none"> <li>• Need of ignition system, working of different components (ballast resister, ignition coil, distributor, spark plug, cords and condenser).</li> </ul> <p><b>4.2</b> Electronic ignition system- <span style="float: right;"><b>12 Marks</b></span></p> <ul style="list-style-type: none"> <li>• Triggering of Primary circuit: Purpose, use of Transistor, Methods of triggering (magnetic pick up, Optical, Hall effect, HEI)</li> <li>• Electronic spark timing (EST): operation and block diagram</li> <li>• Computer controlled ignition system: operation and block diagram</li> <li>• Distributorless ignition system: operation and block diagram</li> <li>• Sensors: List and functions of Crankshaft Position Sensor, Camshaft Position sensor, Detonation sensor, Cylinder Identification sensor] (No construction and working)</li> </ul>	10	18
<p><b>Topic 5: Advanced Accessories Fundamentals</b></p> <p><b>Specific Objectives:</b></p> <ul style="list-style-type: none"> <li>➤ Understand purpose and operation of advanced automotive accessories.</li> <li>➤ Know latest technology and concepts used in automobiles.</li> </ul> <p><b>5.1</b> Purpose and Operation of advanced accessories <span style="float: right;"><b>08 Marks</b></span></p> <ul style="list-style-type: none"> <li>• Automatic headlight dimming.</li> </ul>	10	14

<ul style="list-style-type: none"> <li>• Automatic on/off headlight with time delay.</li> <li>• Keyless entry system</li> <li>• Common anti-theft system</li> <li>• Automatic door lock system.</li> <li>• Park assists system.</li> </ul> <p>( No circuit diagram expected for above mentioned accessories)</p>		
<p><b>5.2</b> Introduction to microprocessor, embedded system, and GPS (block diagram only), Use and working of fiber optics and its diagnosis. 06 Marks</p>		
<p><b>Topic 6: Diagnosis of Electronic Components and Systems</b>  <b>Specific Objectives:</b></p> <ul style="list-style-type: none"> <li>➤ Apply methods to diagnose electronic sensors and actuators.</li> <li>➤ Know features of OBD and OBD terms.</li> <li>➤ Understand and identify troubles using malfunction indicator signal or diagnostic tester.</li> <li>➤ Judge reasons of failure in electronic gauges.</li> </ul>		
<p><b>6.1</b> Sensor construction, working and Testing 08 Marks</p> <ul style="list-style-type: none"> <li>• Oxygen sensor, Engine coolant sensor, Intake air temperature sensor, Throttle position sensor, Manifold absolute pressure sensor.</li> <li>• Electronic fuel Injector testing (Sound test, Ohmmeter test only)</li> </ul>	10	12
<p><b>6.2</b> Onboard diagnosis (OBD) 04 Marks</p> <ul style="list-style-type: none"> <li>• Purpose of onboard diagnostic second generation</li> <li>• Flash codes of Malfunction indicator light.</li> <li>• OBD II Concept, terminology: Drive cycle, Trip, Warm up cycle (Definitions only)</li> <li>• SAE J2012 standards Diagnostic Trouble Code(DTC) :-5 digits only</li> </ul>		
<b>Total</b>	<b>64</b>	<b>100</b>

**Practical:****Skills to be developed:****Intellectual Skills:**

1. Understand the operations of Automotive Electrical and Electronic Components, working of electrical accessories.
2. Apply various test procedures for battery as specified by manufacturer.
3. Adopt the precautions while handling a battery.
4. Identify the alternator components, starter motor components and understand test procedure of some of the components.
5. Understand the test and service procedure for spark plug, distributor and spark plug cords.
6. Identify and locate sensors and understand diagnostic procedures (on-board and stand alone diagnosis).

**Motor Skills:**

1. Test electrical circuits for simple circuit defects. Measure parameters such as current, voltage drop using multi-meter.
2. Use hydrometer, use temperature correction factor.
3. Perform starter motor tests as specified by manufacturer.
4. Perform alternator tests and component tests as specified by manufacturer.
5. Use of stroboscope operation for ignition timing adjustment.

**List of Practicals:**

1. Testing of circuit defects like open, short, short to ground, voltage drop.
2. Battery Tests- Specific gravity of electrolyte, High rate discharge test of battery. Load test of battery, Open circuit test, Battery drain test.
3. Starter Motor –Component identification, dismantling and assembly.  
– Starter current draw test and voltage drop test.
4. Alternator- Component identification, dismantling and assembly.
5. Alternator- Output test, Regulated Voltage Output Test, Charging circuit resistance test.
6. Alternator- Electrical testing of rotor and stator of alternator
7. Checking ignition timing of a multi cylinder engine with strobe (neon light)
8. Inspection of spark plug cords, Servicing of spark plugs and distributor.
9. Industrial Visit: Demonstration of On-board diagnosis at nearby automobile workshop with necessary facility, write assignment on the same.

**Note:**

1. Practical's to be conducted in group of 3-4 students.
2. Use of Auto. Electrical test bench and Trainer kits is necessary.
3. A number of practicals may be initiated simultaneously.

**List of Assignments:**

1. Study and collect information of Location, construction and working of sensors and actuators. Use books, and websites. Printed data should be added to journal
2. Write symptoms, causes and remedies for Troubles of electronic gauges like.
  - Gauge reads low constantly.
  - Gauge reads high constantly.
  - Inaccurate Gauge reading

**Learning Resources:****1. Books:**

Sr. No.	Author	Title	Publisher / Edition
01	Jack Erjavec, Robert Scharff	Automotive Technology: A System Approach	Delmar Publisher Inc
02	Anthony E Schwaller	Motor Automotive Technology	Delmar Publisher Inc. 3 <sup>rd</sup> Edition
03	Barry Hollenbeck	Automotive Electricity, Electronics and Computer Controls	Delmar Publishers

2. **IS, BIS and International Codes:** SAE J 2012 Standards

3. **Websites:** [www.howstuffworks.com](http://www.howstuffworks.com),  
[www.educyclopedia.be](http://www.educyclopedia.be)  
[www.autoshop101.com](http://www.autoshop101.com)

**Course Name : Diploma in Automobile Engineering**

**Course Code : AE**

**Semester : Sixth**

**Subject Title : Vehicle Systems Maintenance**

**Subject Code : 17618**

**Teaching and Examination Scheme:**

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS	TH	PR	OR	TW	TOTAL
04	--	04	03	100	25 #	--	25 @	150

**NOTE:**

- **Two tests each of 25 marks to be conducted as per the schedule given by MSBTE.**
- **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 system maintenance is a core technology subject deals with automobile workshop, troubleshooting, servicing and repair of engine and related systems, transmission system, brake system, steering and suspension system etc. Prerequisites for this subject are automobile engines, advanced automobile engines, automobile transmission system and automobile systems which are studied adequately in previous semesters.

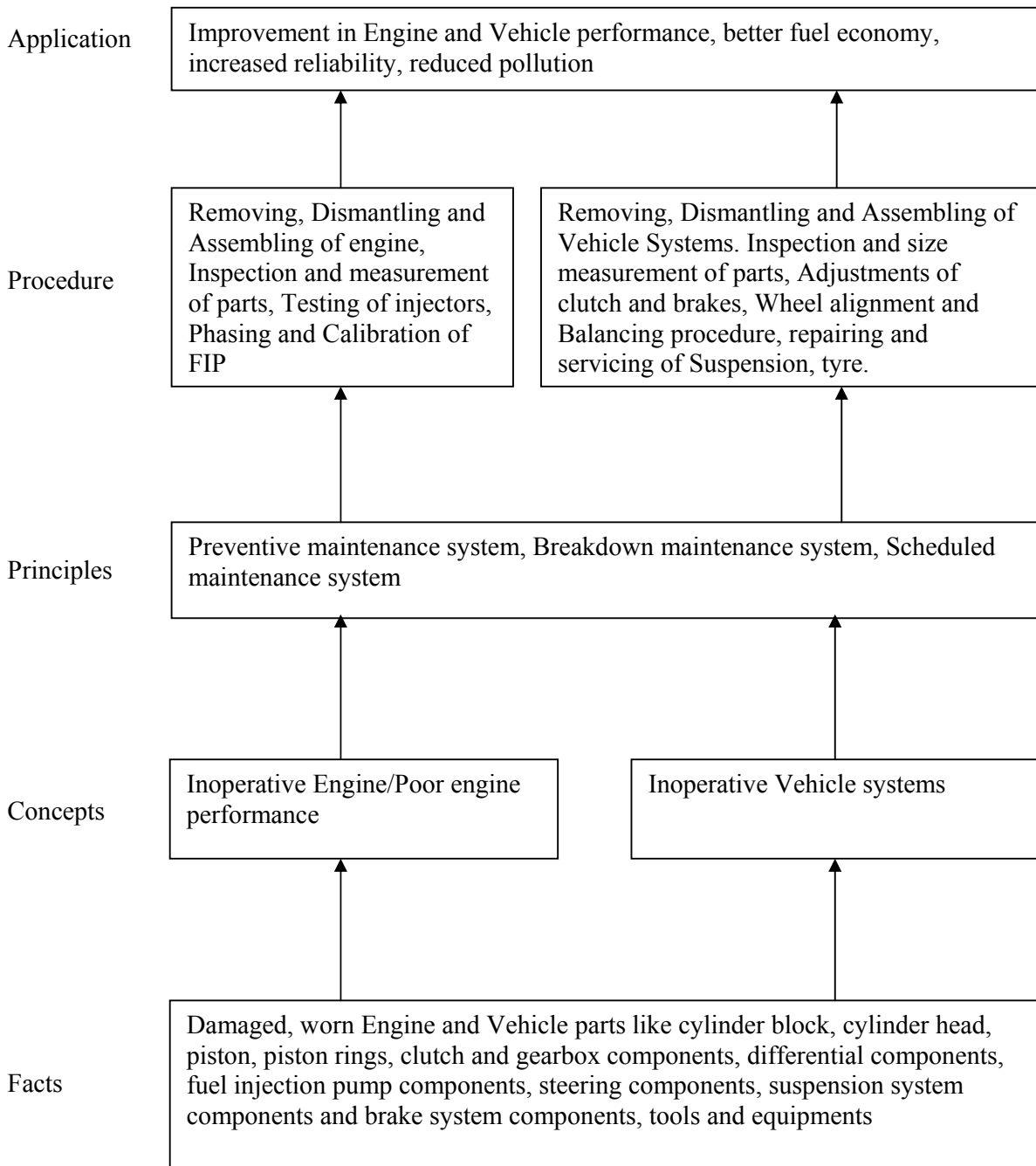
There is huge opportunity for diploma engineers in automobile service sector and entrepreneurship.

**General Objectives:**

The students will be able to:

- 1) Know the use of various workshop tools and equipments.
- 2) Draw layouts of automobile workshops, garages, and service stations.
- 3) Compare various types of maintenance systems.
- 4) Describe the general maintenance procedure.
- 5) Overhaul major components/assemblies and trouble shooting of various complaints.
- 6) Test and tune up of reassembled units/components.

**Learning Structure:**



**Theory:**

Topic and Contents	Hours	Marks
<p><b>Topic 1: Auto Workshop Layout and Equipments</b></p> <p><b>Specific Objectives:</b></p> <ul style="list-style-type: none"> <li>➤ Understand the use of different general purpose and special purpose tools and equipments required in workshops.</li> <li>➤ Know safety precautions and procedures.</li> <li>➤ Draw layouts of 2 and 4 wheeler service center, garage, modern workshop - carrying specialized repairs and list out required tools and equipments.</li> </ul> <p><b>Contents:</b></p> <p>1.1 Shop Equipments and Safety precautions</p> <ul style="list-style-type: none"> <li>• General safety precautions and procedures.</li> <li>• Functions of General shop equipments, gauges and tools with safety precautions while using: Cylinder bore gauge, Inside and outside micrometer, dial indicator gauge, Straight edge and Feeler gauge, Torque wrench, Depth gauge, Wheel balancer, Wheel aligner, Crankshaft aligner and straightner, Engine analyzer, Arbor press, Tyre changer, FIP calibration machine, Head light aligner, Valve grinder, Cylinder boring, Honing machine.</li> </ul> <p>1.2 Workshop Layouts:-</p> <ul style="list-style-type: none"> <li>• Layout with equipments required for dealers of two wheeler, four wheelers- cars and commercial vehicles and for road- side garage.</li> <li>• Layout of modern workshop for specialized job work like crankshaft repair, engine cylinder re-boring, F.I.P testing and repair, brake drum boring. Wheel balancing and alignment, Dent and paint shop etc.</li> </ul>	08	14
<p><b>Topic 2: Maintenance Management and Record Keeping</b></p> <p><b>Specific Objectives:</b></p> <ul style="list-style-type: none"> <li>➤ Understand necessity and types of maintenance, write maintenance schedule</li> <li>➤ Keep the maintenance records.</li> </ul> <p><b>Contents:</b></p> <p>2.1 Maintenance Management</p> <ul style="list-style-type: none"> <li>• Necessity of maintenance</li> <li>• Types of maintenance and their applications - Preventive maintenance system, Scheduled maintenance system, Break down maintenance system</li> <li>• General maintenance schedule –on time/day basis or kilometers traveled basis for Two wheelers, Light Motor Vehicle, Heavy Motor Vehicle</li> <li>• General servicing procedure. Decision to repair or replace.</li> </ul> <p>2.2 Record Keeping</p> <ul style="list-style-type: none"> <li>• Workshop records and their importance - History sheet, Work orders and activity file only.</li> </ul>	07	12
<p><b>Topic 3: Engine Maintenance</b></p> <p><b>Specific Objectives:</b></p> <ul style="list-style-type: none"> <li>➤ Identify the complaints, write their causes, remedies of engine and engine systems.</li> <li>➤ Know and perform engine tune up.</li> <li>➤ Perform the servicing of fuel, lubrication and cooling system</li> </ul>		

<p>components.</p> <p><b>Contents:</b></p> <p><b>Part A: Engine diagnosis, Servicing and trouble shooting 20 Marks</b></p> <p>3.1 Engine Diagnosis- Engine Smoke, oil level and condition, coolant level and condition, oil pressure testing, compression test, vacuum test, Cylinder Leakage test.</p> <p>3.2 Engine Servicing</p> <ul style="list-style-type: none"> <li>• Checking and Servicing of engine components: cylinder head, cylinder block, cylinder liners, piston, piston ring, crank-shaft, Connecting rod, valves.</li> <li>• Tuning of engine.</li> </ul> <p>3.3 Troubles, Causes and remedies in fuel, cooling, lubrication system and MPFI Engine, charging and starting system.</p> <p><b>Part B: Fuel, Lubrication and Cooling systems servicing 18 Marks</b></p> <p>3.4 Fuel feed system service, carburetor - dismantling, cleaning and tuning. Injector cleaning and testing, FIP phasing and calibration, CRDI injector servicing, MPFI -injector testing and cleaning.</p> <p>3.5 Lubrication system service. – change oil filter, check oil pump, and diagnose causes for excessive oil consumption, external oil leakage, and low oil pressure in an engine.</p> <p>3.6 Cooling system servicing - refilling of radiator, Pressure testing, thermostat checking, Leakage testing, Fan belt tension checking and adjusting.</p>	14	20
<p><b>Topic 4: Transmission System Maintenance</b></p> <p><b>Specific Objectives:</b></p> <ul style="list-style-type: none"> <li>➤ Identify faults in transmission system.</li> <li>➤ Carry-out maintenance to rectify the faults</li> </ul> <p><b>Contents:</b></p> <p>4.1 Maintenance of Clutch and Gearbox</p> <ul style="list-style-type: none"> <li>• Checking clutch plate for thickness, run out, rivet depth, slackness of torsion spring. Pressure plate surface and thickness, axial spring height.</li> <li>• Clutch adjustment – types and procedure.</li> <li>• Clutch troubleshooting – causes and remedies</li> <li>• Checking gearbox for run out of main shaft and lay shaft, oil seals, bearings, gears and synchromesh unit.</li> <li>• Gearbox Troubleshooting- causes and remedies.</li> </ul> <p>4.2 Maintenance of Final drive, Propeller shaft and rear axle.</p> <ul style="list-style-type: none"> <li>• Checking and adjusting differential for ring gear run-out, backlash in ring gear, tooth contact between ring gear and pinion, bearing preload – necessity and procedure.</li> <li>• Troubles, Causes and remedies of propeller shaft, differential and rear axle.</li> </ul>	10	16
<p><b>Topic 5: System and Body Maintenance</b></p> <p><b>Specific Objectives:</b></p> <ul style="list-style-type: none"> <li>➤ Identify faults in suspension, steering and braking system.</li> <li>➤ Carry-out maintenance to rectify the faults</li> <li>➤ Describe repair methods of body and repainting.</li> <li>➤ Identify painting defects and describe their causes and remedies.</li> </ul> <p><b>Contents:</b></p> <p>5.1 Maintenance of Brakes</p>	13	20

<ul style="list-style-type: none"> <li>• Inspection of master cylinder, wheel cylinder, brake drum, brake linings, brake disc and brake pads.</li> <li>• Adjustment of hydraulic brakes – shoe clearance, brake pedal free travel, pedal to floor clearance, parking brake adjustment.</li> <li>• Procedure of bleeding of hydraulic brakes. Types of brake bleeding.</li> <li>• Troubles, Causes and remedies of Hydraulic and Air brake system.</li> </ul> <p>5.2 Troubleshooting of suspension and Steering system</p> <ul style="list-style-type: none"> <li>• Troubles, causes and remedies of suspension system,</li> <li>• Troubles, causes and remedies of steering System.</li> </ul> <p>5.3 Maintenance of wheels and tyres</p> <ul style="list-style-type: none"> <li>• Care of wheels and tyres,</li> <li>• Procedure of tyre retreading and vulcanizing.</li> <li>• Procedure of wheel alignment by wheel alignment gauges and procedure of wheel balancing.</li> </ul> <p>5.4 Frame and Body repair</p> <ul style="list-style-type: none"> <li>• Frame repairs (for cracks, loose rivets, and skewness in frames) and alignments.</li> <li>• Body repairs- Procedure to remove dent, denting tools and equipments.</li> <li>• Adjustment of doors and locks.</li> <li>• Repainting procedure, patch work. Painting defects.</li> </ul>		
<b>Total</b>	<b>64</b>	<b>100</b>

**Practical:****Skills to be developed:****Intellectual Skills:**

1. Select tool and equipment for vehicle maintenance.
2. Diagnose faults and suggest remedies.
3. Understand tuning, backlash.

**Motor Skills:**

1. Put vehicle on the ramp
2. Use diagnostic tester
3. Use service manuals for maintenance of vehicle.

**List of Practicals:**

Sr. No	List of Practical
01	Observe and list various tools, machine equipments used in garage / workshops - write their function and precautions while handling.
02	Remove multi-cylinder engine from a vehicle, dismantle, clean, inspects, and write causes and repair procedure of following components. a) Cylinder head for warpage and cracks, refacing by grinding or cutting, straightening cylinder heads b) Cylinder block for measurement of ovality and taper, cylinder boring, honing process, changing of liners. c) Piston and piston rings for wear, appearance, and piston head for signs of deposits, over size piston, ring groove clearance, piston ring end gap, removing and refitting rings.
03	Tuning of carburetor.



04	Dismantle and do maintenance of Diesel fuel injection pump and fuel injector.
05	Servicing lubrication system- change oil filter, check oil pump, diagnose causes for excessive consumption, external oil leakage, and low oil pressure in an automobile engine.
06	To dismantle, overhaul and assemble a single plate clutch assembly.
07	Dismantle, overhaul and assemble a synchromesh gearbox of a vehicle.
08	Dismantle the propeller shaft and differential. Check wear in universal joint and slip joint, straightness in propeller shaft, remove bushes and bearing and reassemble it. Check the differential gears for wear, run out, backlash, and tooth contact. Write procedure to adjust the final drive for obtaining even tooth contact.
09	Dismantle and write procedure of adjustment of mechanical and hydraulic brakes and renewal of brake liners, repairing of master cylinder, wheel cylinder, brake chamber, brake bleeding, skimming scored brake drum.
10	Remove and refit the steering linkage and gearbox. Removing and installing of ball joints. Adjust backlash in steering gears. Adjust steering column end play and write procedure.

**Learning Resources:****1. Books:**

Sr. No.	Author	Title	Publisher
01	Tim Gills	Automotive Service	Delmar Publisher Inc.
02	Crouse / Anglin.	Automobile Mechanics	TATA McGraw – HILL
03	James Halderman	Automotive Engines- Theory and Servicing	Pearson Education
04	Anil Chikara	Automobile Engineering (Vol. III, IV and V)	Satya Prakashan, New Delhi
05	Anthony Schwaller	Motor Automotive Technology	Delmar Publisher Inc.
06	Ken Layne	Automotive Engine Performance	Prentice Hall Career Technology
07	Ian Norman, Robert Scharff, John Corinchoke	Heavy Duty Truck System	Delmar Publisher Inc.
08	--	Santro and Accent Basic training Book	Hyundai Motors India Ltd
09	--	Service Manuals of Euro-II Vehicles.	Maruti motors India Ltd.

**2. CDs, PPTs Etc.:**

- CAI Package- Experiments in Automobile Garage Practice, developed by MSBTE.

**3. Websites:**

www.howstuffworks.com ,  
www.nptel.com

**Course Name : Diploma in Automobile Engineering**

**Course code : AE**

**Semester : Sixth**

**Subject Title : Autotronics (Elective)**

**Subject Code : 17619**

**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 MSBTE.**
- **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:**

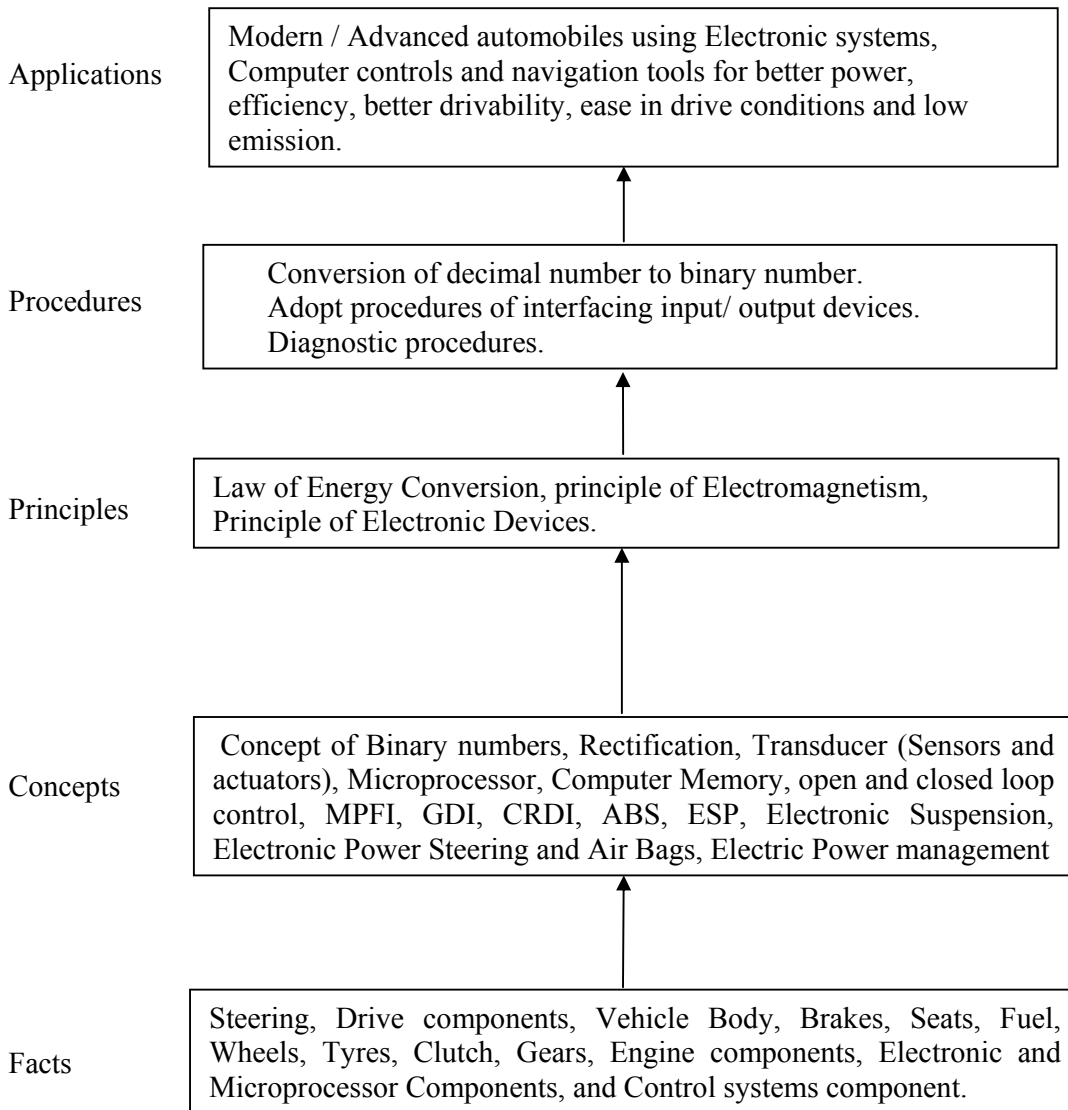
The integration of Electrical engineering, electronics engineering, Telecommunication, computer technology and control engineering in Automobile Engineering is on the rise. Automobile electronics plays a vital role in functioning of various systems of vehicle. It is desirable to have knowledge of various interdisciplinary areas by a diploma engineer, who plays a role of a technician in the Automobile Industry.

**General Objectives:**

Student will be able to

- 1) Understand Construction, working and output signals of the sensors and actuators
- 2) Understand digital visual display and analog visual display and Binary number system.
- 3) Carry out the recommended procedures of the testing sensors/ actuators using a service manual.
- 4) Know various types of Computer memories and use of the same.
- 5) Describe various types of control systems.

**Learning Structure:**



**Theory:**

<b>Topic and Content</b>	<b>Hours</b>	<b>Marks</b>
<p><b>Topic 1. Automobile Electronic Components</b></p> <p><b>Specific Objectives:</b></p> <ul style="list-style-type: none"> <li>➤ Understand various types of diodes, displays and their uses and convert decimal number to binary number.</li> </ul> <p><b>Contents:</b></p> <p><b>1.1</b> Introduction to Automobile Electronics.</p> <p><b>1.2</b> Use of Diode</p> <ul style="list-style-type: none"> <li>• Semi conductor diode - Voltage regulator in charging system.</li> <li>• Photo Diode and LED - Ignition and display system.</li> <li>• Power Diode – Alternator (Charging System)</li> </ul> <p><b>1.3</b> Introduction to digital visual display and analog visual display.</p> <p><b>1.4</b> Introduction to Binary number system.</p>	06	16
<p><b>Topic 2. Automotive Computer Technology</b></p> <p><b>Specific Objectives:</b></p> <ul style="list-style-type: none"> <li>➤ Student will be able to understand open and closed loop control systems, interfacing, and various types of computer memories</li> </ul> <p><b>Contents:</b></p> <p><b>2.1</b> Computer Basics and control systems 10 Marks</p> <ul style="list-style-type: none"> <li>• Block diagram of basic computer</li> <li>• Types of computer memory – i) Primary memory - Read only memory (ROM), Read/Write (R/W), PROM, EPROM, EEPROM. ii) Volatile memory - RAM (Random Access Memory), KAM (Keep Alive Memory)</li> <li>• Open loop and closed loop control systems</li> </ul> <p><b>2.2</b> Signal conditioning 10 Marks</p> <ul style="list-style-type: none"> <li>• Conversion of signals- Analog to Digital and Digital to Analog</li> <li>• Types of communication systems in automobile - CAN Bus, LIN Bus, Wi-Fi, Bluetooth, Ethernet, Optic Fibers, GSM networks.</li> </ul>	10	20
<p><b>Topic 3. Sensors and Actuators</b></p> <p><b>Specific Objectives:</b></p> <ul style="list-style-type: none"> <li>➤ Understand construction, working, and location of sensors and actuators</li> </ul> <p><b>Contents:</b></p> <p><b>3.1</b> Sensors 14 Marks</p> <ul style="list-style-type: none"> <li>• Construction, working and output signals of the following sensors - Crank shaft position, Oxygen, Air flow measurement, Temperature, Pressure, Camshaft position, Speed, position sensors</li> </ul> <p><b>3.2</b> Actuators 10 Marks</p> <ul style="list-style-type: none"> <li>• Construction, working of the following Actuators - Idle speed actuator, Fuel pump, Unit injector, EGR Valve, Purge control Valve</li> </ul>	12	24
<p><b>Topic 4. Vehicle Control Systems and Instrumentation</b></p> <p><b>Specific objectives:</b></p> <ul style="list-style-type: none"> <li>➤ Understand various control systems such as MPFI, GDI, CRDI, ABS, ESP, Electronic Suspension, Electronic Power Steering, and Navigation Systems.</li> </ul> <p><b>4.1</b> Vehicle control systems</p> <ul style="list-style-type: none"> <li>• Power train control system: Electronic control system used in MPFI, GDI and CRDI system.</li> </ul>	12	24

<ul style="list-style-type: none"> <li>• Motion Control System: Introduction to ABS, ESP. Electronic suspension, Electronic power steering.</li> <li>• Safety systems: (Need and working only) Air bags, Collision avoidance, Low pressure warning system, Park assists.</li> </ul> <p><b>4.2 Instrumentation</b></p> <ul style="list-style-type: none"> <li>• Vehicle instrumentation and measurement of parameters –time, speed, temperature, distance and level</li> <li>• Error analysis - types of errors and error compensation.</li> <li>• Navigation system - Global positioning system (GPS)</li> </ul>		
<p><b>Topic 5: System Diagnosis</b></p> <p><b>Specific objectives:</b></p> <ul style="list-style-type: none"> <li>➤ Understand Diagnostic Procedures and testing procedures of Systems and Transducers.</li> </ul> <p><b>5.1 On board diagnosis (OBD) of MPFI/ CRDI system.</b></p> <ul style="list-style-type: none"> <li>• Stand alone diagnosis of electronic components: Diodes, sensors and actuators of the control systems.</li> </ul> <p><b>5.2 Six step approach for Component Testing.</b></p> <p><b>5.3 Types of measuring instruments and its application while checking signals and sensors.</b></p> <ul style="list-style-type: none"> <li>• Digital multi-meters, , Oscilloscope, Thermometers, Battery testers, Lux meters, Frequency meters</li> </ul>	08	16
<b>Total</b>	<b>48</b>	<b>100</b>

**Practical:**

Skills to be developed:

**Intellectual Skills:**

1. Convert decimal number to binary number and binary number to decimal number.
2. Understand types of diodes and diagnose the condition of the same.
3. Understand types of sensors and actuators with their location in a vehicle.

**Motor Skills:**

1. Use a multi-meter for standalone diagnosis.
2. Use workshop manual and adopt diagnostic procedures.
3. Check parameters like battery voltage, charging voltage of a vehicle.
4. Use various electronic accessories, facilities and technologies available in modern motor vehicles.

**List of Practicals:**

1. Check a given Diode type and comment on the condition of the same. Convert the given Decimal numbers into Binary numbers and Binary numbers into Decimal numbers.
2. Collect specifications and features of control systems of any modern Automobile with reference to any system such as MPFI or GDI and prepare a report of the same.
3. Collect specifications and features of control systems of any modern Automobile with reference to any system such as TDI and CRDI system used in a vehicle and prepare a report of the same.
4. Collect specifications and features of control systems of a vehicle, such as: ABS, ESP, Electronic Power Steering system and prepare a report of the same.
5. Collect specifications and features of control systems of a vehicle, such as: Electronic Suspension and Navigation Systems and prepare a report of the same.
6. Identify and diagnose a sensor and comment on condition of the same.

7. Identify and diagnose an actuator and comment on condition of the same Using Autotronics trainer kit, simulate the circuit for idle air control valve or any other autotronics application.
8. Visit a modern Service Station for observing Automobile Electronic and Computer controlled systems and prepare a report of the same.
9. Prepare one block diagram for Detonation control using microprocessor, and detonation sensor. Similar controls like Fuel Injection Control, Ignition timing Control, Lambda Control, Antilock Braking System, Electronic Stability Programme may be shown using a block diagram.

**Note:**

1. Practical's to be conducted in group of 3-4 students
2. As far as possible, the teachers should make use of information, ppts, video clips available on manufacturer's websites.

**Learning Resources:****1. Books:**

Sr. No.	Author	Title	Publication
01	Allan W.M. Bonnick	Automotive Computer Controlled System.	Butter worth Heinemann
02	William B. Ribbens	Understanding Automotive Electronics. Fifth Edition.	Newnes.
03	Lynn Mosher	Auto mechanic's Guide to Electronic Instrumentation And Microprocessor.	Prentice – Hall, Inc.
04	Bosch	Automotive Handbook	Bosch

**2. Websites:**

[www.howstuffworks.com](http://www.howstuffworks.com)

**Course Name : Diploma in Automobile Engineering**

**Course Code : AE**

**Semester : Sixth**

**Subject Title : Automobile Air Conditioning (Elective)**

**Subject Code : 17620**

**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 MSBTE.**
- **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:**

Modern cars, Multi-utility vehicles, heavy passenger and goods vehicles are equipped with “heating ventilation and air conditioning (HVAC) system”. Air Conditioning system not only provides comfort but also ultimately results in road safety. Air Conditioning servicing, therefore offers good job opportunities for diploma engineers. The prerequisite for this subject is Heat Power engineering and Hydraulics and Pneumatics in earlier semester.

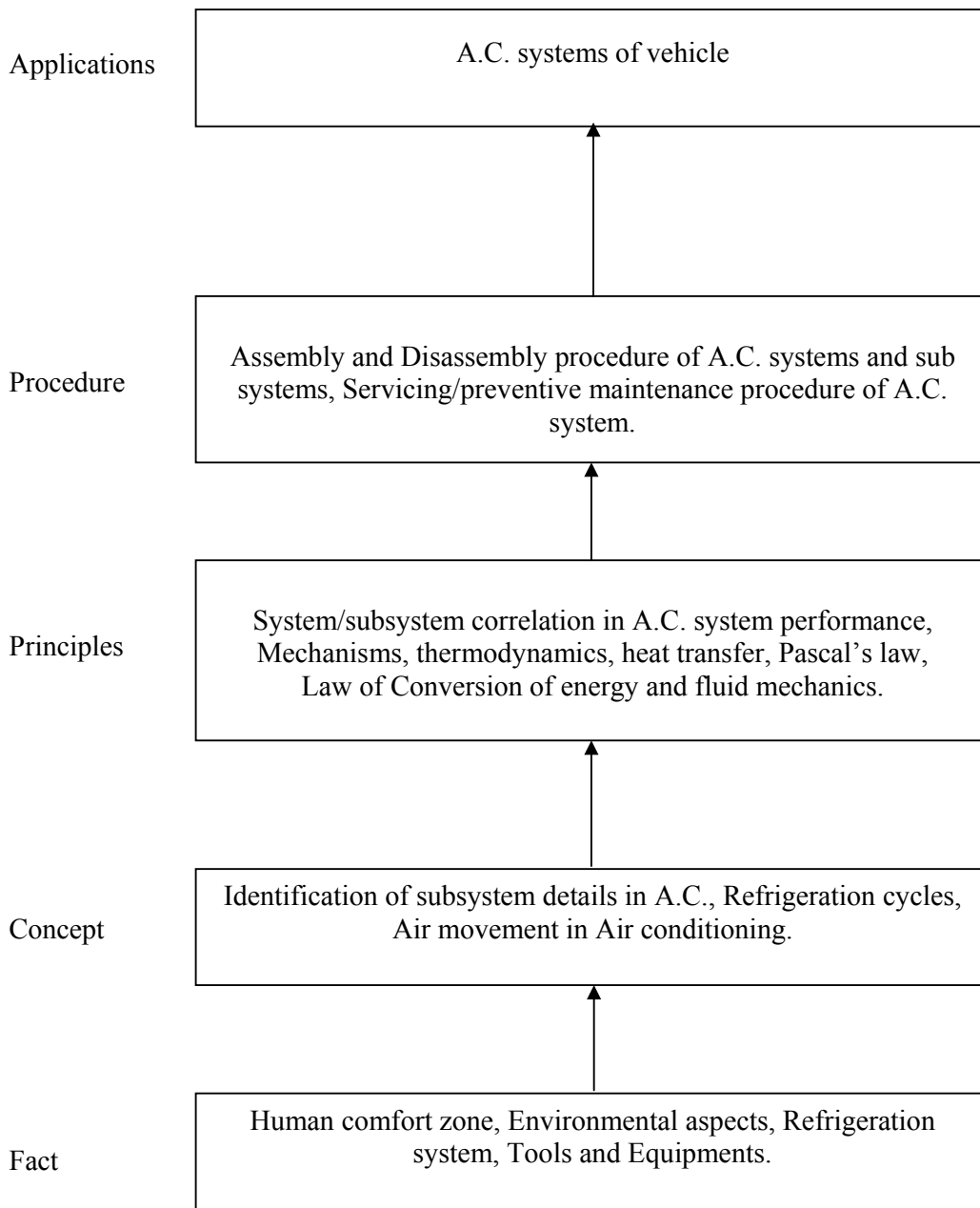
This subject will make student to understand and apply the knowledge in servicing various systems and subsystems of Air Conditioning.

**General Objectives:**

The student will be able to:

- 1) Identify various HVAC systems and sub systems.
- 2) Understand working and construction of Air Conditioning Systems and sub systems.
- 3) Carry out repair and maintenance of Air Conditioning Systems and sub systems.
- 4) Know environmental aspects related to HVAC Systems.

**Learning Structure:**





**Theory:**

<b>Topic and Content</b>	<b>Hours</b>	<b>Marks</b>
<p><b>Topic 1. Introduction</b></p> <p>Specific Objectives:</p> <ul style="list-style-type: none"> <li>➤ Know the environment temp., human body temp and comfort.</li> <li>➤ Know the heat transfer fundamentals.</li> <li>➤ Requirement of HVAC in different vehicles.</li> </ul> <p><b>Content:</b></p> <p>1.1 Introduction- <b>06 Marks</b></p> <ul style="list-style-type: none"> <li>• Environmental and safety aspects in heating, Ventilation and air conditioning systems.</li> <li>• Human comfort control - comfort zone, air movement, wind chill factor, odour problems and effects of humidity.</li> <li>• Heat transfer fundamentals-convection, radiation, evaporation and conduction.</li> </ul> <p>1.2 Requirements of heating, ventilation and air conditioning system</p> <ul style="list-style-type: none"> <li>• light motor vehicle</li> <li>• Heavy goods vehicle</li> <li>• Heavy passenger vehicle <b>04 Marks</b></li> </ul> <p>1.3 Controlled and uncontrolled ventilation - working, application and comparison. <b>04 Marks</b></p>	06	14
<p><b>Topic 2. Case and Duct System</b></p> <p>Specific Objectives:</p> <ul style="list-style-type: none"> <li>➤ Understand the construction and working of duct, case system.</li> </ul> <p><b>Content:</b></p> <ul style="list-style-type: none"> <li>• Construction and working of Air intake section, core section and distribution section.</li> <li>• Construction and working of Downstream, upstream, split and hybrid.</li> <li>• Construction and working of rear heating and cooling system</li> </ul>	06	10
<p><b>Topic 3. Air Conditioning System</b></p> <p><b>Part A</b> <b>22 Marks</b></p> <p>Specific Objectives:</p> <ul style="list-style-type: none"> <li>➤ Know the A.C. system and A.C. sub systems.</li> <li>➤ Understand construction and working of components of A.C. system.</li> </ul> <p><b>Content:</b></p> <p>3.1 Layout and Sub systems- <b>08 Marks</b></p> <ul style="list-style-type: none"> <li>• General layout of Automotive Air conditioning system.</li> <li>• Construction and working of following refrigeration sub systems</li> <li>• Thermostatic expansion valve, fixed orifice tube and rotary vane air cycle system.</li> </ul> <p>3.2 Construction and working of evaporator, condenser, accumulator. Receiver, driers and accumulator <b>06 Marks</b></p> <p>3.3 Construction and working of reciprocating, scroll and rotary vane compressors. Drive systems for compressors. <b>04 Marks</b></p> <p>3.4 Refrigerant- <b>04 Marks</b></p> <ul style="list-style-type: none"> <li>• Properties</li> <li>• types</li> <li>• Packaging and storage</li> <li>• color code and purity test</li> </ul>	10	22

<p><b>Part B</b> <span style="float: right;"><b>12 Marks</b></span></p> <p>Specific Objectives:</p> <ul style="list-style-type: none"> <li>➤ Understand construction and working and comparisons of components of sub system.</li> </ul> <p><b>Content:</b></p> <p>3.5 Construction and working of electromagnetic clutch <span style="float: right;"><b>04 Marks</b></span></p> <p>3.6 Metering devices- <span style="float: right;"><b>04 Marks</b></span></p> <ul style="list-style-type: none"> <li>• Comparison of thermostatic Expansion valve and fixed orifice tube.</li> <li>• Types, working and comparison of thermostatic Expansion valves i.e. H valve, block type, internally equalized and externally equalized.</li> </ul> <p>3.7 Functions of thermostatic expansion valve i.e. Throttling action, modulating action and controlling action. Construction and working of remote bulb. <span style="float: right;"><b>04 Marks</b></span></p>	06	12
<p><b>Topic 4. System Control Devices</b></p> <p>Specific Objectives:</p> <ul style="list-style-type: none"> <li>➤ Know the different control system and its components with its construction and working.</li> </ul> <p><b>Content:</b></p> <p>4.1 System controls - Construction and working of Typical vacuum system and electronic temperature control system <span style="float: right;"><b>04 Marks</b></span></p> <p>4.2 Construction and working of vacuum operated devices i.e. vacuum reserve tank, vacuum restrictor, vacuum motor, check valve and check relays. <span style="float: right;"><b>06 Marks</b></span></p> <p>4.3 Switches - Construction and working of high- Side temperature switch, low-side temperature switch, high pressure switch, low- pressure switch, pressure regulator, ambient switch and superheat switch. <span style="float: right;"><b>04 Marks</b></span></p> <p>4.4 Sensors- Construction and working of sun load sensor, outside temperature sensor and in car temperature sensors. <span style="float: right;"><b>04 Marks</b></span></p> <p>4.5 Controls- <span style="float: right;"><b>04 Marks</b></span></p> <ul style="list-style-type: none"> <li>• Concept of Aspirator, blower clutch control, heater control, and time delay relay for heater control.</li> <li>• Block diagram of climate control system and Electronic climate control system.</li> </ul>	10	22
<p><b>Topic 5. Repairs and Maintenance of Air Conditioning System</b></p> <p>Specific Objectives:</p> <ul style="list-style-type: none"> <li>➤ Observe and use some service equipments and Tools.</li> <li>➤ Understand maintenance of A.C. system and A.C. Component service</li> </ul> <p><b>Content:</b></p> <p>5.1 Maintenance Of A.C. Systems- <span style="float: right;"><b>06 Marks</b></span></p> <ul style="list-style-type: none"> <li>• Visual and acoustic check, side glass, leak test, Temperature test, procedure of charging and discharging. Moisture removal procedure.</li> <li>• Service equipments and tools- Vacuum pump, Manifold and gauge i.e. Low side and high side, gauge calibration recovery unit and recycling unit, Halide (Freon) and Fluorescent leak detector, nitrogen leak tester</li> </ul> <p>5.2 Symptoms, Faults , causes and remedies <span style="float: right;"><b>04 Marks</b></span></p> <ul style="list-style-type: none"> <li>• Compressor</li> <li>• Electromagnetic clutch</li> </ul> <p>5.3 Hoses and connectors - construction of system hoses, charging hose with shut off valve and connectors. <span style="float: right;"><b>04 Marks</b></span></p>	07	14

<b>Topic 6. Comfort Heating System</b>	<b>06 Marks</b>		
Specific Objectives: ➤ Know the comfort heating system and its general faults.			
<b>Content:</b> Comfort heating system		03	06
<ul style="list-style-type: none"> <li>• Function</li> <li>• Construction and working</li> <li>• Maintenance</li> <li>• general faults and their remedies</li> </ul>			
	<b>Total</b>	<b>48</b>	<b>100</b>

**Practical:****Skills to be developed:****Intellectual Skills:**

1. Select tools for servicing of heating, ventilation and air conditioning system (HVAC).
2. Diagnose control system faults.
3. Diagnose various faults in car HVAC system.
4. Understand charging and evacuation procedures of refrigerant from the HVAC system.

**Motor Skills:**

1. Perform lubrication of air conditioning system and servicing of heating system as per manufacturer's service procedure.
2. Carry-out diagnostic procedure to trace faults in car heating, ventilation and air conditioning.

**List of Practical's:**

<b>Sr. No.</b>	<b>List of Practicals</b>
1.	Observe and draw layout of Automobile Air Conditioning System and sub systems.
2.	Identification and use of tools, gauges and equipment for servicing of A.C. system.
3.	Observe and write the procedure of evacuation and charging of refrigerant from A.C. system.
4.	Observe and write the procedure of leakage test of A.C. system.
5.	Observe and Sketch of all types of Duct system.
6.	Diagnosis of control systems faults and write causes and remedies.
7.	Visit to modern garage for servicing of HVAC system. Write a report on the same.
8.	Diagnosis of various running faults in car HVAC and write causes and remedies.
9.	Perform trial on A.C. test rig and report the performance.

**Learning Resources:****1. Books:**

<b>Sr. No.</b>	<b>Author</b>	<b>Title</b>	<b>Publisher</b>
1	Boyce H. Dwiggin	Automobile Air Conditioning	Thomson Learning
2	John H Haynes and Mike Stubblefield	Automotive Heating and Air Conditioning	Haynes Publishing Group
3	William L.Crouse/ Donald Anglin	Automotive Mechanics	Tata Mcgraw Hill Publications
4	R. S. Khurmi and J. K. Gupta	A text book of Refrigeration and Air Conditioning	S. Chand
5	P. N. Ananthanarayanan	Refrigeration and Air Conditioning	Tata McGraw Hill
6	Roy Dossat	Principles of Refrigeration	Pearson Education
7	Domkunwar and Arora	Refrigeration and Air Conditioning	Dhanpat Rai and Sons.

**2. Websites:**

- [http://cx.podolsk.ru/xm/docum/Haynes\\_Techbook\\_Automotive\\_Heating\\_and\\_Conditioning.pdf](http://cx.podolsk.ru/xm/docum/Haynes_Techbook_Automotive_Heating_and_Conditioning.pdf)
- [http://www.recampus.com/documents/book02\\_c01.pdf](http://www.recampus.com/documents/book02_c01.pdf)

**Course Name : Mechanical Engineering Group**

**Course Code : AE/ME/MH/MI/PG/PT/FE/FG**

**Semester : Sixth for AE/ME/PG/PT/FG and Seventh for MH/MI/FE**

**Subject Title : Project**

**Subject Code : 17090**

**Teaching and Examination Scheme:**

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS	TH	PR	OR	TW	TOTAL
--	--	04	--	--	--	50#	50@	100

**Rationale:**

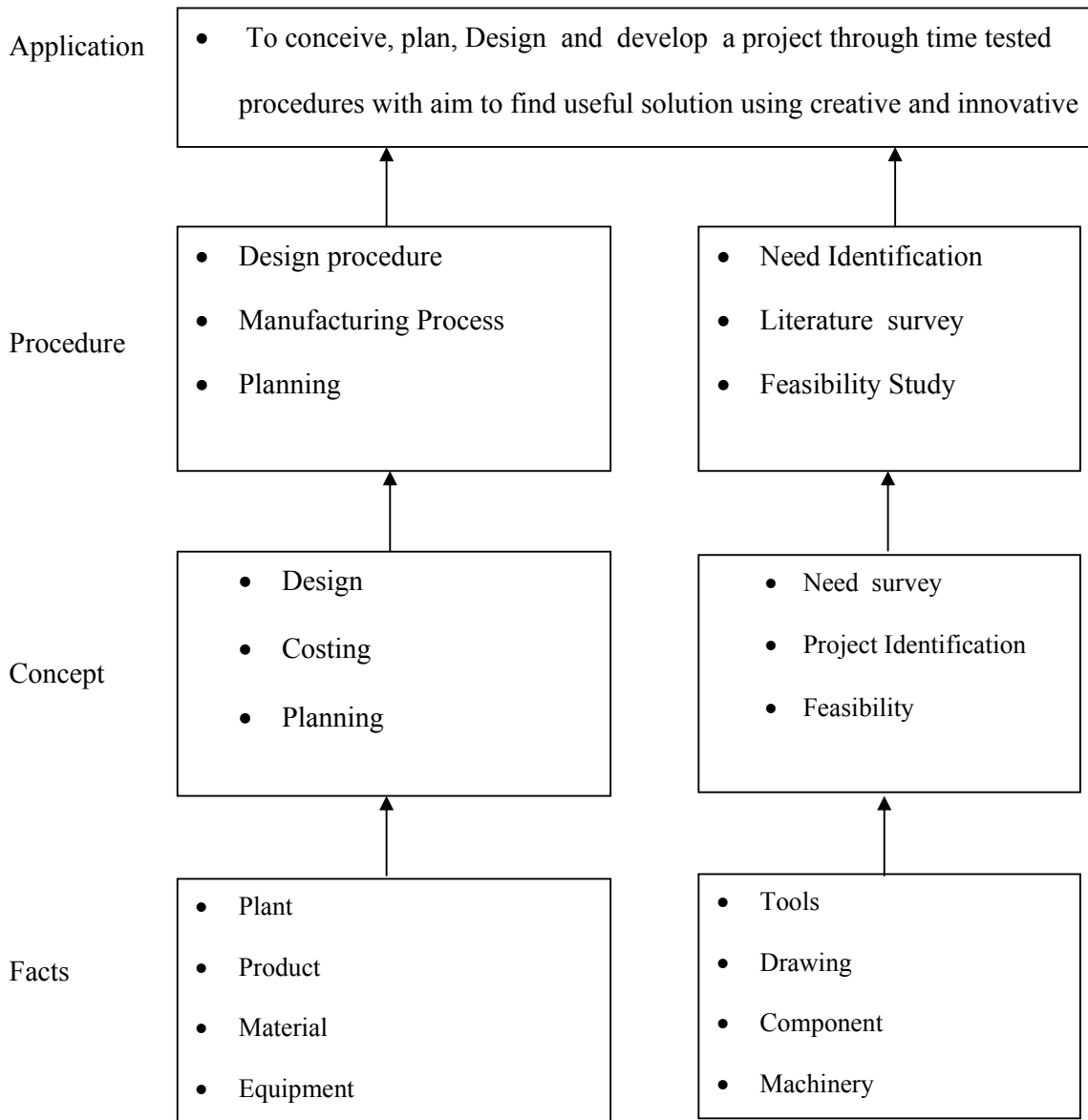
Project work allows students to use their creative and innovative ideas translating in working model, prototypes, and equipments and developing necessary hands on skills. This will allow the students to apply the previous knowledge and skills acquired during the course.

**General Objectives:**

The student will be able to:

1. Analyze the given problem.
2. Generate alternative solutions to the problem.
3. Compare & select feasible solutions amongst alternative generated.
4. Develop and manufacture new/modified equipments.
5. Acquire technical knowledge beyond curriculum.

**Learning Structure:**



**Content:**

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

1. The Selection and preliminary work regarding Project to be done as per directives given in **PROFESSIONAL PRACTICES – V** Curriculum.
2. The identified projects be executed during the semester as per the Guidance from the project Guide by the group of students (Group size max. 4 students).
3. Maintain the project diary individually for the activities performed in the format specified below.

**Project Diary format:**

Sr. No.	Date	Activity Carried out	Remarks	Signature of Guide

**SUGGESTED PROJECT WORK AREAS**

- 1) Fabrication of small machine / devices / test rigs / material handling devices / jig & fixtures / demonstration models, etc.
- 2) Design & fabrication of mechanisms, machines, Devices, etc.
- 3) Development of computer program for designing and /or drawing of machine components, Simulation of movement & operation, 3D modeling, pick & place robots
- 4) Industry sponsored projects- project related with solving the problems identified by Industry should be selected. (One person from industry is expected to work as co- guide along with guide from institution).
- 5) Literature survey based projects: Project related with collection, tabulation, classification, analysis & presentation of the information. Topic selected must be related with latest technological developments in mechanical field, and preferably beyond curriculum.
- 6) Modification in the existing machinery / equipment for improved performance.
- 7) Maintenance based projects.
- 8) Industrial engineering based project: Project based on work study, method study, methods improvement, leading to productivity improvement.
- 9) Low cost automation projects.
- 10) Innovative/ Creative projects involving generation of new ideas and converting it into a model, gadget.
- 11) Market survey based projects.
- 12) Project based on use of appropriate technology particularly benefiting rural society or economically weaker section.
- 13) Equivalent level project can be selected from other than the area specified above.

**Note:**

Project should provide viable and feasible solution to the problem identified.

Report should be of 40 TO 50 pages.

Font size of project report contents be as follows:

1. Main title: 16 bold Times new roman
2. Sub titles: 14 bold Times new roman
3. Running matter: 12 Times new roman, paragraph 1.5 line spacing,
4. Margin spacing 1.5 inch from left and 1 inch from other sides.

**Preferably actual photographs / video clips showing progress of project work at different stages be added to project report).**

**Suggested framework for the project report:**

The topics/ contents of the project report should be as follows:-

- Abstract
- Topic introduction / Philosophy
- Literature Survey / Methodology adopted
- Principle (aim objectives of the Project work)
- Data collection / Design consideration/Basic Framework / Design / Drawing
- Manufacturing Processes and Process Sheets (if relevant)
- Assembly (if relevant)
- Performance / Calculations etc. (If relevant)
- Costing
- Results and Discussion
- Conclusion
- Future Scope
- Bibliography/ References

**Learning Resources:**

**Reference Books:**

<b>Sr. No.</b>	<b>Name of Book</b>	<b>Author</b>	<b>Publisher</b>
1	Project Management	Maylor	Pearson Education
2	Project Management And Appraisal	Khatua	Oxford University Press
3	Project Management/2/e	Bhavesh Patel	Vikas Publishing House
4	Project Management 3/e	Vasant Desai	Himalaya Publishing House
5	Project Management The Managerial Approach	Gray	TMH



**Course Name : Mechanical Engineering Group**

**Course Code : AE/ME/PG/PT/MH/MI/FE/FG**

**Semester : Sixth for AE/ME/PG/PT/FG and Seventh for MH/MI/FE**

**Subject Title : Entrepreneurship Development**

**Subject Code : 17099**

**Teaching and Examination Scheme:**

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

**Rational:**

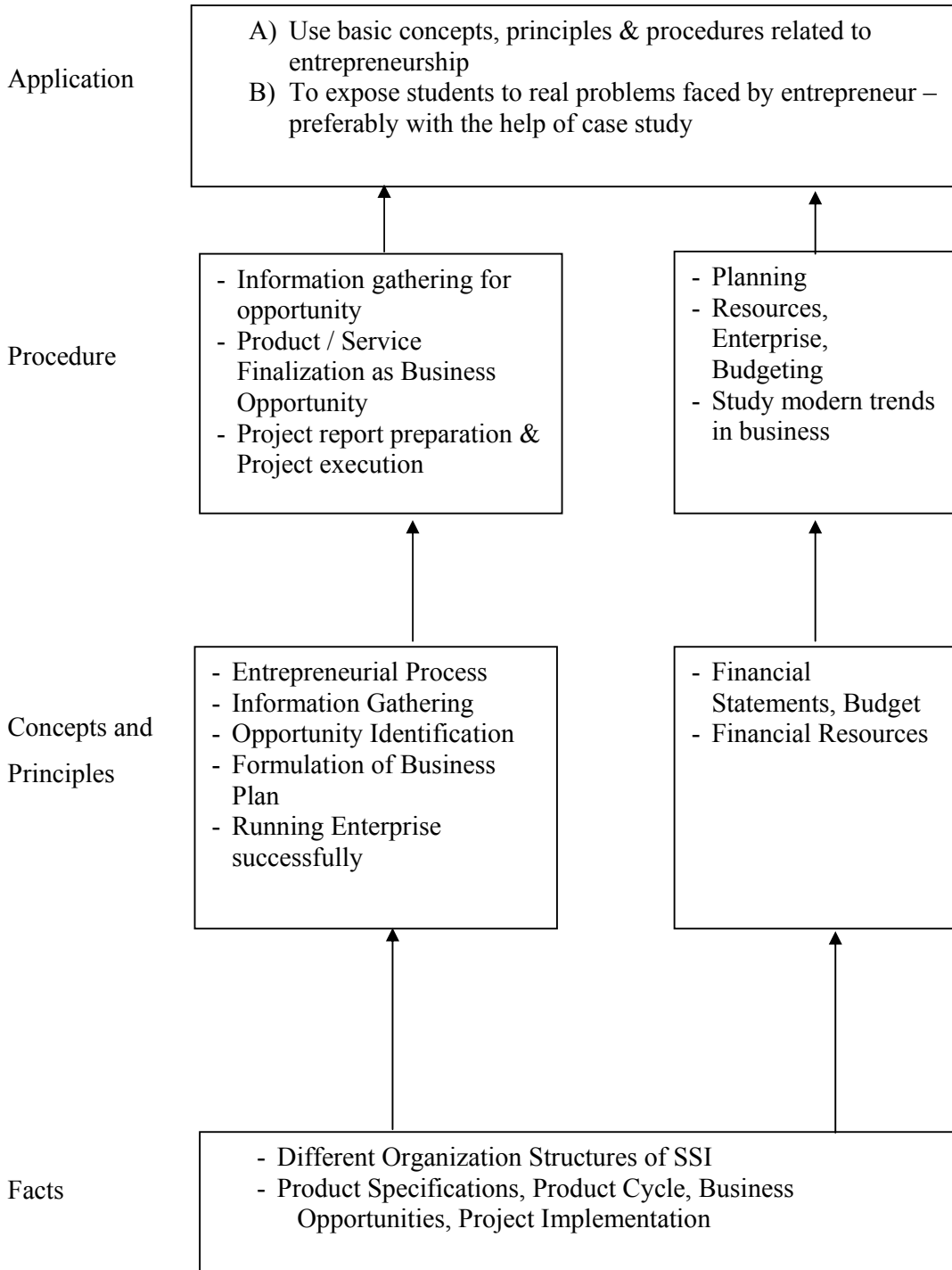
Globalization, liberalization & privatization along with revolution in Information Technology, have thrown up new opportunities that are transforming lives of the masses. Talented and enterprising personalities are exploring such opportunities & translating opportunities into business ventures such as- 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. This subject will help in developing the awareness and interest in entrepreneurship and create employment for others.

**General Objectives:**

The students will be able to

- 1) Appreciate the concept of Entrepreneurship
- 2) Identify entrepreneurship opportunity.
- 3) Develop entrepreneurial values and attitude.
- 4) Collect and use the information to prepare project report for business venture.
- 5) Develop awareness about enterprise management.

**Learning Structure:**



**Content:**

<b>Topic and Contents</b>	<b>Hours</b>
<p><b>1. Entrepreneurship, Creativity &amp; Opportunities</b>  <b>Specific objectives:</b></p> <ul style="list-style-type: none"> <li>➤ Know the characteristics of entrepreneur and business</li> </ul> <p><b>Contents:</b>            1.1 Concept, Classification &amp; Characteristics of Entrepreneur            1.2 Creativity and Risk taking.            1.3 Business types and Reforms            1.4 SWOT Analysis</p>	03
<p><b>2. Information and Support Systems for Development of Entrepreneurship</b>  <b>Specific objectives:</b></p> <ul style="list-style-type: none"> <li>➤ Know the various information sources and support systems</li> </ul> <p><b>Contents:</b>            2.1 <b>Information Sources:</b> Information related to project, procedures and formalities            2.2 <b>Support Systems</b>            1) Business Planning &amp; Requirements for setting up an SSI            2) Govt. &amp; Institutional Agencies (Like MSFC, DIC, MSME, MCED, MSSIDC, MIDC, LEAD BANKS) Statutory Requirements and Agencies.</p>	03
<p><b>3. Market Assessment and feasibility</b>  <b>Specific objectives:</b></p> <ul style="list-style-type: none"> <li>➤ Know the market requirement and customer needs through survey and feasibility analysis</li> </ul> <p><b>Contents:</b>            3.1 Marketing -Concept and Importance, Market Identification.            3.2 Customer need assessment, Market Survey, Product feasibility analysis</p>	02
<p><b>4. Business Finance &amp; Accounts</b>  <b>Specific objectives:</b></p> <ul style="list-style-type: none"> <li>➤ Know the basics of elements of costing, financial resources and business accounting procedure</li> </ul> <p><b>Contents:</b>            4.1 <b>Business Finance:</b> Costing basics, Sources of Finance, Break Even Analysis.            4.2 <b>Business Accounts:</b> Book Keeping, Financial Statements, Financial Ratios and its importance, Concept of Audit.</p>	03
<p><b>5. Project Report Preparation</b>  <b>Specific objectives:</b></p> <ul style="list-style-type: none"> <li>➤ Understand and plan the steps in starting the business</li> <li>➤ Prepare project report and carry out project feasibility study</li> </ul> <p><b>Contents:</b>            5.1 Business plan: Steps involved from concept to commissioning            5.2 <b>Project Report</b>            1) Meaning and Importance            2) Components of project report/profile            5.3 <b>Project Feasibility Study:</b>            1) Meaning and definition            2) Technical, Market, Financial feasibility</p>	03
<p><b>6. Enterprise Management And Modern Trends</b>  <b>Specific objectives:</b></p> <ul style="list-style-type: none"> <li>➤ Know the role of entrepreneur in management of enterprise</li> <li>➤ Understand the concept of E-Commerce</li> </ul> <p><b>Contents:</b></p>	02

6.1 <b>Enterprise Management</b> 1) Essential roles of Entrepreneur in managing enterprise 2) Probable causes of sickness	
6.2 E-Commerce: Concept and process	
6.3 Global Entrepreneur	
<b>Total</b>	<b>16</b>

**Tutorial:**

Sr. No	Assignments
1	Assess yourself-are you an entrepreneur?
2	An Interview with an Entrepreneur.
3	Feasibility study of a product.
4	Prepare a Project Report for starting a small scale business.

**Note** - A teacher shall guide the students during tutorial periods for writing the above assignments.

**Learning Resources:****1) Reference Books:**

Sr. No.	Name of Book	Author	Publisher
1	Entrepreneurship	Trehan	Dream Tech Press
2	Entrepreneurship 2/e	Rajeev Roy	Oxford University Press
3	Entrepreneurship and Small Business	Schaper	Wiley India Publication
4	Entrepreneurship Development	Colombo plan staff college for Technical education.	Tata McGraw Hill Publishing co. ltd. New Delhi.
5	Poornima M. Charantimath	Entrepreneurship Development of Small Business Enterprises	Pearson Education
6	Entrepreneurship Development	E. Gorden K.Natrajan	Himalaya Publishing. Mumbai

**2) Video Cassettes:**

Sr. 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: <a href="mailto:ediindia@sancharnet.in">ediindia@sancharnet.in</a> / <a href="mailto:olpe@ediindia.org">olpe@ediindia.org</a> Website : <a href="http://www.ediindia.org">http://www.ediindia.org</a>
2	Assessing Entrepreneurial Competencies	
3	Business Opportunity Selection and Guidance	
4	Planning for completion & Growth	
5	Problem solving-An Entrepreneur Skill	