

CURRICULUM REVISION PROJECT

2012

TEACHER GUIDE FOR

(AUTOMOBILE MANUFACTURING PROCESSES -17403.)

**FOURTH SEMESTER AUTOMMOBILE 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.

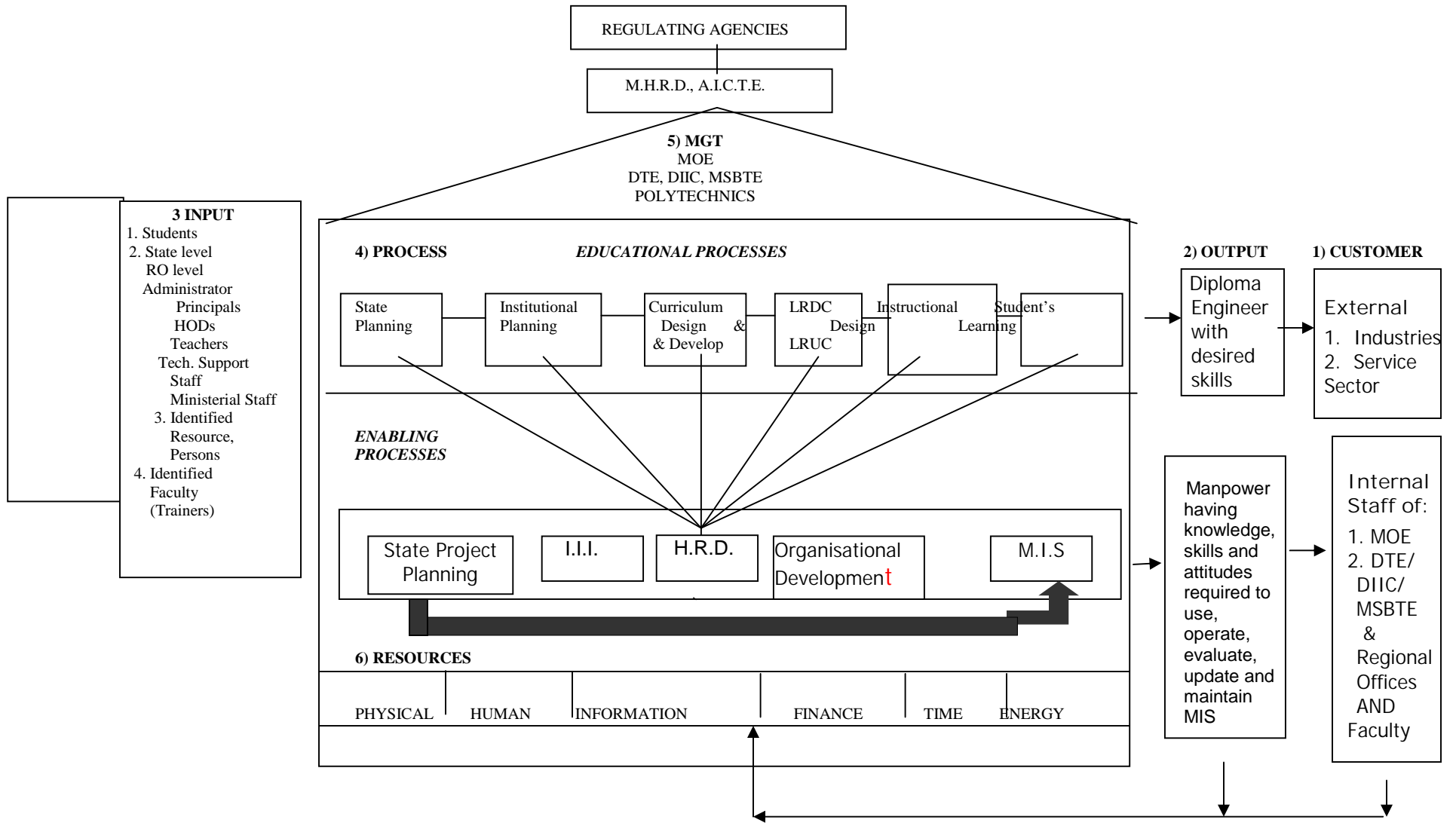


Fig 1 Systems Approach

1.4 Curriculum goals

1. To develop confidence in students by providing more exposure to industry experience and world of work at global level
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.

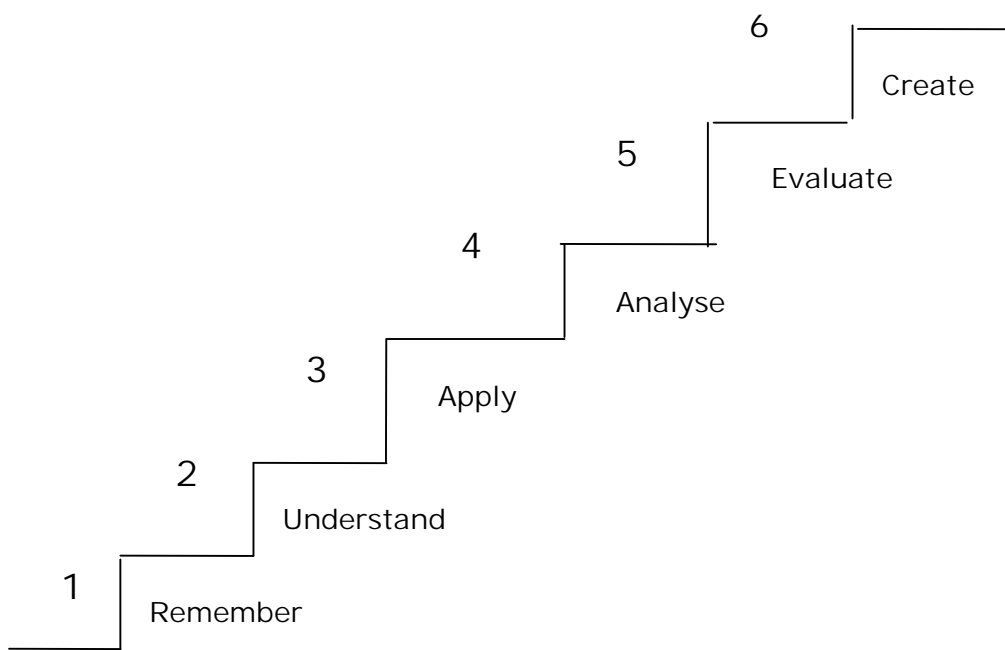
2.3 LEVELS OF LEARNING:

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 and 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 form to another (words or numbers) by interpreting material (explaining or	Understands fact, principles Interprets verbal material, Interprets charts, tables, graphs.	Convert, distinguish estimate, explain, extend, generalize, give examples;

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.	Translates verbal material to mathematical formula. Estimates consequences implied in data. Justifies methods & procedures.	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 the entire curriculum.

Rationale tells the students the connection of subjects related to the 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/performance 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 studying 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 provides 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 Practical. So in the curriculum the list of the skills to be developed through Practical is given. The list of Practical is so developed that after performing the Practical 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 1 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 learning, 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 other 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 Manufacturing Processes

Subject Code : 17403

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:

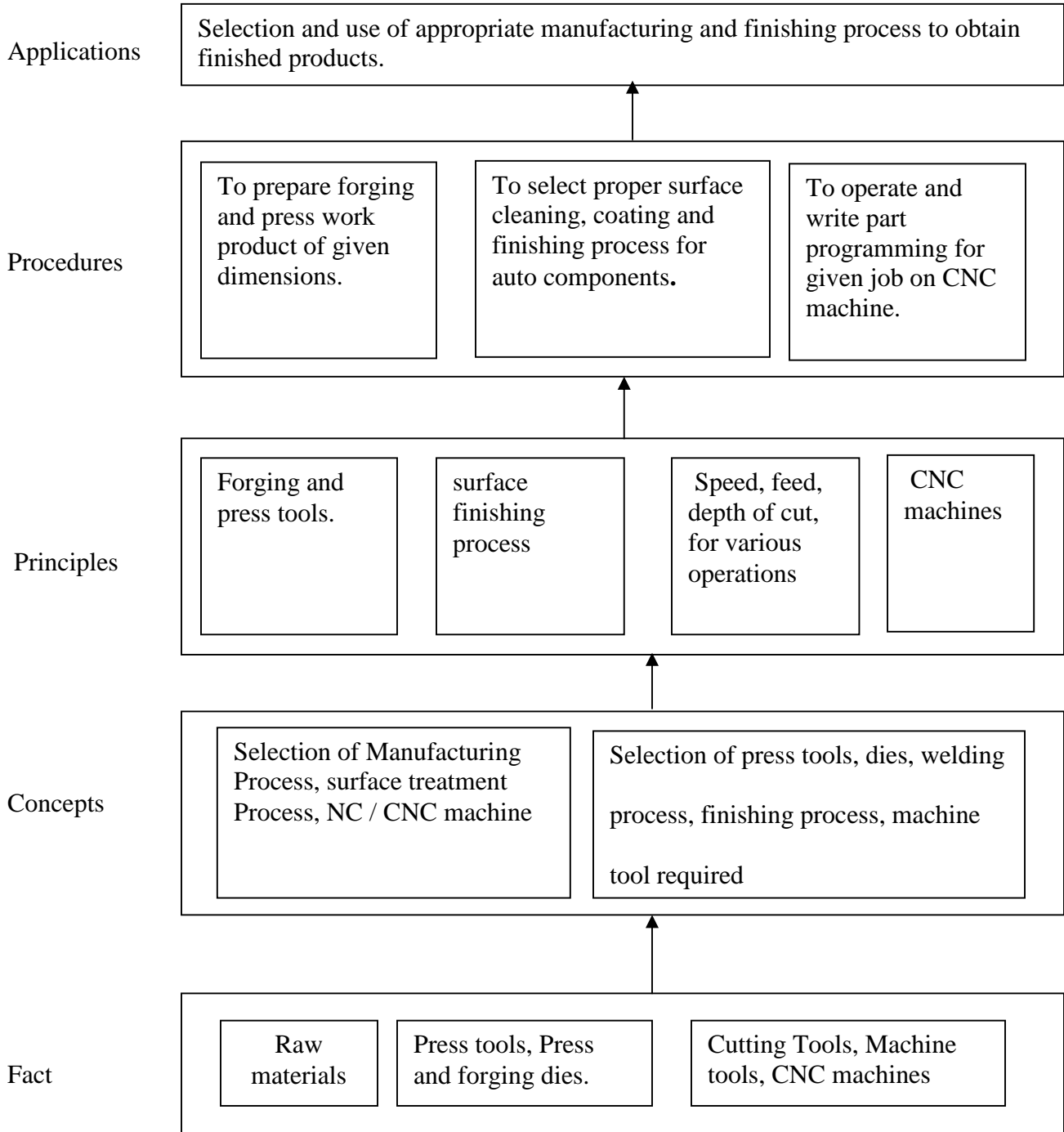
Automobile manufacturing processes is a core technological subject. With advent of technology there are many advances in manufacturing processes and equipments. The knowledge of these advances is essential for a diploma student engaged in manufacturing organizations. Students should be able to write and apply CNC programs in manufacturing industry.

General Objectives:

Student will be able to,

- Know the forging process and it's use in manufacturing automobile parts.
- Know the different press tools and their operations.
- Understand different welding processes used in industry.
- Selection and applications of different surface cleaning and coating processes
- Know the different methods of surface finishing.
- Know about sub-systems of CNC machines and write CNC programs.

Learning Structure:



Theory

Topic and Contents		Hours	Marks
1: Forging 16 Marks Specific Objectives: ➤ Understand forging processes and their applications Contents:			
1.1	Introduction: 08 Marks <ul style="list-style-type: none"> • Forgeable materials and forgeability • Classification of forging processes • Advantages and limitations of forging processes 	06	16
1.2	Forging sequences for Auto components- 08 Marks Connecting rods, Crankshafts, Camshafts and Spanners		
2: Press and press work 24 Marks Specific Objectives: ➤ Know the press operations and their applications Contents:			
2.1	Introduction 08 Marks <ul style="list-style-type: none"> • Materials used in press work for automobile applications. • Classifications of presses and terminology used in presses • Major parts of Fly press 	12	24
2.2	Press tools 12 Marks <ul style="list-style-type: none"> • Parts of standard die set • Die accessories- Pilots, Stops, Strippers, Pressure pads and Knock outs • Types and construction of dies—Simple, progressive, compound and combination die 		
2.3	Press operations- 04 Marks Blanking, piercing, bending, drawing.		
3: Welding processes 16 Marks Specific Objectives: ➤ Know various welding operations and their applications Contents:			
3.1	Introduction 04 Marks <ul style="list-style-type: none"> • Classification and selection of welding process. • Working principle of Gas welding and types of flames. 	08	16
3.2	Arc welding process 08 Marks <ul style="list-style-type: none"> • Metal arc, TIG and MIG 		
3.3	Resistance welding, Brazing and soldering 04 Marks		
4: Surface treatment and finishing processes 10 Marks Specific Objectives: ➤ Know various surface cleaning, coating and finishing operations.		04	10

<p>Contents:</p> <p>4.1 Surface cleaning and coating processes 06 Marks</p> <ul style="list-style-type: none"> • Surface cleaning processes- acid, alkaline, electrolytic cleaning, blasting and tumbling • Metallic surface coating- Electroplating, Galvanizing and metal spraying <p>4.2 Surface finishing processes 04 Marks</p> <ul style="list-style-type: none"> • Lapping, honing, super finishing, buffing, burnishing and their applications, advantages and limitations. 		
<p>5: Introduction to CNC machines 16 Marks</p> <p>Specific Objectives:</p> <ul style="list-style-type: none"> ➤ Know the basic components of CNC machines and tools. <p>Contents:</p> <ul style="list-style-type: none"> • NC and CNC Machines. • Difference between conventional machines and CNCs. • Working principle of CNC machines. • Classification of CNC machines. • Advantages and disadvantages of CNC machines. • Type of tools used on turning center and VMC. • Absolute and Incremental Co-ordinate system. 	08	16
<p>6. CNC Part programming 18 Marks</p> <p>Specific Objectives:</p> <ul style="list-style-type: none"> ➤ Understand and write CNC part programming <p>Content :</p> <ul style="list-style-type: none"> • Axes configuration- X, Y and Z axes. • Procedure for developing the Part program • ISO Codes used in programming • Simple Part programming as per ISO codes on CNC and VMC for operations like turning, drilling and Milling. 	10	18
Total	48	100

Practical:

Skills to be developed:

Intellectual Skills:

1. Understand the different types of press and welding components.
2. Know the different types of programming codes

Motor Skills:

1. To prepare given job on milling machine.
2. To use press machine to produce various auto components
3. To prepare job by welding process
4. To produce a job on CNC turning center

List of Practicals:

1. One job involving different milling machine operations such as key way cutting, gear cutting by indexing in a batch of 2 students.
2. One press work job involving operations like blanking, piercing and drawing. (Job should be selected from market utility).
3. One resistance welding job to show the working principle of resistance welding. Calculate current and time required for completion of a resistance welding job.
4. One simple part programming job on CNC machine. One job on CNC lathe having plain turning, taper turning, step turning, threading, boring and grooving (Batch of 2 students).

OR

One job on CNC milling having following operations – face milling, slotting, contour machining (Batch of 2 students)

5. Industrial visit shall be arranged to demonstrate different Milling machines, grinding machines, CNC machines, forging operations, press operations, Surface treatment and surface finishing processes. Write a report.

Note: Different machine tools and operations may be shown during industrial visits arranged under Professional Practices -IV

List of Assignments:

1. ISO codes for turning and machining center used in CNC programming.
2. Prepare Process sheet for forging operations of a simple automobile component.
3. Prepare Process sheet for press working operation using compound or progressive die.

Learning Resources:

1. Books:

Sr No.	Author	Title	Publication
1.	S. K. Hajra Choudhury. A. K. Hajra Choudhury. Nirjhar Roy	Elements of Workshop Technology. Vol. - I and II	Media Promoters and Publishers Pvt. Ltd. Mumbai.
2.	H. S. Bawa	Workshop Technology Vol. - I and II.	Tata McGraw-Hill Publishing Co. Ltd. New Delhi.
3.	R. K. Jain	Production Technology	Khanna Publishers. Delhi.
4.	P.N.Rao	CAD/CAM Principles and applications	Tata McGraw-Hill Publishing Co. Ltd. New Delhi.
5.	Aditan Pabla	CNC machines programming and applications	New Age International Publication

6.	Serope Kalpakjian Steven R. Schmid	Manufacturing Engineering and Technology	Pearson
7	N.K. Chougule	CAD/CAM/CAE	Sciotech

1. CDs, PPTs Etc.:

Electronics Trades and Technology Development Corporation (A Govt. Of India undertaking), Akbar Hotel Anex, Chankyapuri, New Delhi-110 021.

Learning Materials: Transparencies, CBT packages developed by N.I.T.T.E.R. Bhopal.

2. Websites:

www.npkauto.com

www.youtube.com

5. IMPLEMENTATION STRATEGY:

5.1 Planning of Lectures for a Semester with Content Detailing:

Topic I	Name: FORGING		
	Teacher shall implement the methodology/ techniques mentioned in the following table while teaching the topics. Along with this teacher may use additional/alternative methods to make students learning more meaningful.		
	e.g.		
	Knowledge Category	Example/s of category	Teaching methodology
	FACT	Forging die, forging press, drop hammer	Show the forged components like crankshaft, spanner, in classroom or workshop ,
	CONCEPT	Forging , Forgeability	Class room teaching and show ppt or show VDO clips from U tube .
	PRINCIPLE	Principle of forging, principle of metal shearing	Explain on black board, white board,
PROCEDURE	Procedure for manufacturing automobile components – connecting rod, crankshafts , camshafts, spanners	Write down procedure and explain each step. show the VDO clips on forging	
APPLICATION	manufacturing automobile components – connecting rod, crankshafts , camshafts, spanners	Show the automobile components like connecting rod, crankshaft, camshaft and spanners in classroom.	
Learning Resources:			

	<p>Books:</p> <p>Title: 1) Production Technology by R.K.Jain 2) Workshop technology Volume I and II by Bawa 3) Workshop technology ,volume I and II by Hajra Choudhary 4) Production engineering by P.C.Sharma</p> <p>Teaching Aids: Black board / White board, transparencies, charts,</p> <p>PPTs: available on www.slideshare.net</p> <p>Websites : www.forging.org, www.efunda.com, www.howstuffworks.com , www.technologystudent.com/</p>									
Lecture No.	Topic/ Subtopic to be covered									
1	Introduction : Forgeable materials and forgeability									
2	Classification of forging processes									
3	Advantages and limitations of forging processes									
4	Forging sequences for Auto components- Connecting rods,									
5	Forging sequences for Auto components Crankshafts									
6	Forging sequences for Auto components Camshafts and Spanners									
Topic 2	<p>Name: PRESS AND PRESS WORK</p> <p>Teacher shall implement the methodology/ techniques mentioned in the following table while teaching the topics. Along with this teacher may use additional/alternative methods to make students learning meaningful.</p> <p>e.g.</p> <table border="1"> <thead> <tr> <th>Knowledge Category</th> <th>Example/s of category</th> <th>Teaching methodology</th> </tr> </thead> <tbody> <tr> <td>FACT</td> <td>Die, press, flypress, ram, bolster plate, C frame</td> <td>Introduce students to the press machine in classroom and also show the components made on press like washer plates etc.</td> </tr> <tr> <td>CONCEPT</td> <td>Shut height of press, shut height of die, die details</td> <td>Explain with sketch or figure in classroom or show actual small version of press</td> </tr> </tbody> </table>	Knowledge Category	Example/s of category	Teaching methodology	FACT	Die, press, flypress, ram, bolster plate, C frame	Introduce students to the press machine in classroom and also show the components made on press like washer plates etc.	CONCEPT	Shut height of press, shut height of die, die details	Explain with sketch or figure in classroom or show actual small version of press
Knowledge Category	Example/s of category	Teaching methodology								
FACT	Die, press, flypress, ram, bolster plate, C frame	Introduce students to the press machine in classroom and also show the components made on press like washer plates etc.								
CONCEPT	Shut height of press, shut height of die, die details	Explain with sketch or figure in classroom or show actual small version of press								

		machine.
PRINCIPLE	Principle of press working, Principle of metal flow	Use black board, white board, books and ppt or even show on small fly press.
PROCEDURE	Blanking, piercing, notching, drawing	Explain in the class room. Show the actual products of blanking, piercing and drawing operations etc also show the VDO clips
APPLICATION	washers, electrical parts, car doors, bonnet of car	Explain with examples. Brings actual small products in classroom.

Learning Resources::

Books: 1) Production Technology by R.K.Jain

2) Workshop technology Volume I and II by H.S.Bawa

3) Workshop technology ,volume I and II by Hajra Choudhary

4) Production engineering by P.C.Sharma

Teaching Aids: Black board / White board, transparencies, charts,

PPT with Sample:

Websites: : www.npkauto.com , www.youtube.com, www.en.wikipedia.org , www.technologystudent.com/

Lecture No.	Topic/ Subtopic to be covered
1	Introduction
2	Materials used in press work for automobile applications.
3	Classifications of presses and terminology used in presses
4	Major parts of Fly press
5	Press tools
6	Parts of standard die set
7	Die accessories- Pilots, Stops, Strippers, Pressure pads and Knock outs
8	Types and construction of dies—Simple, progressive,
9	Types and construction of dies - compound and combination die
10	Press operations
11	Blanking, Piercing
12	Bending, Drawing.

Topic
3

Name: **WELDING PROCESSES**

Teacher shall implement the methodology/ techniques mentioned in the following table while teaching the topics. Along with this teacher may use additional/alternative methods to make students learning more meaningful.

e.g.

Knowledge Category	Example/s of category	Teaching methodology
FACT	Welding rod, flux, oxygen, hydrogen, acetylene etc	Explain the need of welding process and show welding rods, transformer, generator, gas welding set up etc in workshop.
CONCEPT	gas welding, arc welding laser welding	Explain with sketch or figure. Expose students to the real Gas welding set in workshop.
PRINCIPLE	leftward and rightward technique, TIG, MIG etc, principle of soldering, brazing	Explain technique on black board and also demonstrate the technique at workshop/show ppts also,
PROCEDURE	Seam welding, projection welding. etc	Explain technique on black board and also demonstrate the technique at workshop/show ppts also,
APPLICATION	window grills, vessels tanks, car body truck body, electronic components for soldering brazing tool tip on tool holders	Explain initially in classroom and show the product in workshop or any small fabrication unit.

Learning Resources:

Books:

- Title: 1) Production Technology by R.K.Jain
 2) Workshop technology Volume I and II by H.S.Bawa
 3) Workshop technology ,volume I and II by Hajra Choudhary
 4) Production engineering by P.C.Sharma

Teaching Aids: OHP , LCD PROJECTOR , CHARTS , MODELS

PPTs: www.srmuniv.ac.in/downloads/sheet.ppt,

Websites www.npkauto.com , www.youtube.com,www.technologystudent.com/

Lecture No.	Topic/ Subtopic to be covered															
1	Introduction, Classification and selection of welding process.															
2	Working principle of Gas welding and types of flames.															
3	Arc welding process, Metal arc															
4	TIG															
5	MIG															
6	Resistance welding,															
7	Brazing															
8	Soldering															
Topic 4	<p>Name: SURFACE TREATMENT AND FINISHING PROCESSES</p> <p>Teacher shall implement the methodology/ techniques mentioned in the following table while teaching the topics. Along with this teacher may use additional/alternative methods to make students learning meaningful. e.g.</p> <table border="1"> <thead> <tr> <th>Knowledge Category</th> <th>Example/s of category</th> <th>Teaching methodology</th> </tr> </thead> <tbody> <tr> <td>FACT</td> <td>Acid, Alkalies, lapping machine, honing machine, Burnishing machine</td> <td>Explain with Chalk and Board initially show PPTs, Videos, show the demo of machines in workshop, Models</td> </tr> <tr> <td>CONCEPT</td> <td>Cleaning, Finishing Process, Surface Treatment Processes</td> <td>Explain with Chalk and Board initially show PPTs, Videos, Visit to Industry</td> </tr> <tr> <td>PRINCIPLE</td> <td>Working principle of lapping machine, honing machine etc.</td> <td>Explain with Chalk and Board initially show PPTs, Videos,</td> </tr> <tr> <td>PROCEDURE</td> <td>Select Proper Surface Cleaning, Coating, finishing process for</td> <td>Explain with Chalk and Board initially. Show PPTs, Videos, Ask</td> </tr> </tbody> </table>	Knowledge Category	Example/s of category	Teaching methodology	FACT	Acid, Alkalies, lapping machine, honing machine, Burnishing machine	Explain with Chalk and Board initially show PPTs, Videos, show the demo of machines in workshop, Models	CONCEPT	Cleaning, Finishing Process, Surface Treatment Processes	Explain with Chalk and Board initially show PPTs, Videos, Visit to Industry	PRINCIPLE	Working principle of lapping machine, honing machine etc.	Explain with Chalk and Board initially show PPTs, Videos,	PROCEDURE	Select Proper Surface Cleaning, Coating, finishing process for	Explain with Chalk and Board initially. Show PPTs, Videos, Ask
Knowledge Category	Example/s of category	Teaching methodology														
FACT	Acid, Alkalies, lapping machine, honing machine, Burnishing machine	Explain with Chalk and Board initially show PPTs, Videos, show the demo of machines in workshop, Models														
CONCEPT	Cleaning, Finishing Process, Surface Treatment Processes	Explain with Chalk and Board initially show PPTs, Videos, Visit to Industry														
PRINCIPLE	Working principle of lapping machine, honing machine etc.	Explain with Chalk and Board initially show PPTs, Videos,														
PROCEDURE	Select Proper Surface Cleaning, Coating, finishing process for	Explain with Chalk and Board initially. Show PPTs, Videos, Ask														

		Auto components	students to collect the Information and submit as Assignments.
	APPLICATION	Surface finishing of Axles, Wheel, Auto Bodies and other Auto Components.	Explain with Chalk and Board initially. Show Actual Components in Class Room/Workshop and Industry
<p>Learning Resources:: Books: 1) Elements of workshop technology vol.I & II, S.K.Hajra Choudhary 2) Workshop technology vol. I and II by H.S.Bawa 3) Production Technology by R.K.Jain</p> <p>Teaching Aids: LCD PROJECTOR , CHARTS , MODELS, PPTs, Videos</p> <p>PPT with Sample:</p> <p>Websites: www.npkauto.com , www.youtube.com, www.technologystudent.com/</p>			
Lecture No.	Topic/ Subtopic to be covered		
1	Surface cleaning and coating processes * Surface cleaning processes- acid, alkaline, electrolytic cleaning, blasting and tumbling		
2	Metallic surface coating- Electroplating, Galvanizing and metal spraying		
3	Surface finishing processes - Lapping, honing,		
4	Super finishing Burnishing and their applications, advantages and limitations.		
Topic 5	Name: INTRODUCTION TO CNC MACHINES Teacher shall implement the methodology/ techniques mentioned in the following table while teaching the topics. Along with this teacher may use additional/alternative methods to make students learning more meaningful.		
	Knowledge Category	Example/s of category	Teaching methodology
	FACT	Conventional Lathe, Drilling, Milling machines etc. NC, CNC,VMC machines, Cutting Tools	Explain with Chalk and Board initially. Show the actual machine in

			workshop/ show PPTs, Videos or working of these machines.
CONCEPT	NC, / CNC system, Codes of Programming Selection of Tools required, Absolute and Incremental Coordinate system		Explain with Chalk and Board initially. Show actual machines available in the institute. Show PPTs/ Videos of actual operations of these machines.
PRINCIPLE	Speed Feed, Depth of Cut, parametric selection, Metal cutting principles		Explain with Chalk and Board initially. Show PPTs, Videos, Operation Manuals of machines supplied by the machine manufactures.
PROCEDURE	Understanding Selection of Cutting Tools, Codes and parameters for Various CNC machines		Explain with Chalk and Board initially. Show PPTs, Videos, Demo of machines in workshop, Explain with the help of machine manuals supplied by the machine manufactures.
APPLICATION	Auto components		Bring actual samples of auto components in class room. Ask student to collect information about other auto components.
Learning Resources:			

	<p>Books:</p> <p>Title: 1)Pabla Adithan, CNC Programming And Applications, New Age International 2) P. N. Rao, CAD/CAM Principles and Applications, Tata McGraw Hill Publication</p> <p>Teaching Aids: LCD PROJECTOR , MODELS, MACHINE MANUAL, PPTs:</p> <p>Websites: www.npkauto.com , www.youtube.com, www.technologystudent.com/</p>									
Lecture No.	Topic/ Subtopic to be covered									
1	NC and CNC Machines.									
2	Difference between conventional machines and CNCs.									
3	Working principle of CNC machines									
4	Classification of CNC machines.									
5	Advantages and disadvantages of CNC machines.									
6	Type of tools used on turning centre									
7	Type of tools used on VMC.									
8	Absolute and Incremental Co-ordinate system.									
Topic 6	<p>Name: CNC PART PROGRAMMING</p> <p>Teacher shall implement the methodology/ techniques mentioned in the following table while teaching the topics. Along with this teacher may use additional/alternative methods to make students learning meaningful.</p> <table border="1"> <thead> <tr> <th>Knowledge Category</th> <th>Example/s of category</th> <th>Teaching methodology</th> </tr> </thead> <tbody> <tr> <td>FACT</td> <td>NC/CNC machine , VMC , HMC, Machine Tools</td> <td>Explain with Chalk and Board initially. Demo of machines in workshop, Or show PPTs, Videos of actual working of these machines/ Visit to Industry.</td> </tr> <tr> <td>CONCEPT</td> <td>NC/CNC systems, Codes of Programming Selection of Tools</td> <td>Explain with Chalk and Board initially. Demo of</td> </tr> </tbody> </table>	Knowledge Category	Example/s of category	Teaching methodology	FACT	NC/CNC machine , VMC , HMC, Machine Tools	Explain with Chalk and Board initially. Demo of machines in workshop, Or show PPTs, Videos of actual working of these machines/ Visit to Industry.	CONCEPT	NC/CNC systems, Codes of Programming Selection of Tools	Explain with Chalk and Board initially. Demo of
Knowledge Category	Example/s of category	Teaching methodology								
FACT	NC/CNC machine , VMC , HMC, Machine Tools	Explain with Chalk and Board initially. Demo of machines in workshop, Or show PPTs, Videos of actual working of these machines/ Visit to Industry.								
CONCEPT	NC/CNC systems, Codes of Programming Selection of Tools	Explain with Chalk and Board initially. Demo of								

	required, Programming methods	machines in workshop, Or show PPTs, Videos of actual working of machines based on Programming / Visit to Industry.
PRINCIPLE	Parametric selection, Metal cutting principles, Part Programming	Explain with Chalk and Board initially. Demo of machines in workshop, Or show PPTs, Videos of actual working of machines based on Programming / Visit to Industry.
PROCEDURE	Operate and Writ Part programming for various auto parts	Explain with Chalk and Board initially. Demo of machines in workshop, Or show PPTs, Videos of actual working of machines based on Programming / Visit to Industry.
APPLICATION	Auto parts like axles, Engine Block etc.	Show actual parts, Videos, Visit to Industry

Learning Resources::

Books:

Title: 1)Pabla Adithan, CNC Programming And Applications, New Age International

2) P. N. Rao, CAD/CAM Principles and Applications, Tata McGraw Hill Publication

Teaching Aids: LCD PROJECTOR , MODELS, MANUALS, PPTs:

	Websites: www.npkauto.com , www.youtube.com , www.technologystudent.com/
Lecture No.	Topic/ Subtopic to be covered
1	Axes configuration- X, Y and Z axes.
2	Procedure for developing the Part program
3	• ISO Codes used in programming
4	Simple Part programming as per ISO codes on CNC and VMC for operations like TURNING,
5	Simple Part programming as per ISO codes on CNC and VMC for operations like TURNING,
6	Simple Part programming as per ISO codes on CNC and VMC for operations like DRILLING,
7	Simple Part programming as per ISO codes on CNC and VMC for operations like DRILLING,
8	Simple Part programming as per ISO codes on CNC and VMC for operations like MILLING,
9	Simple Part programming as per ISO codes on CNC and VMC for operations like MILLING,
10	Simple Part programming as per ISO codes on CNC and VMC for operations like MILLING,

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: As per MSBTE norms

5.4 Strategies for Conduct of Practical:

5.4.1 Suggestions for effective conduct of practical and assessment:

- **Any other low cost method which will explain the concept may be followed so as to overcome infrastructural facilities. (Use of china clay, wax, wax moulds etc and other materials which are used in schools can be used to make understand the concept of pattern, mould, and casting. This should be the last choice not the first one)**
- **Each student shall be given opportunity at least once to grind tool on bench grinder and working on lathe for turning job. The instructor shall be warned not to assist the students in carrying out operations. He shall assist them only in case of difficulty or wrong execution of process or in case of safety of machine tool and student.**
- **Additional assignments / extra practical for better motor skill can be done so as to enhance the knowledge of student.**
- **They shall be informed at introductory level about operation sheet / process sheet before assigning assignment on practical five i.e. on turning job. Sample process sheet can be displayed on notice board after proper explanation**
- **Any other related practice / work / job / can be done as an additional assignment**

5.4.3 Preparation for conduct of 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

AUTOMOBILE MANUFACTURING PROCESSES (17403)

Roll No.							
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Institute Name:

Course Name: **AUTOMOBILE ENGINEERING**

Course Code: AE

Semester : Fourth Semester

Subject: **AUTOMOBILE MANUFACTURING PROCESSES**

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* (3x3)

- Define Forgeability. List any two forgeable material
- Explain punching operation with neat sketch.
- Why clearance is necessary in between die and punch?
- State any three functions of pilots used in presses.

Q2. Attempt any *Two* (4x2)

- Compare Brazing and Soldering.(Any four points)
- Explain Blanking operation with neat sketch.
- Explain working principle of Gas welding operation.

Q3. Attempt any *Two* (4x2)

- Write forging sequence for manufacturing of Crank shaft.
- Compare TIG and MIG welding with respect to principle and application.
- Draw sketch of combination die and name different parts .



Sample Test Paper-2
AUTOMOBILE MANUFACTURING PROCESSES (17403)

Roll No.				
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Institute Name:

Course Name: **AUTOMOBILE ENGINEERING**

Course Code: AE

Semester : FOURTH SEMESTER

Subject: **AUTOMOBILE MANUFACTURING PROCESSES (17403)**

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* (3x3)

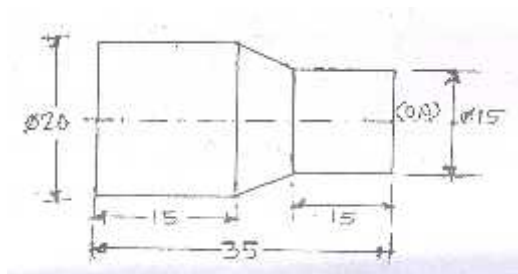
- a) Describe Lapping process.
- b) Classify CNC machines.
- c) Why surface cleaning is necessary before surface treatment?
- d) State the function of any four M codes used in CNC part programming.

Q2. Attempt any *Two* (4x2)

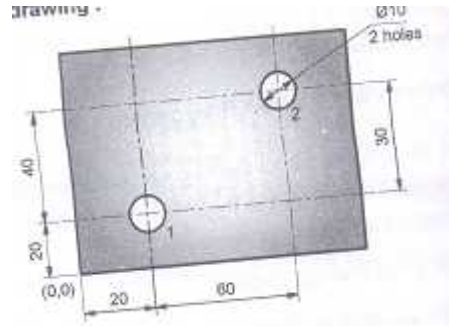
- a) What is Buffing? State any two advantages of Buffing.
- b) Differentiate between Conventional machines and CNC machines.
- c) List any four types of tools used on turning center. Draw simple sketch of any one.

Q3. Attempt any *One* (8x1)

- a) Develop a part program for the following part. (Fig. 1)



b) Develop a part program for the job shown in Fig. 2. Assume job thickness 10 mm.



6.2.1 Specification Table:

Course Name: AUTOMOBILE ENGINEERING

Course Code: AE

Semester: FOURTH SEMESTER

Title of the Subject: AUTOMOBILE MANUFACTURING PROCESSES

Subject Code: 17403

SPECIFICATION TABLE

Level Chapter /Topic	Levels from Cognition Process Dimension			Total Marks
	R	U	A	
1	4(2)	8(4)	4(2)	16(8)
2	6(2)	16(2)	2(8)	24(12)
3	2(4)	10	4(6)	16(10)
4	-	8	4(6)	12(6)
5	4	8(4)	4	16(4)
6	4	4	8(8)	16(8)
Total	20(8)	54(10)	26(30)	100(48)

R – Remember

U – Understand

A–Analyses/Apply

6. 2. 2 QUESTION PAPER PROFILE:

Course Name: AUTOMOBILE ENGINEERING

Course Code: AE

Semester: FOURTH 'G'

Title of the Subject: AUTOMOBILE MANUFACTURING PROCESSES

Subject Code: 17403

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	T	L	M	L	M	T	L	M	T	L	M	T	L	M	T	L	M	
01 A	1	A	2	2	R	2	3	U	2	3	R	2	4	R	2	5	R	2	6	A	2	1	U	2	
01 B	1	R	4	1	U	4	1	U	4																
02	1	U	4	1	A	4	2	U	4	2	R	4	2	U	4	2	A	4							
03	2	A	4	3	U	4	3	A	4	3	U	4	3	A	4	2	A	4							
04	3	A	4	4	U	4	4	U	4	4	A	4	5	R	4	5	U	4							
05	5	U	4	5	A	4	5	A	4	6	R	4	6	U	4	4	A	4							
06	6	A	8	6	A	8	2	U	8																

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.									
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17403

Maharashtra State Board of Technical Education

Course Name: Automobile Engineering

Course Code: AE

Semester: Fourth

Title of the Subject: **Automobile Manufacturing Process**

Subject Code: **17403**

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*

Q1-A) Attempt any six

(2x6=12)

- i) Define forgeability of materials?
- ii) Explain piercing operation?
- iii) State the factors considered for selection of welding process?
- iv) What is soldering? Give one application of soldering.
- v) State one application of electroplating and galvanizing .
- vi) Define G code and M code used in CNC process?
- vii) What is vertical machining centre?
- viii) Define forging process?

B) Attempt any two

(4x2=8)

- i) State two advantages and two disadvantages of forging process?
- ii) Explain drop forging with neat sketch
- iii) Distinguish between open die forging and closed die forging processes. (Any four points)

Q2 – Attempt any four

(4x4 =16)

- a) Explain how forging process improves the mechanical properties of components?
- b) Write down the sequence for manufacturing connecting rods?

- c) List the material used in press work in automobile parts with example.
- d) Describe simple die with neat sketch.
- e) Explain bending operation and drawing operation with neat sketch.
- f) List various die accessories. Describe any one using neat sketch.

Q3 – Attempt any four (4x4=16)

- a) Explain how a steel glass is manufactured using drawing process.
- b) Draw labeled sketch of TIG welding process .
- c) Differentiate between TIG and MIG welding process.(Any four points)
- d) Describe resistance welding process.
- e) Compare soldering and brazing .(Any four points)
- f) Sketch and label fly press.

Q4- Attempt any four (4x4=16)

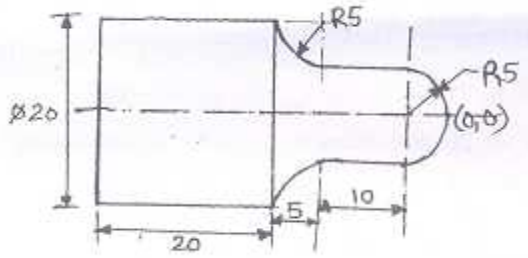
- a) Sketch and label different types of gas welding flames. Give application of any one.
- b) Explain galvanizing process and give two applications.
- c) How sand blasting process is used in surface cleaning?
- d) What are the advantages of burnishing process over other surface finishing process.(any four points)
- e) State any four limitations of conventional machining process.
- f) Explain absolute and incremental coordinate system with suitable example.

Q5- Attempt any four (4x4=16)

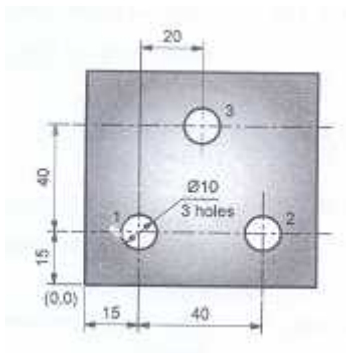
- a) Describe closed loop control CNC system with block diagram.
- b) Differentiate between NC and CNC machines (any four points)
- c) Point out any four disadvantages of CNC machines .
- d) State functions of G01, G03, M02, M06 used in CNC part programming?
- e) Write stepwise procedure for developing CNC part program.
- f) Differentiate between lapping and honing operation. (any four points)

Q6 - Attempt any two (2x8=16)

- a) Write a part program for following component. Assume suitable data for programming.



- b) Write a part program for the job shown in figure. Use absolute mode for programming. Take plate thickness of 10 mm.



- c) Draw labeled sketch of progressive die. Write functions of any four parts of progressive die.