CURRICULUM REVISION PROJECT

2012

TEACHER GUIDE FOR

(Automobile Engines-17408)

FOURTH SEMESTER AE-4G AUTOMOBILE ENGINEERING GROUP

DECEMBER 2013

MAHARASHTRA STATE
BOARD OF TECHNICAL EDUCATION, Mumbai
(Autonomous) (ISO 9001:2008) (ISO/IEC 27001:2005)

1. APPROACH TO CURRICULUM DESIGN

1.1 Background:

MSBTE is introducing the revised curriculum under 'G' scheme from the academic year 2012-13.

There are many institutions in the state running different diploma courses. In order to ensure uniform and effective implementation of the curriculum it is necessary that every teacher is aware of approach for curriculum design, educational principles to be adopted, learning resources to be used and evaluation methods. The teacher guide prepared for each subject will provide the inputs related to above mentioned aspects to achieve uniform and effective implementation of curriculum of various subjects.

1.2 CURRICULUM PHILOSOPHY

MSBTE has adopted systems approach while designing the scientific based curriculum since 1995. The same approach has been adopted while revising the curriculum in semester pattern.

Fig. No. 1 shows the systems diagram. This diagram provides the holistic view for curriculum designing, development, implementation and evaluation

The input to polytechnic education system is the students having 10+ qualifications. The teaching learning process occurs in the institution for six/eight semesters. The output of the system i. e. Diploma pass out is normally the input to industries. (Some students do go for higher education). While designing the curriculum the expectations of the industries play a major role. Due to globalization and competition the industries expect that pass outs have generic and technological skills along with right attitude.

To fulfill the needs derived from systems approach following conceptual framework is considered:

1.3 Curriculum:

"Curriculum is an educational program designed and implemented to achieve specified educational objectives"

This definition takes into account the fact that

- Education is purposeful
- There is an organized plan of action contemplated
- Such a plan is translated into action through appropriate strategies of implementation.

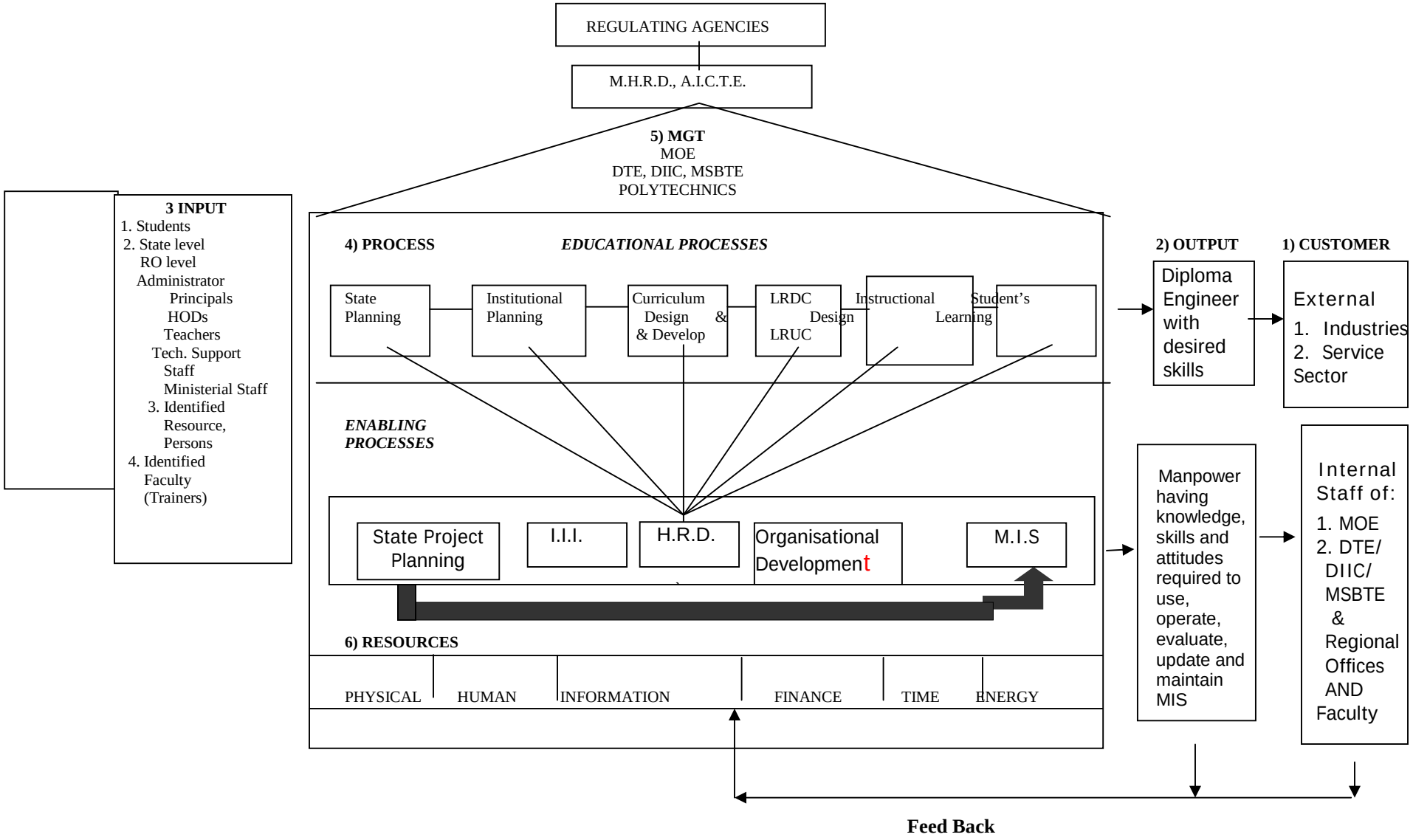


Fig 1 Systems Approach

1.4 Curriculum goals

1. To develop l. confidence in students by providing more exposure to industry experience and world of work at global leve
2. To provide conceptual knowledge and develop analytical ability
3. To develop communication skill with good English by providing sufficient practice
4. To enhance latest technical knowledge industry interaction and media
5. To develop learning to learn skills and life skills to cope up with industrial culture
6. To impart managerial skills by providing appropriate theoretical inputs
7. To develop problem solving ability through technical projects.

1.5 DESIRED SKILLS

Industries expect from the diploma engineer the abilities and skills of general nature and specific to the job performance. The curriculum aims at developing life skills and technological skills so that the diploma pass outs would be suitable for industry. The skills are listed below:

Life Skills:

- Search information from various sources
- Develop communication ability
- Develop Presentation skill
- Work as a member of a team/group and as leader
- Collect field data
- Develop Learning to learn
- Write report for given task/work/project
- Develop computer proficiency
- Develop observation skills

Technological Skills:

Diploma engineers should possess following Technological skills in order to satisfactorily perform duties assigned to them:

A) **Intellectual Skills**:

1) Read and interpret Automobile Engineering drawings.
2) Prepare spares and labor estimates for vehicle service.
3) Carryout loss assessment of accident vehicle.
4) Design simple automobile engineering components.
5) Prepare job card and warranty report.
6) Plan, execution of various vehicle service activities.
7) Test vehicle repair quality, prepare reports and interpret them.
8) Use various automobile engineering software.
9) Follow various standards and codes.
10) Maintain records in various formats.
11) Carry out vehicle scheduled and breakdown maintenance.
12) Maintain fleet of vehicle and keep transport related documents.
13) Supervise service and production work.
14) Select appropriate technique for quality control.

A) Motor Skills.

1) Prepare manual and Computer generated Automobile engineering drawings.
2) Use measuring instruments and prepare inspection reports.
3) Handle testing of equipments.
4) Lay out of different types of vehicle.
5) Draw free hand sketches of automobile components.

1.5 Salient Changes in the curriculum:

- For First Semester Basic Science is divided into two parts- Basic Physics and Basic Chemistry. Theory examination of both parts as well as practical examination of both parts will be conducted on separate days. Sum of theory marks of both parts shall be considered for passing theory examination of Basic Science. Similarly it is applicable to practical examination. It is mandatory to appear for theory and practical examination of both parts. Candidate remaining absent in any examination of any section will not be declared successful for that exam head.

- For second semester Applied Science is divided into two sections- Applied Physics and Applied Chemistry where the theory examination of 50 marks each and practical examination of 25 Marks each will be conducted separately and the minimum passing marks for Engineering Science will be the combination of both the sections. . It is mandatory to appear for theory and practical examination of both parts. Candidate remaining absent in any examination of any section will not be declared successful for that exam head.
- The components of Development of Life Skills were taught in two semesters. In Development of Life Skills –I the topics related to personal development, such as Learning to Learn Skills, personality development, presentation skills etc. were included. In Development of Life Skills – II the topics related to Team Building, Leadership, group behavior etc. were covered. In the revised curriculum the scope of development of life skills has been broaden to include behavioral science component. Therefore the subject Development of Life Skills – II has been renamed and it is now included at Vth Semester in the revised curriculum under the title Behavioral Science.
- The subject of Professional Practices was introduced to integrate the skills acquired in Development of Life Skills, through technical subjects from second to sixth semester. The experience in implementing the contents of the subject shows that there are limited activities possible in second semester as the technical knowledge given to the students is very limited. Also at sixth semester the student are doing projects in which they are performing many activities included in the Professional Practices and therefore it is proposed that the subject of Professional Practices be prescribed only for three semesters vis. Third, fourth and fifth semesters.
- Introduction of Environment Engineering at fourth Semester for all courses
- From the experience of implementation of Elective Subjects at V and VI semesters in last five years, it is proposed to have only one elective either at the fifth and sixth semesters for all courses. However the specialized courses like Medical Electronics, Electronics and Video Engineering will not have provision for electives. For elective, student will have to choose one from the given two/three subjects.
- While revising the curriculum redundant /obsolete topics/sub topics are being replaced by new/advance technology topics/sub topics.

- In Mechanical Engineering Group CADD, 3D Modelling, CNC Machines, Engine Maintenance (AUTO) are introduced as independent subjects.
- In Civil Engineering Group CAD has been added as an independent subject.
- In Electronics Engineering Group simulation software has been introduced, weightage of Microprocessors is reduced and more weightage is given to Microcontrollers, topics on PLC and SCADA are added, contents of discrete circuits are reduced and emphasis is given on integrated circuits.
- In Electrical Engineering new topic of LED lighting has been added in Illumination Engineering subject. Similarly introduction of residential solar lighting systems, topics like duties and responsibilities of Electrical Inspector, Commercial aspects of power utilities have also been added. Heating, Ventilation & Air-conditioning (HVAC) has been deleted from the revised curriculum. Subject of Power System Operation has been introduced at VI Semester Electrical Course also.
- In Automobile Engineering, new subjects like 2-Wheeler Technology, Auto-tronics . Solid modeling, Cad (Auto) are introduced.

2. OBJECTIVES

2.1 Introduction

Objectives are the statements which describe the expected learning outcome. Such statements enable teachers to plan instructional process with appropriate resources. These objectives also provide a direction to frame proper questions to assess the learning outcome. During last decade there has been research on cognitive approach in psychology. This approach is based on biological structure of brain and meta-cognitive knowledge dimension. Important elements of this approach which form basics of learning are explained below.

2.2 Domains of Learning:

Learning is a process by which students develop relatively permanent change in mental associations through experience. This is how learning is defined by cognitive psychologists. Behavioral; psychologists define learning as a relatively permanent change in behavior.

There are following domains of learning:

A: Cognitive Domain relates to intellectual skills or abilities

B: Affective Domain relates to emotions, feelings, likes, dislikes etc.

C: Psychomotor Domain relates to manipulative skills of hands, legs. Eye-hand coordination in Engineering & Technology courses, endeavor is made to design curriculum with a focus on development of cognitive skills through classroom teaching. Where as manipulative (psychomotor) skills are developed in workshops, laboratories & seminars where students work individually or in a group. Development of affective skills attitudes and value is supposed to be acquired through projects and co curricular activities. These are also developed from the work culture or institutions.

How far a student has developed these abilities/skills especially from cognitive and psychomotor domains is assessed on the basis of suitable examinations. When classroom and laboratory teaching is viewed in this light, evaluation becomes an integral part of teaching – learning process.

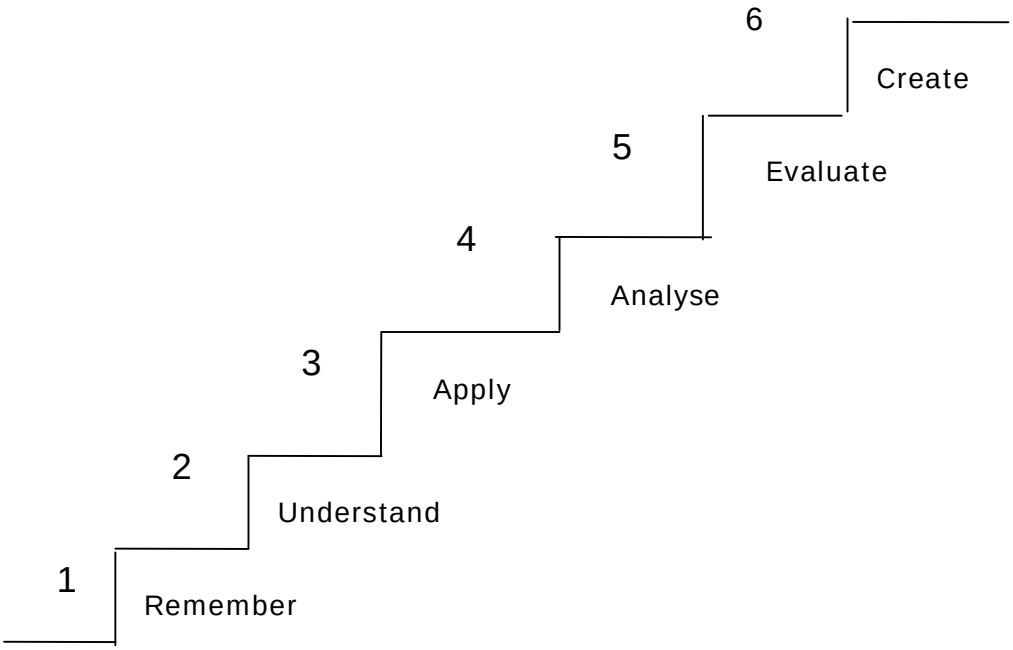
2.3 LEVELS OF LEARNING:

Question paper is a tool/ instrument designed to test the extent of learning of the student. Various questions set in a question paper should assess the abilities of students to respond to level of learning. Dr. Bloom a German educationist classified levels of learning in cognitive domain for the purpose of writing objectives and assessment. Dr. Bloom's revised taxonomy is based on cognitive psychology and is two dimensional. First dimension is cognitive process dimension ad other is knowledge dimension. Details of these two dimensions are given below.

2.4.1 Cognitive Domain:

Dr. Benjamin Bloom (1956) analysed questions asked in various examinations in American situation and proposed a hierarchical arrangement of instructional objectives (Intellectual abilities) tested by these questions.

The lowest level of cognitive learning achieved by a student is demonstrated by the recall of information that the student retrieves from his long term memory. So, the storage and retrieval of specific facts, concepts, principles, laws, definitions, properties, procedures etc. directly from memory was classified as a knowledge level objective. Thus questions testing memory of students were treated as at the lowest level of the hierarchy of intellectual abilities. The other levels of hierarchy proposed by Dr. Bloom in 1956 relate to the degree of information processing required in the brain needed to provide answer to a question. The various levels in the cognitive hierarchy proposed by Dr. Bloom in 1956 and further revised in 2001 are given below in the diagrammatic form.



Following are the details of each level which indicate the general and specific objectives. Further appropriate verbs are given which are useful in setting good questions. In this table only four levels are considered for diploma students.

Description of the Major Levels in the cognitive Domain (Bloom's Taxonomy)	Illustrative General Instructional Objectives	Illustrative verbs for stating specific learning outcomes
Remember – Knowledge is defined as the remembering of previously learned material. This may involve the recall of a wide range of material, from specific facts to complete theories, but all that is required to mind of the appropriate information. This represents the lowest level of learning outcomes in the cognitive domain	Knows common terms, specific facts, basic concepts, principles, methods & procedures	Define, describe, identify label, list, match, name, outline, reproduce, select, state
Understand – This is defined as the ability to grasp the meaning of material. This may be shown by translating material from one	Understands fact, principles Interprets verbal material,	Convert, distinguish estimate, explain,

form to another (words or numbers) by interpreting material (explaining or summarizing), and by estimating future trends (predicting consequences or effects). Draw sketches these learning outcomes go one step beyond the simple remembering of material and represent the lowest level of understanding.	Interprets charts, tables, graphs. Translates verbal material to mathematical formula. Estimates consequences implied in data. Justifies methods & procedures.	extend, generalize, give examples; infer, paraphrase, predict, rewrite, summarize, draw labeled sketches.
Apply – Application refers to the ability to use learned material in new and concrete situations. This may include the application of such things as concepts, principles, rules, methods, laws and theories. Learning outcomes in this area require a higher level of understanding than those under the level described earlier.	Applies principles to new situations. Applies theories to practical situations. Solves mathematical problem. Construct charts, graphs Demonstrates correct usage of a procedure	Change, compile, demonstrate, discover manipulate, modify operate, predict, prepare, produce, show, solve, use.
Analyze – Analysis refers to the ability to break down material into its component parts so that its organizational structure may be understood. This may include the identification of the parts, analysis of the relationship between parts, and recognition of the organizational principles involved. Learning outcomes here represent a higher intellectual level than "understand" and apply because they require an understanding of both the content and the structural form of the material.	Recognizes unstated assumptions and logical fallacies in reasoning. Distinguishes between facts and inferences. Evaluates relevance/ adequacy of data.	Breakdown, diagram, differentiate, discriminate, distinguish, identify illustrate, infer, outline, point out, relate, select, separate, subdivide.

2.4.2 Categories of Knowledge Dimension

After considering the various designations of knowledge types, especially developments in cognitive psychology that have taken place since the original framework of Bloom's taxonomy, knowledge is categorised in 4 types – Factual , Conceptual, Procedural and Meta-cognitive.

Factual Knowledge (A) is knowledge of discrete, isolated content elements. It includes knowledge of terminology and knowledge of specific details and elements. In contrast,

Conceptual Knowledge (B) is knowledge of "more complex, organised knowledge form". It includes knowledge of classifications and categories, principles and generalizations and theories, models and structures.

Procedural Knowledge (C) is "knowledge of how to do something". It includes knowledge of skills and algorithms, techniques and methods, as well as knowledge of criteria used to determine and/or justify "when to do what" within specific fields and disciplines.

Meta-cognitive knowledge (D) is "knowledge about cognition in general as well as awareness of and knowledge about one's own cognition. It encompasses strategic knowledge, knowledge about cognitive tasks, including contextual and conditional knowledge; and self-knowledge".

Assessment is required to be done on the basis of categories of knowledge and levels of learning. Table below indicates the two dimensional grid based on Blooms Taxonomy for setting questions.

Knowledge Dimension	COGNITIVE PROCESS DIMENSION			
	1 Remember	2 Understand	3 Apply	4 Analyze
A. Factual Knowledge				
B. Conceptual Knowledge				
C. Procedural Knowledge				
D. Meta-cognitive Knowledge				

2.5 Components of Curriculum:

2.5.1 Rationale: It indicates the logical basis for the inclusion of the subject in the curriculum It also indicates the importance of the subject related to entire curriculum.

Rationale tells the students the connection of subjects related to study of higher level subjects and also the use in their job/profession.

2.5.2 Objectives: Objectives indicate what the student will be able to do/perform after he/she completes the study of the subject. It also in other words indicates the scope of the subject.

Objectives indicate what is achievable and hence gives direction to the student about how to study the subject, what important things are to be observed and performed during practicals.

Just as rationale indicates the use of the knowledge gained while studing the subject, objectives indicate how efficiently and effectively one can work if the objectives are fulfilled while studying the subject.

2.5.3 Learning Structure: It graphically/pictorially indicates the content of the curriculum of the subject and what is to be learnt in the subject. As you know that Cognitive Domain knowledge is divided in four components as mentioned in the Two dimensional grid. Of this Factual, Conceptual and Procedural knowledge components are identified in the curriculum of the subject along with the applications.
Facts, Concepts, Principles are used in developing procedures and applications. So these are given sequentially below procedure as Principles, Concepts and Facts in their order. Learning structure also provide an idea about how to develop the subject logically to achieve the objectives.

2.5.4 Contents: List of topics and subtopics to be included in the curriculum of the subject is given in the contents. This helps in achieving the rationale and objectives identified. Contents indicate the importance of the topics, sub topics in development of the subject and accordingly weightages in terms of Hours required to teach the subject components, so that the desired learning takes place. Marks to be allotted while testing the knowledge gained by the student are also indicated.

2.5.5 Practicals: While designing the curriculum the objectives are identified. To achieve these objectives students have to develop certain intellectual and motor skills. These skills are developed through well designed Practicals. So in the curriculum the list of the skills to be developed through Practicals is given. The list of Practicals is so developed that after performing the Practicals identified skills will be developed. Here it is necessary that the teacher gives enough opportunity to all the students to perform the practical properly to develop the skills in each one of them.

The skills will be developed if the students actually perform certain activities or tasks. Therefore it is necessary that any practical included in the curriculum necessarily involve some activities to be done by the students. So one has to think and innovate to modify the study experiments so that students will be asked to perform some activity. It could be in terms of identifying components, listing of materials used for manufacturing the components, stating importance of use of certain materials etc.

So any curriculum of a subject is so designed that it achieves the objectives of that subject as well as fulfill the objectives of the entire curriculum

3. CONTENT ANALYSIS

3.1 Components of Content Analysis:

As we have discussed earlier, any curriculum or syllabus of a SUBJECT given to the teacher is organised in terms of UNITS which include TOPICS or SUB-TOPICS as the case may be indicating the TIME in which it is expected to be taught to the students. Components of a topic or part thereof are analysed here at a micro level.

Before we begin actual teaching of any topic (lesson), we must carefully and critically analyse it so that we can plan for teaching - select appropriate media, methods and techniques of teaching and arrange the suitable resources to be required. This analysis of the content of a Topic results in identification of the following components of the content:

1. Facts
2. Concepts
3. Principles (rules, laws, theories)
4. Applications
5. Procedures
6. Skills (Psychomotor Skills), and
7. Attitudes (underlying affective behaviors as quite often these are not specifically mentioned in the curriculum, still they are to be developed lesson after lesson gradually).

When we undertake the exercise of content analysis, we ourselves understand the subject fully well and at the same time we become clear as to what we are going to teach. It also gives us an idea as to which methods of teaching and media of instruction we should prepare and use and also what resources including time we will require. This analysis will also enable us to design assignments as well as how we are going to assess students learning.

Since the nature of the components of content (1 to 7) differs from one another. These are learned by the students differently as different mental processes are involved in learning these

components. The immediate implication of this varying nature of components is that these need to be taught differently and assessed differently. For example, if you look at components I to 5 all of which belong to Cognitive Domain of Learning; Component 6 belongs to Psychomotor Domain and Component 7 belongs to Affective Domain (cannot be taught as these attitudes are caught), you will find that these differ from one another. The classification of human behaviors (activities) into the above three domains of learning entails the use of entirely different methods and media of instruction. Different locations of learning (classroom, laboratories, workshops, field visits) need to be selected.

Now we will discuss these components in some detail and see how each one of these should be taught and assessed differently.

3.1.1 FACTS:

These are universally accepted and commonly understood items about which there cannot be much argument and discussion. These are required only to be informed. For example: The sun rises in east and sets in the west; names of scientists and the year in which their theories were propounded; the rules and regulations of admission and examination prescribed by the University are some of the examples of facts. Sometimes, they need not be emphasised in the class as the students already know them. But information can be passed on by word of mouth, if deemed necessary.

3.1.2 CONCEPTS:

A concept is an abstraction or an idea that permits the learner to classify a variety of related phenomena into a convenient and meaningful category. Concept of something is like a picture formation of that thing which helps in conceptualizing it. Gagne says that concept learning produces a certain fundamental change in human performance that is independent of subject or content. Concepts can be divided into the following two categories:

1. **Concrete Concepts:** those which can be seen, touched and manipulated e.g. house, book, table, chair, cat, dog, any machine or apparatus, overhead projector, chalkboard and duster.

2. Abstract Concepts: those which cannot be seen and touched and handled but can only be imagined e.g. force, work, fractions, decimal, bending moment, moment of inertia, friction, heat, and induction. Teaching of concrete concepts is not that difficult because the teacher can show the object physically or its picture. On the contrary, teaching of an abstract concept offers difficulty to the teacher as well as for students to understand. These concepts can be learned by heart without understanding as children mug up Nursery Rhymes without understanding even a single word. But at the stage of higher tearing, this type of rote learning is not desirable. Adolescents (teenagers) and adults do not accept things without understanding.

3.1.3 Concept Attributes:

We identify a concept and understand it, once we are told about its qualities characteristics, and features. They are technically called concept attributes. While teaching a concept to our students we must spell out as many attributes as possible for better understanding of the concept.

Example: The Concept **of Friction**

Attributes:

1. Friction is a resistive force.
2. Frictional force acts in the direction opposite to the direction of the applied force.
3. Frictional force is more when the surfaces in contact are rough.
4. Smooth surfaces (perfect) have zero friction.
5. Frictional force is self-adjusting to a limit.

Towards the end of this Theme Paper a number of examples of concept attributes are given for your guidance.

The following questions pertaining to a concept (object or process) will be helpful in writing concept attributes:

1. What it is.
2. What are its constituent parts.
3. How it works.
4. How it is similar to and different from other known concepts.

5. What are its uses?

3.1.4 PRINCIPLES:

A principle is a statement of relationship between two or more concepts. Principles are sometimes called rules, laws or generalizations. In others words, relationship between two or more concepts which is scientific and universally true is called a Principle.

For Example: (related concepts are underlined)

1. Actions and reactions are equal and opposite.
2. Ohm's law I = V/R is a principle, where I (Current), V (Voltage), and R (Resistance) are the concepts. While teaching a principle we must recall the concepts which it involves. These concepts might have been taught in the previous lesson. As you already know, concept learning is a prerequisite to Principle learning. Thus we recall the concepts of current, voltage and resistance by asking questions to the students. Only after that we must tell the relationship among these i.e. Ohm's Law.

3.1.5 APPLICATIONS:

Whatever principles, laws and theories have been learned are only academic exercises unless these are applied to solve a practical problem. In other words, we call this application transfer of learning to a new situation. If you recall, the process of learning dealt with in Theme Paper 2, you will appreciate that the litmus test of learning having occurred is its application in a new situation or solving a new problem.

For example:

1. Ohm's law can be applied to find out the unknown quantity (voltage, current, and resistance).
2. Design of a structure can be made based on related principles and theories.
3. Principles of learning and events of instruction can be applied in ‘Designing a lesson Plan' and 'Presenting the lesson in the classroom".
4, The above principles can also be applied while preparing textbooks, workbooks, learning packages and laboratory manuals to be used by the students.

3.1.6 PROCEDURES:

While analysing the content of a topic you might come across certain standard procedures which are prescribed to perform an operation or a given task. These procedures should be clearly identified and taught accordingly not to be left to chance. We should not pre-suppose that the students understand them. We cannot afford to take these things for granted.

For Example:

1. Procedure of setting up of an apparatus.
2. Procedure to start an engine.
3. Procedure to operate a machine (a lathe).

3.1.7 SKILLS (PSYCHOMOTOR):

A skill is an ability to perform a task expertly and well. The skilled performance; must meet a pre-specified standard of acceptable performance. A skill has the following three characteristics:

1. It represents a chain of motor responses;
2. It involves the co-ordination of hand and eye movements, and
3. It requires the organization of chains into complex response patterns.

Skills could be intellectual (thinking, understanding); interactive (communication skills) and social (socialising, mixing up with others) also. But normally when we use the word skills, it refers to psychomotor skills.

For Example:

1. Welding a butt joint,
2. Setting a theodolite at a station,
3. Making proper circuit connections, and
4. Turning a job on a lathe machine.

Laboratories and workshops of Polytechnics are the locations where these skills are developed among the students under the guidance of expert instructors *of* operators. Drill and practice are the main methods of teaching and learning these skills through model demonstrations and careful observations thereof.

Alongside developing these skills, desirable attitudes like cooperation, team work, leadership, safety, cost consciousness are also developed.

3.2 TEACHING OF CONCEPTS;

In order to teach concepts effectively the following steps have been suggested by De Cecco & Crawford (1974).

Steps Suggested:

1. Describe the performance expected of the student after he has learned the concept.
2. Reduce the number of attributes to be learned in complex concepts and make important attributes dominant.
3, Provide the student with verbal indicators (explanation).
4. Provide positive and negative examples (non-examples) of the concept.
5. Present the examples in close succession or simultaneously.
6. Provide occasions for student responses and the reinforcement of these responses, and
7. Assess the learning of the concept.

3.3 TEACHING OF PRINCIPLES:

De Cecco & Crawford (1974) has suggested the following steps for teaching principles effectively.

Steps:

1. Describe the performance expected of the student after he has learned the principle.
2. Decide and indicate which concepts or principles the students must recall in learning the new principle.
3. Assist the student in the recall of component concepts.
4. Help the student in the recall of component concepts.
5. Help the student to combine the concepts and put them in a proper order.
6. Provide for practice of the principle and for reinforcement of student responses.
7. Assess the learning of the principle.

3.4 CONCLUSION:

To sum up, it can be said that. it is essential for the teachers to develop the skills of 'Content Analysis' of their subjects. It brings content clarity among teachers themselves. More importantly, Content Analysis will be a pre-requisite for writing Instructional Objectives of the topic to be taught. You will study Instructional Objectives in a separate Theme Paper in detail. Teaching and learning process is bound to be effective once these crucial academic activities are undertaken.

4. CURRICULUM:

Course Name : Diploma in Automobile Engineering

Course Code : AE

Semester : Fourth

Subject Title : Automobile Engines

Subject Code : 17408

Teaching and Examination Scheme:

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS	TH	PR	OR	TW	TOTAL
03	--	04	03	100	50#	--	25@	175

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:

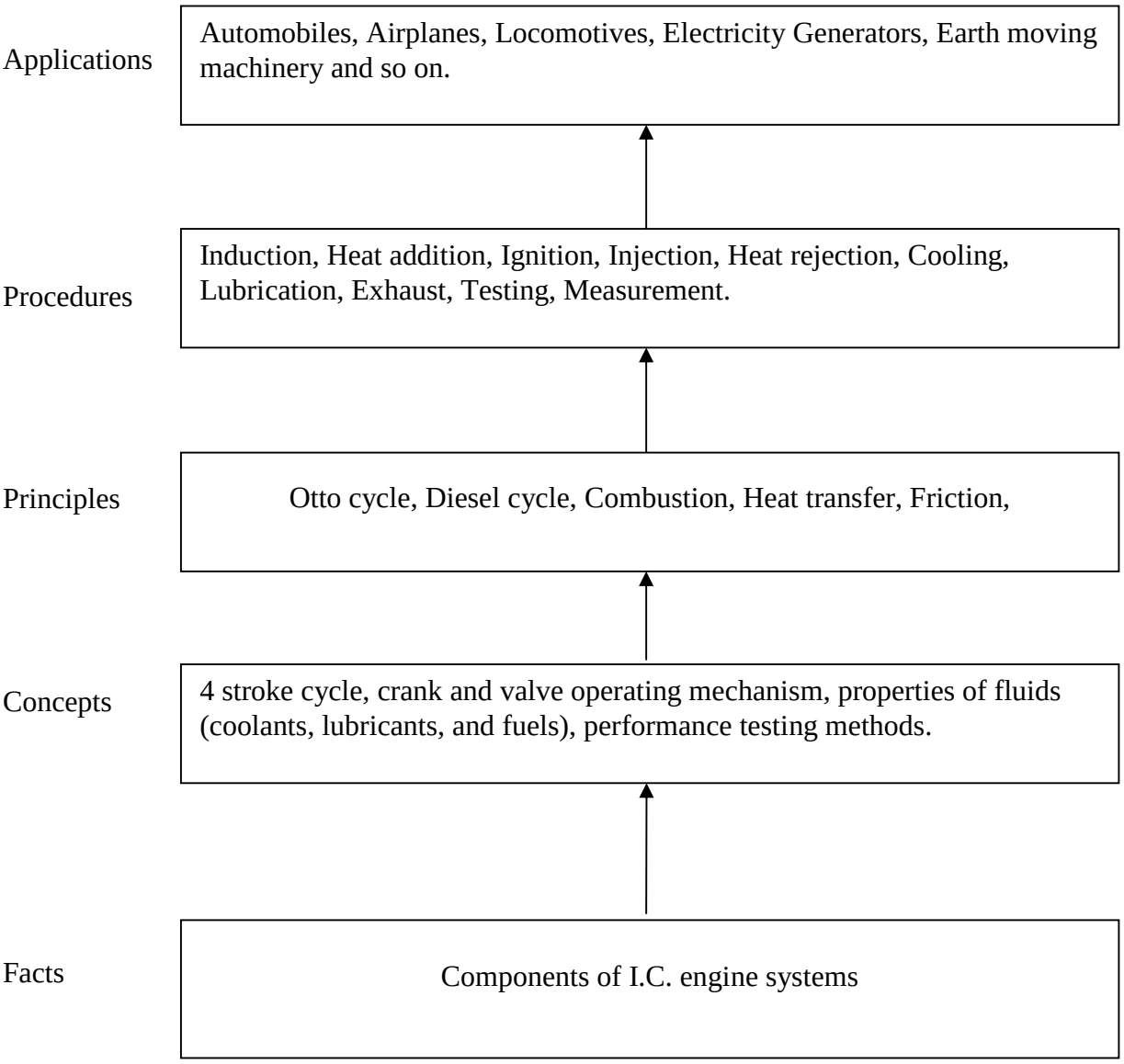
This is a core technology subject. I C engines are required to run the vehicles. The basic principles of Thermodynamics are applied in I C engine. This subject forms the basis for the Advanced Automobile Engine and vehicle maintenance. Knowledge of various engine systems will be helpful in finding and evaluating engine maintenance problems.

General Objectives:

Students will be able to,

- Understand working principles, comparison and applications of I C engine.
- Know constructional details of different types of engine.
- Draw layout and understand construction and working of various systems required in engine.
- Perform tests on I.C. engine and estimate performance parameters.

Learning Structure:



Theory:

Topics and Contents	Hours	Marks
01. Fundamentals of I.C. Engine 16 marks **Specific Objectives:** ➢ Understand working principle of four and two stroke cycle engines. ➢ Write nomenclature of engine. ➢ Compare petrol and diesel engines, four stroke and two stroke engines. ➢ Classify I.C. engines and write their specifications. **Content** 1.1 Introduction 4 Marks • Definition of I C engine. • Engine nomenclature. 1.2 The working principle of Engine 6 Marks • Four-Stroke Spark Ignition Engine. • Four-Stroke Compression Ignition Engine. • Comparison of Four-Stroke SI and CI Engine. • Two-Stroke Engines • Scavenging. • Comparison of Four-Stroke and Two-Stroke Engine. 1.3 Classification, Specifications and applications 6 Marks • Classification of engine on the basis of: Cycle of operation, Fuel, Method of Air intake system, Ignition, Cooling, Cylinder arrangement, camshaft layout. • Merits and Demerits of Vertical and horizontal engines. • Engine Specifications - Two Wheelers, Light Motor Vehicle, Medium Motor Vehicle and Heavy Motor Vehicle. • Applications of I C Engines.	08	16
02. Construction of I. C. Engine 20 Marks **Specific Objectives:** ➢ Describe function, Construction and material of engine components. ➢ Understand Types of drives required to operate, draw and describe various mechanisms. ➢ Understand and draw Valve and port timing diagrams. **Content** 2.1 Function, construction , materials and manufacturing methods of Engine components 16 Marks • Cylinder block, Cylinder liners – Dry and Wet, Cylinder head, Inlet and Exhaust manifold, Tappet cover, Timing cover, Crank case. Oil Sump. • Crank Mechanism: Piston and piston rings, Piston pin, Connecting rod, Crank Shaft, Cam shaft, Flywheel, Bearings, Oil seals, Gaskets. (Only the Name of commonly used Manufacturing Method is expected) • Valve and Valve Operating Mechanisms: Overhead Valve and	10	20

Overhead Cam arrangements. • Valve Cooling. 2.2 Camshaft Drives and Valve Timing 4 Marks • Camshaft drives: Timing Gears, Chain and Belt drive. Relation between speed of camshaft and crank Shaft. • Valve timing Diagram, Port timing Diagram.		
03. Fuel and Air Feed System 16 Marks **Specific Objectives:** ➢ Draw layout of fuel and air feed systems. ➢ Understand, describe, and compare the construction and working of components involved in the systems. **Content** 3.1 Petrol fuel supply system. 8 Marks • Conventional Petrol Engine: Gravity feed, Pump feed (Layout, Function of Components and location). • Construction and working of components: Fuel Tank, Fuel Filter, S. U. Electrical Fuel Pump, Air cleaners – dry type and Oil wetted types. • Working Principle of Simple Carburettor, Air Fuel ratio requirements, Circuits in Two-wheeler carburettor and Solex carburettor. 3.2 Diesel fuel supply system 8 Marks • Diesel Engine: Need and requirements of Fuel Injection Systems. • Layout of Fuel Injection systems – Individual pump, Unit injector system, Distributor system and Common rail system. • Fuel Injector and types of nozzles. • Fuel metering in Fuel Injection Pump (Inline pump and Distributor pump) • Working principle of Mechanical Governor in Fuel Injection Pump.	08	16
04. Ignition and Exhaust system 8 Marks **Specific Objectives:** ➢ Understand ignition systems. ➢ Understand firing order of the engine. ➢ Compare various types of mufflers **Content** 4.1 Introduction to Ignition System 4 Marks • Requirements of ignition system. • Magneto and Battery Ignition systems (Working only). • Firing order used in 3,4 and 6 cylinder engines 4.2 Types of Exhaust system 4 Marks • Function of Exhaust manifold. • Construction, Working and types of silencer / Mufflers.	04	08
05. Cooling and Lubrication systems 20 Marks **Specific Objectives:** ➢ Identify components and types of cooling and lubrication systems ➢ Compare Cooling and Lubrication systems.	10	20

Content: 5.1 Engine cooling system 4 Marks • Need of cooling system. • Limitations of cooling system. • Types: Air, Water/ Liquid cooling system (Layout and Function of Components) • Properties of coolants and coolant additives 5.2 Construction and working of cooling system 6 Marks • Construction and working of: Thermostat valve, Water expansion tank, Temperature Indicators, Pressure cap, Water pump, Fan and fan belt. • Electrically driven Fan circuit. • Radiator: Construction and type of radiator cores. 5.3 Introduction to Lubrication system 4 Marks • Need of lubrication system. • Properties of lubricating oil, additives of lubricating oil. • Parts to be lubricated. 5.4 Types of Lubrication system 6 Marks • Types of lubrication system: Splash, Pressure – wet sump and dry sump (Layout of lubrication system) • Components: Oil filters, Pump and its drive, pressure regulators, oil pressure gauge. • Positive crank case ventilation • Classification of Lubricating Oils on the basis of Viscosity (SAE) and Load (API) Severity rating.		
06. Performance of Engine 20 Marks **Specific Objectives:** ➢ Understand performance parameters, draw engine characteristic graphs. ➢ Perform Engine tests and measure different parameters and analyze the results. **Content:** 6.1 Performance parameters. 04 Marks • Definitions: Indicated Power, Brake Power and Frictional Power, Efficiencies - Air standard, Mechanical, Brake Thermal, Indicated Thermal, Volumetric and Relative. 6.2 Dynamometers and engine testing: 16 Marks • Working Principle and types of Dyanmometers: Rope brake, Hydraulic and Eddy current. • Engine Testing: Morse Test, Willian's line Method for finding Frictional Power. • Heat balance sheet and Method of calculating Volumetric Efficiency and Fuel Consumption.(Simple Numerical problems)	08	20
Total	**48**	**100**

Practical:
Skills to be developed:

Intellectual skill:

- Understand working principle of S.I. / C.I. engine
- Select special tools used for engine disassembly / assembly.
- Identify engine components.
- Identify components of the engine systems.
- Interpret results from engine power observations and calculations.

Motor Skills:

- Sketch engine components and engine system components.
- Measure certain parameters with the help of - dynamometer, air box, fuel measuring burette, exhaust gas calorimeter, measuring tools.

Practicals:

1. Use Special Tools In Dismantling And Assembling By Identifying Tools, Demonstrating and Arranging The Practice Of Same.
2. Operate Cut Section Engine Model To Understand Engine Nomenclature and Operate Engine.
3. Identify and Observe Location Of Various Engine Components.
4. Trace Induction System and Fuel Supply System Curve to Understand the Characteristics.
5. Dismantle Ignition System and Distributor Assembly, To Understand The Functions.
6. Dismantle Cooling System, Identify Components and Their Functions.
7. Dismantle Lubrication System, Identify Components. Draw Layout.
8. Prepare Heat Balance Sheet And Plot Performance Characteristics Curve of An Engine After Trial.
9. Conduct Morse Test On Multicylinder Engine & Calculate Frictional Power & Mechanical Efficiency.
10. Dismantle & Assemble An Engine.

Notes:

1. **Practicals may be performed in a group of 4 to 6 students.**
2. **Engine testing practicals may be performed by the batch.**

Learning Resources:

1. **Books:**

Sr. No.	Author	Title	Publisher / Edition
1	Dr. Kirpal Singh	Automobile Engg. Vol.-2	Standard Publishers
2	Anil Chhikara	Automobile Engineering Vol.1	Satya Prakashan, New Delhi
3	R.B. Gupta	Automobile Engineering	Satya Prakashan

4	K.K. Ramlingam	Automobile Engineering	Scitech Publications
5	John B. Heywood	Internal Combustion Engine Fundamentals	McGraw-Hill International Edition
6	Newton and Steeds	Internal Combustion Engine	--

2. **Websites:**
www.npkauto.com
www.howstuffworks.com
www.youtube.com for animations and videos of various engine system operations.

5. IMPLEMENTATION STRATEGY:

5.1 Planning of Lectures for a Semester with Content Detailing:

Topic I — Name**: Fundamentals of I.C. Engine**

Knowledge Category	Example/s of category	Teaching methodology
FACT	**Piston, Connecting rod, Crank shaft, Cam shaft, cylinder block , cylinder head , piston pin and piston ring and flywheel**	Explanation with chalk & board initially. Make use of charts/ working models and also show the engine and engine components available in laboratory for better understanding of students.
CONCEPT	**LMV, MMV and HMV. Four stroke, two stroke cycle, scavenging,**	Explanation of concept with chalk & board initially. Show schematic diagrams, ppts, working models or animations/ videos on U-tube for better understanding of students.
PRINCIPLE	**Otto cycle and Diesel cycle**	Explanation with chalk & board initially. Draw the actual and theoretical PV diagram on black board for better understanding of students.
PROCEDURE	**Suction, Compression,**	Explanation with chalk

		Expansion and Exhaust stroke	& board initially. Demonstrate the details about all 4 strokes through models and PPT.
	APPLICATION	**IC Engines for Two wheeler, LMV, MMV , HMV and Off road vehicle.**	Explanation with chalk & board initially. Show charts, working models, PPT and Video clips available on U-tube for better understanding of students.

Learning Resources: Books , Charts ,Models and PPTs

Books: 1) Dr. Kripal Singh- Automobile engine Vol.2
Title 2) Anil Chikara- Automobile engineering Vol.1
3) R.B.Gupta- Automobile engineering
4) K.K.Ramlingam- Automobile engineering

Teaching Aids: Charts of PV diagrams, Cut section models of 2-Stroke and 4-Stroke Engine. Animations of operation cycles.

PPTs: Engine nomenclature, Comparison, classification, specification of engines.

Websites :-
www.howstuffworks.com
www.youtube.com
www.npkauto.com

Lecture No.	Topic/ Subtopic to be covered
1	IC engine and its nomenclature. Explain briefly function of major Components of engine.-
2	Working of 4-Stroke SI engine
3	Working of 4-Stroke CI engine
4	Compare 4-Stroke SI and CI engine. working of two stoke engine
5	Concept of scavenging. Compare 2- Stroke and 4- Stroke engine
6	Classification of IC engines .

<table>
<tr><td>7</td><td>Horizontal and vertical engines and merits and demerits of each. LMV, MMV and HMV</td></tr>
<tr><td>8</td><td>Engine specifications And applications of IC engines</td></tr>
<tr><td>Topic 2</td><td>Name: Construction of IC engine.
<table>
<tr><th>Knowledge Category</th><th>Example/s of category</th><th>Teaching methodology</th></tr>
<tr><td>FACT</td><td>Piston, Connecting rod, Crank shaft, Cam shaft, cylinder block ,Cylinder block liner cylinder head , piston pin and piston ring and flywheel, Valve, bearings ,Gaskets and oil seals, Gears, Belt</td><td>Explanation with chalk & board initially. Show the various components of engine in class room from functional point of view. Also make use of Charts/PPTs for better understanding of students.</td></tr>
<tr><td>CONCEPT</td><td>Properties of materials, Manufacturing method, motion transfer and chain and belt drive. Valve timing diagram and port timing diagram.</td><td>Explanation with chalk & board initially. Make use of Charts/PPTs of component. Explain the, function and working conditions of each component. Discuss materials used and also the manufacturing method of each component. Ask student to collect the information about specifications and market price of these components and submit in the form of</td></tr>
</table></td></tr>
</table>

		assignment.
PRINCIPLE	**Friction, Heat Transfer Speed relation of cam shaft and crank shaft**	Explanation with chalk & board initially. Explain with figures and charts the position and working condition of component. Give practice assignment for reinforcing the principle.
PROCEDURE	**Manufacturing methods and mechanisms.**	Explanation with chalk & board initially. Show charts pictures, PPTs and animations to the students for better understanding.
APPLICATION	**IC engines**	Explanation with chalk & board initially. Explain the engine assembly through exploded view show charts and model for better understanding of students.

Learning Resources: Learning Resources: Books , Charts ,Models and PPTs

Books: 1) Dr. Kripal Singh- Automobile engine Vol.2
Title 2) Anil Chikara- Automobile engineering Vol.1
3) R.B.Gupta- Automobile engineering
4) K.K.Ramlingam- Automobile engineering
5) P.C.Sharma- Production technology
65) R.K.Jain – production technology

Teaching Aids: Charts of engine component, Cut section models of 2-Stroke and 4-Stroke Engine, Working model of valve mechanism and model or chart of chain

<table>
<tr><td></td><td>drive and belt drive.

PPT with Sample: Engine assembly, Valve mechanisms, valve and port timing diagram.

Websites:
www.howstuffworks.com
www.youtube.com
www.npkauto.com</td></tr>
<tr><td>Lecture No.</td><td>Topic/ Subtopic to be covered</td></tr>
<tr><td>1</td><td>Function, construction, material and manufacturing method of cylinder block, cylinder liners, cylinder head, manifolds.</td></tr>
<tr><td>2</td><td>Function, construction, material and manufacturing method of Tappet and Timing cover, crank case and oil sump</td></tr>
<tr><td>3</td><td>Function, construction, material and manufacturing method of Piston, piston rings, piston pin connecting rod .</td></tr>
<tr><td>4</td><td>Function, construction, material and manufacturing method of Crank shaft, cam shaft, flywheel ,bearings ,oil seals and gasket.</td></tr>
<tr><td>5 & 6</td><td>Function, construction, material and manufacturing method of valve. construction and working of valve operating mechanism, necessity and method of valve cooling.</td></tr>
<tr><td>7 &8</td><td>Cam shaft drive and valve timing ,construction and working of timing gears ,chain and belt drive for cam shaft drive , relation between speed of cam shaft and crank shaft</td></tr>
<tr><td>9&10</td><td>Valve and port timing diagram.</td></tr>
<tr><td></td><td></td></tr>
<tr><td>Topic 3</td><td>Name: Fuel and Air feed system.

<table>
<tr><th>Knowledge Category</th><th>Example/s of category</th><th>Teaching methodology</th></tr>
<tr><td>FACT</td><td>Petrol, diesel, air, pump, fuel tank, fuel filters, air filters, carburetor, injector and nozzle.</td><td>Explanation with chalk & board initially. Show the different materials and components and explain their role in the system.</td></tr>
<tr><td>CONCEPT</td><td>Air fuel ratio, Atm. Pressure, Gravity, properties of fuel</td><td>Explanation with chalk & board initially. Explain interrelationship of these concepts on black board.</td></tr>
<tr><td>PRINCIPLE</td><td>Bernoulli’s theorem, Centrifugal force.</td><td>Explanation with chalk & board initially. Show venture diagram on black board./ Cut section</td></tr>
</table></td></tr>
</table>

			model of carburetor, cut section model of FIP and model of governor. Cite practical examples in class room for better understanding.
	PROCEDURE	**Fuel flow from feed pump to combustion chamber.**	Explanation with chalk & board initially. Demonstrate through models, PPT and schematic diagram for better understanding.
	APPLICATION	**Two wheeler, LMV, MMV , HMV and Off road vehicle.**	Explanation with chalk & board initially. Show working models, cut section models charts, PPT and Video clips for better understanding.

Learning Resources: Books , Charts ,Models and PPTs

Books: 1) Dr. Kripal Singh- Automobile engine Vol.2
Title 2) Anil Chikara- Automobile engineering Vol.1
3) R.B.Gupta- Automobile engineering
4) K.K.Ramlingam- Automobile engineering

Teaching Aids: Charts of PV diagrams, Cut section models of 2-Stroke and 4-Stroke Engine. Animations of operation cycles.

PPTs: Engine nomenclature, Comparison, classification, specification of engines.

Websites :-

www.howstuffworks.com
www.youtube.com
www.npkauto.com

Lecture No.	Topic/ Subtopic to be covered
1	Layout, components and their functions, location of petrol fuel supply system. Construction and working of fuel tank fuel filter.
2	Construction and working of S.U. electrical fuel pump and air filters
3	Working principle of simple carburetor, air fuel ratio.
4	Circuits of two wheeler carburetor and Solex carburetor.
5	Requirements of fuel injection system for diesel engine. layout of individual

	pump and injector system.
6	Layout of distributor system and common rail system.
7	Fuel injector and types of nozzles and fuel metering
8	Working principle of mechanical governor in FIP.

Topic 4

Name**: Ignition and Exhaust system**

Knowledge Category	Example/s of category	Teaching methodology
FACT	**Spark plug, battery, magneto, contact breaker point, and exhaust manifold, silencer mufflers.**	Explanation with chalk & board initially. Show the actual components in class room and explain their role in system. Make use of charts and figure for better understanding.
CONCEPT	**Current. Potential difference, firing order, spark timing and injection timing**	Explanation with chalk & board initially with schematic diagram. Also show the animation of it.
PRINCIPLE	**Ohms law**	Explanation with chalk & board initially. State its applications in practical field.
PROCEDURE	**Battery ignition system and magneto ignition system, exhaust system.**	Explanation with chalk & board initially Demonstrate through models, PPT and schematic diagram on black board
APPLICATION	**IC engines**	Explanation with chalk & board initially, Show charts, PPT and Video clips for better understanding.

Learning Resources: Books , Charts ,Models and PPTs

Books: 1) Dr. Kripal Singh- Automobile engine Vol.2
Title 2) Anil Chikara- Automobile engineering Vol.1
3) R.B.Gupta- Automobile engineering
4) K.K.Ramlingam- Automobile engineering

Teaching Aids: Charts of PV diagrams, Cut section models of 2-Stroke and 4-Stroke Engine. Animations of operation cycles.

	PPTs: Battery ignition system, magneto ignition system, firing order of engine and exhaust system. **Websites :-** **www.howstuffworks.com** **www.youtube.com** **www.npkauto.com**
Lecture No.	Topic/ Subtopic to be covered
1	Requirement of ignition system ,working of magneto ignition system .
2	Working of battery ignition system and firing orders of 3,4 and six cylinder engine.
3	Function of exhaust manifold ,construction and working of silencer.
4	Construction and working of mufflers.

Topic 5

Name**: Cooling and lubrication system.**

Knowledge Category	Example/s of category	Teaching methodology
FACT	**Radiator, water pump, Water , Air, Thermostat valve, fan ,fanbelt, pressure cap, Oil filter, pump, pressure regulator, oil pressure gauge**	Explanation with chalk & board initially, Show the various components of engine cooling and lubrication system in class room and explain their role in system. Explain with schematic diagram better understanding.
CONCEPT	**Properties of coolants and coolant additives, Properties of** Explanation with chalk & board initially, **lubricating oil and additives.**	Explanation with chalk & board initially, Explain relevance of these concepts from engine performance point of view.
PRINCIPLE	**Heat Transfer, fluid**	Explanation with chalk

	friction and pressure.	& board initially, Explain with figures and animation for better understanding.
PROCEDURE	**Cooling system, lubricating system,**	Explanation with chalk & board initially, Show the pictures, PPTs and animations for better understanding.
APPLICATION	**IC engines**	Explanation with chalk & board initially, Show the picture, PPTs, working models or animations available on U-tube for better understanding.

Learning Resources: Learning Resources: Books , Charts ,Models and PPTs

Books: 1) Dr. Kripal Singh- Automobile engine Vol.2
Title 2) Anil Chikara- Automobile engineering Vol.1
3) R.B.Gupta- Automobile engineering
4) K.K.Ramlingam- Automobile engineering

Teaching Aids: Charts of engine cooling and lubrication system, Components of cooling and lubrication system.

PPT with Sample: Engine cooling and lubrication system

Websites:
www.howstuffworks.com
www.youtube.com
www.npkauto.com

Lecture	Topic/ Subtopic to be covered

No.	
1	Need of engine cooling system and limitation of cooling system.
2	Types and layout of cooling system.
3	Function of components of cooling system and properties of coolants and coolant additives.
4	Construction and working of cooling system.
5	Electrically driven fan circuit. Construction of radiator , type of radiator cores.
6	Need of lubrication system , Properties of lubricating oil, additives of lubricating oil and parts to be lubricated.
7&8	Layout of lubrication system of various types,
9	Function of components of lubrication system
10	Positive crank case ventilation and classification of lubricating oils on the basis of viscosity(SAE) and load (API) severity rating

Topic 6

Name**: Performance of engine.**

Knowledge Category	**Example/s of category**	**Teaching methodology**
FACT	**Dynamometer, engine,**	Explanation with chalk & board initially, Show test rig in lab and explain the functions of these components in engine testing.
CONCEPT	**Indicated power, brake power, frictional power, and efficiencies.**	Explanation with chalk & board initially, Explain need and interrelationship of these concepts. Solve simple problems to reinforce the concept.
PRINCIPLE	**Heat Transfer and power lost and heat lost.**	Explanation with chalk & board initially, Explain the process in detail and the various components involved in

		the process.
PROCEDURE	**Morse test, Willian's line method and heat balance sheet**	Explanation with chalk & board initially, Also perform practical on test ring in laboratory and solve numerical for reinforcement of knowledge of procedure.
APPLICATION	**IC engines testing**	Explanation with chalk & board initially, Show picture, PPTs, videos of IC engines also Visit to any small automobile shop/company/ ARAI

Learning Resources: Learning Resources: Books , Charts ,Models and PPTs

Books: 1) Dr. Kripal Singh- Automobile engine Vol.2
Title 2) Anil Chikara- Automobile engineering Vol.1
3) R.B.Gupta- Automobile engineering
4) K.K.Ramlingam- Automobile engineering

Teaching Aids: Test rig

PPT with Sample: ----

Websites:

www.npkauto.com

Lecture No.	Topic/ Subtopic to be covered
1	Defination of Indicated power, brake power and frictional power.
2	Defination of efficiencies-Air standard, Mechanical ,Brake thermal, Indicated Thermal Volumetric and Relative.
3&4	Working principle of rope brake, hydraulic and eddy current dynamometers.
5	Engine testing - Morse test and Willian's line method

6	Frictional power calculation
7	Heat balance sheet and method for calculating volumetric efficiency and fuel consumption.
8	Numerical on heat balance sheet, volumetric efficiency and fuel consumption .

5.2 Planning and Conduct of Test:

a) The time table and sample test paper for the test should be displayed minimum 10 days before the test.
b) Each test will be of 25 marks.
c) First test should cover about 40% of curriculum and second test should cover remaining curriculum.
d) Format for question paper should be as per the sample question paper supplied by MSBTE.

e) Guidelines for Setting Class Test Question Paper:
- Question no.1 Attempt any three out of four (3X3=9 Marks)
- Question no.2 Attempt any two out of three (2X4=8 Marks)
- Question no.3 Attempt any two out of three (2X4=8 Marks)

5.3 **Details about conduct of assignments:**

Teacher should give assignment on each topic covered. Assignment should based on MSBTE Curriculum.

5.4 **Strategies for Conduct of Practical:**

5.4.1 Suggestions for effective conduct of practical and assessment:
Practical:

1. Use Special Tools in Dismantling and Assembling By Identifying Tools, Demonstrating and Arranging the Practice of Same. Teacher should demonstrate and explain the need of special tools and related safety for self and components. Student will draw sketch of any special tool in appropriate location.
2. Operate Cut Section Engine Model to Understand Engine Nomenclature and Operate Engine. Student should locate different parts on cut section model. Operate cut section model and establish different position.
3. Identify and Observe Location Of Various Engine Components.
4. Trace Induction System and Fuel Supply System Curve to Understand the Characteristics.
5. Dismantle Ignition System and Distributor Assembly, To Understand The Functions. Student should identify the

components of ignition system, draw different components of ignition system and write the function of it.
6. Dismantle Cooling System, Identify Components and Their Functions.
7. Dismantle Lubrication System, Identify Components. Draw Layout.
8. Prepare Heat Balance Sheet and Plot Performance Characteristics Curve of an Engine after Trial.
9. Conduct Morse Test On Multicylinder Engine & Calculate Frictional Power & Mechanical Efficiency. Teacher
Should demonstrate the test
10. Dismantle & Assemble an Engine. Teacher should allow students to decide dismantling sequence and if required
correct them.
+

Note

1. Practicals may be performed in a group of 4 to 6 students.

2. Engine testing practicals may be performed by the batch.

5.4.3 Preparation for conduct of practical

Working models, cut section models, tools , components of various system should be a kept ready for practical.

6. Mode of assessment:

1.1 Class Test:

- There will be two tests each of 25 marks.
- The tests will be conducted as per the MSBTE schedule.
- Teacher should prepare model answer of class test question papers.
- After completion of test, subject teacher should display model answer on Department Notice Board.
- Teacher should show the answer paper of class test to the student and discuss about the mistakes.
- Teacher should maintain the record of class test as per MSBTE norms (CIAAN)

6.1.2 Sample Test Papers:

Sample Test Paper 1

Roll No.				

Subject Code17408

Course Name: Diploma in automobile Engg. Course Code: AE

Semester: Fourth

Subject**:** Automobile Engines

Marks: **25** Time: **1 hour**

Instructions:

1. All questions are compulsory
2. Illustrate your answers with neat sketches wherever necessary

3. Figures to the right indicate full marks
4. Assume suitable data if necessary
5. Preferably, write the answers in sequential order

Q1. Attempt any Three of the following **3x3=9**

a) Differentiate between S.I. engine & C.I. engine.(Min 6 points)

b) Write any three engine specification of two wheeler.

c) Draw single and double overhead cam shaft.

d) Draw a simple sketch of 2 stroke S.I. engine & label all the parts.

e) State material with justification for Gasket.

Q2. Attempt any Two of the following **4x2=8**

a) Describe manufacturing process for piston with simple sketch.

b) Explain with figure actual valve timing diagram for S.I. engine

c) Differentiate between dry liner & wet liner.(minimum 4 points)

Q3. Attempt any Two of the following **4x2=8**

a) Explain layout of distributor type fuel injection pump.

b) Describe working of common rail fuel injection system.

c) Explain working of solex carburetor with neat sketch.

Sample Test Paper 2

Roll No.				

Subject Code17408

Institute Name: G.H.Raisoni Polytechnic, Nagpur

Course Name: Diploma in automobile Engg. Course Code: AE

Semester: Fourth

Subject**:** Automobile Engines

Marks: **25** Time: **1 hour**

Instructions:

1. All questions are compulsory
2. Illustrate your answers with neat sketches wherever necessary
3. Figures to the right indicate full marks
4. Assume suitable data if necessary
5. Preferably, write the answers in sequential order

Q1. Attempt any Three of the following **3x3=9**

a) Draw the labeled diagram of magneto ignition system
b) Explain air cooling system and write its limitations
c) State various properties of lubricating oil
d) Describe working principle of hydraulic dynamometer

Q2. Attempt any Two of the following **4x2=8**

a) State different types of muffler and explain any one of them.
b) Explain construction and working of water pump in cooling system
c) Draw the engine lubrication system and show oil flow.

Q3. Attempt any Two of the following **4x2=8**

a) State different types of radiator and explain construction and working of any one of them.
b) Explain electrically driven cooling fan circuit.
c) State various Engine Performance parameters and describe any two of them.

6.2.1 Specification Table:

Course Name: Automobile Engineering Course Code: AE

Semester: Forth

Title of the Subject: Automobile Engines Subject Code: 17408

SPECIFICATION TABLE

Level / Chapter /Topic	Levels from Cognition Process Dimension			Total Marks
	R	U	A	
01	08(4)	04(4)	04	16(08)
02	08(06)	08	04(04)	20(10)
03	04(02)	12	(04)	16(06)
04	0(0)	08	(04)	08(04)
05	04(2)	12(08)	04	20(10)
06	04(2)	08	08(08)	20(10)
Total	28(16)	52(12)	20(20)	100(48)

R – Remember

U – Understand

A – Analyse / Apply

6. 2. 2 QUESTION PAPER PROFILE:

Course Name: Diploma in Automobile Engineering Course Code: AE

Semester: Forth

Title of the Subject: Automobile Engine Subject Code: 17408

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Q. No.	Bit 1			Bit 2			Bit 3			Bit 4			Bit 5			Bit 6			Bit 7			Bit 8			Option
	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	
01a	1	R	02	1	R	02	1	R	02	1	R	02	5	R	02	06	R	02	2	R	2	3	R	2	6(8)
01b	1	A	4	1	U	4	1	U	4																2(3)
02	1	R	4	2	R	4	2	R	4	2	U	4	2	A	4	2	A	4							4(6)
03	2	U	4	3	U	4	3	R	4	3	U	4	3	U	4	3	A	4							4(6)
04	4	U	4	4	U	4	4	U	4	5	R	4	5	A	4	5	U	4							4(6)
05	5	U	4	5	U	4	5	U	4	5	U	4	6	R	4	6	U	4							4(6)
06	6	U	8	6	A	8	6	A	8																2(3)

T = Topic/Chapter Number L = Level of Question M = Marks R = Remember U = Understand
A = Analyse/Apply

6.2.3 Sample Question Paper:

Exam Seat No.									

Subject Code

Maharashtra State Board of Technical Education

Course Name: Automobile Engineering Course Code: AE

Semester: Fourth

Title of the Subject: Automobile engines Subject Code: 17408

Marks: 100 Time: 3 Hrs

Instructions:

1. All questions are compulsory
2. Illustrate your answers with neat sketches wherever necessary
3. Figures to the right indicate full marks
4. Assume suitable data if necessary
5. Preferably, write the answers in sequential order

Q.1(A) Attempt any Six 12

a) Define I.C engine
b) State any two merits of vertical I.C. engine
c) List any two applications of I.C. engine
d) State any four specifications of LMV engine
e) State any two limitations of water cooling system
f) Define Indicative Power and Brake Power
g) State function of Cylinder Block and Cylinder Head

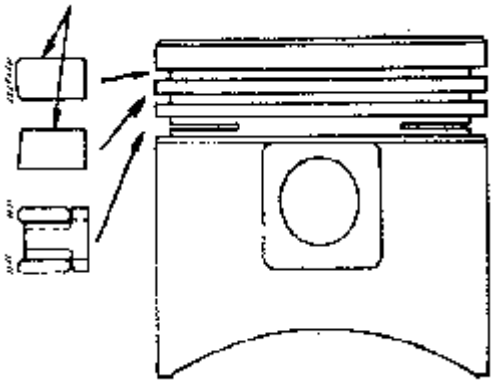
h) State function of Feed Pump

Q1b) Attempt any two **08**

a) Compare 4 stroke S.I. and C.I. Engine (minimum 4 points)
b) Classify I.C. Engines on the basis of
   1) Cycle of Operation
   2) Fuel
   3) Charging Method
   4) Ignition
c) State the necessity of scavenging and describe any on method of Scavenging.

Q2. Attempt any Four **16**

a) Give engine nomenclature
b) Identify and redraw the component shown below, label it and specify suitable material for manufacturing it.



c) State the application and advantages of dry and wet liners.
d) Name manufacturing method for following
   1. Connecting rod
   2. Cam shaft

3. Piston
4. Gasket

e) Compare actual and theoretical valve timing diagrams for 4 Stroke S.I. engine

f) Distinguish between crankshaft and camshaft

Q3. Attempt any Four. **16**

a) Explain Various Engine Cam shaft and Valve arrangement.
b) Explain Construction and working of simple carburetor
c) State different types of fuel injection systems and explain any one of them
d) Explain working principle of mechanical governor in F.I.P.
e) State different types of air cleaners and explain any one of them
f) Compare petrol and Diesel fuel supply systems.(minimum 4 points)

Q4 Attempt any four **16**

a) Explain working of battery ignition system
b) State the function of exhaust systems and list its parts.
c) State the need of firing order in multi- Cylinder Engine and write firing order for typical 3,4 and 6 cylinder Engine.
d) State different properties of coolant.
e) State need of cooling system and compare various cooling systems.
f) Describe construction and working of thermostat valve.

Q5 Attempt any four **16**

a) Draw a neat sketch of lubrication system for multi cylinder engine and describe its working.
b) State need and describe working of Positive crank case ventilation (P.C.V.)
c) Classify lubricating oils and name the oils used in modern engine.
d) State various components of lubricating system and state their function.
e) State various Engine Performance parameters and describe any two and them.
f) State various dynamometers for Engine testing and explain any one

Q6 Attempt any two **16**

a) Explain Morse Test and Williams Line method for frictional power.

b) Following readings were noted during a test on a single cylinder 2-stroke diesel engine. Engine is motored by an electric motor and frictional power loss recorded on Wattmeter is 1.5 KW. Net brake load = 227 N, Diameter of Brake wheel = 100 cm , Engine Speed = 500 rpm , Fuel consumption = 2.04 Kg/ hr. Calorific value of fuel = 42000 KJ/kg .Find Mechanical efficiency and brake thermal efficiency.

c) An engine develops a brake power of 26.2 KW. Following observations are made during a trial.

i. Power required to motor the engine = 4.5 KW
ii. Cooling water circulated = 7.5 Kg/ min.
iii. Specific heat capacity of Water = 4.187 KJ/kg k
iv. Petrol consumption = 200 gm/ min
v. Temperature rise of cooling water = 50 ºC.
vi. If calorific value of petrol is 46000 KJ/kg, draw the heat balance chart for the test on KJ/Min basis.