CURRICULUM REVISION PROJECT

2012

TEACHER GUIDE FOR
(OBJECT ORIENTED PROGRAMMING-17432)

FOURTH SEMESTER COMPUTER ENGINEERING GROUP
(CO/CM/IF/CD/CW)

DECEMBER 2013

MAHARASHTRA STATE

BOARD OF TECHNICAL EDUCATION, MUMBAI

INDEX

1. 0 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.

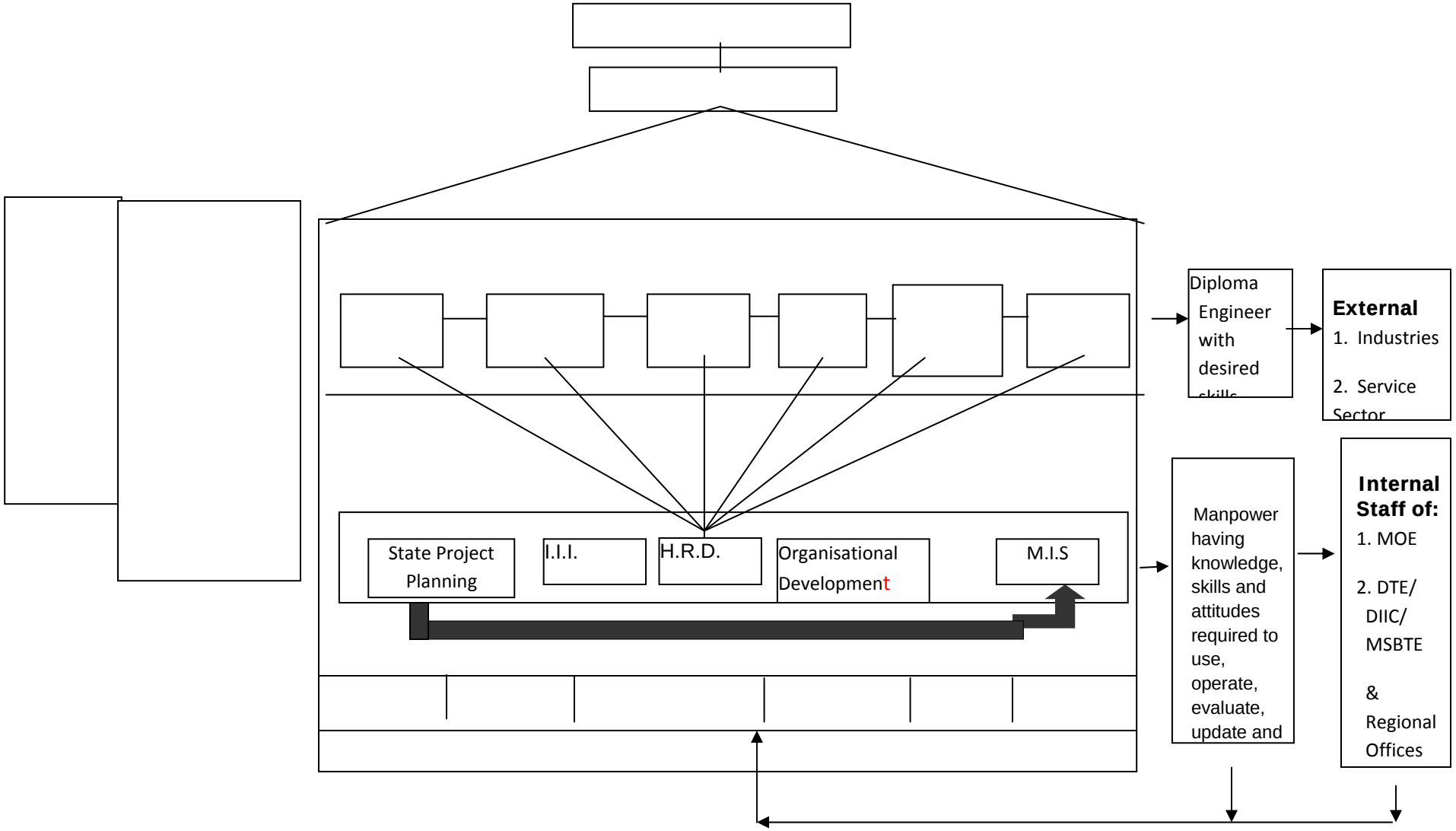


Fig 1 Systems Approach

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 intellectual and motor skills in order to satisfactorily perform duties assigned to them:

A) Intellectual skills.

1. Identify the problem

2. Prepare the algorithms

3. Analyze the problem

4. Prepare the flowchart/model

5. Select hardware and software tools and technologies

6. Use of appropriate programming languages

7. Write programs

8. Test and debug computer Program

9. Diagnose the hardware faults

10. Prepare and interpret software documentation

B) Motor Skills.

1. Handle the Computer system

2. Handling trouble shooting tools

3. Assemble and disassemble computer system

4. Install hardware devices

5. Install network

1.6 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 Applied 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 Studies 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 at the sixth semester 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 Computer Engineering Group, for fourth Semester IF Computer Networks (CON) is replaced with Data Communication and Networking.
- For Fourth Semester IF, Applied Multimedia Technology Theory subject is changed to Practical.
- For Fifth semester CO, System Programming subject is included.

2. 0 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 whereas 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.

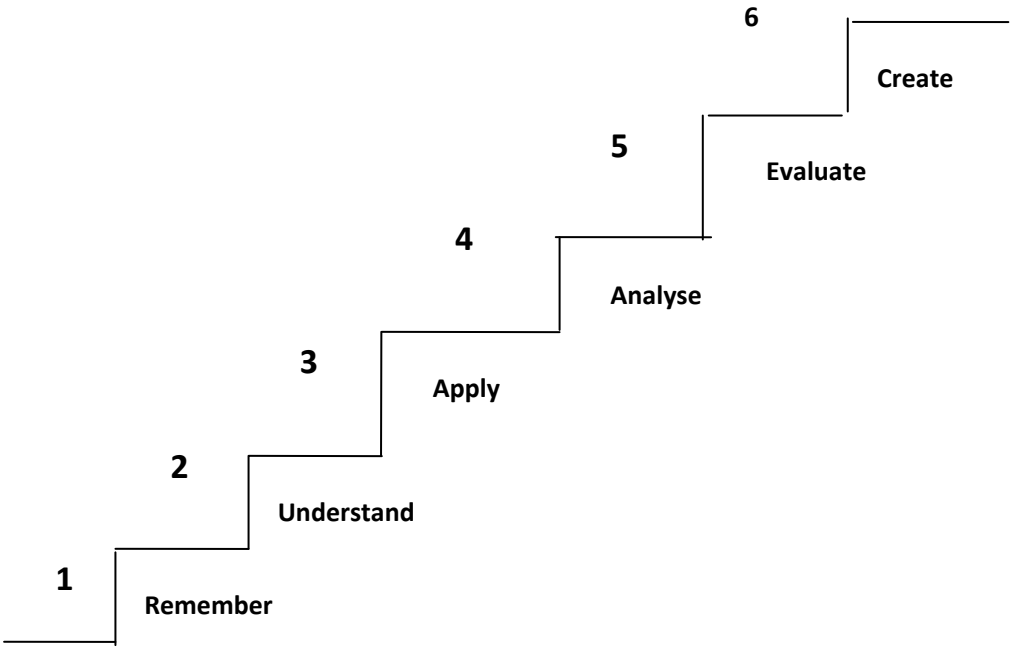
2.3 LEVELS OF LEARNING:

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 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.	Understands fact, principles Interprets verbal material, Interprets charts, tables, graphs. Translates verbal material to mathematical formula. Estimates consequences implied in data. Justifies methods & procedures.	Convert, distinguish estimate, explain, 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 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 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

3.0 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. ConcreteConcepts: 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. AbstractConcepts: 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 CONCEPTATTRIBUTES:

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 **ofFriction**

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.

ForExample: (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.

Forexample:

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.

ForExample:

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.

ForExample:

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 makeimportant 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 amongst the teachers themselves. More importantly, Content Analysis will be a pre-requisite for writing Instructional Objectives of the topic to be taught. Teaching and learning process is bound to be effective once these crucial academic activities are undertaken.

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This definition takes into account the fact that

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

4. CURRICULUM

Course Name : Computer Engineering Group

Course Code : CO/CD/CM/CW/IF

Semester : Fourth

Subject Title : Object Oriented Programming

Subject Code : 17432

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:

The ability to organize & process information is key to success in modern age. Object Oriented Programming has become the most preferred approach for software projects. It offers a new and powerful way to cope up with complexity of real world problems. Among the OOP languages available, C++ is one of the most widely used language.

Instead of viewing program as a series of steps to be carried out, OOP approach views it as a group of objects that have certain properties & can take appropriate actions.

Object Oriented Concepts like inheritance, polymorphism, data abstraction and encapsulation etc. requires knowledge of C++, which also acting as base for programming languages like Java, Object Oriented Modeling & Designing (OOMD), VC++.

Objectives:

To develop following skills:

Intellectual Skills:

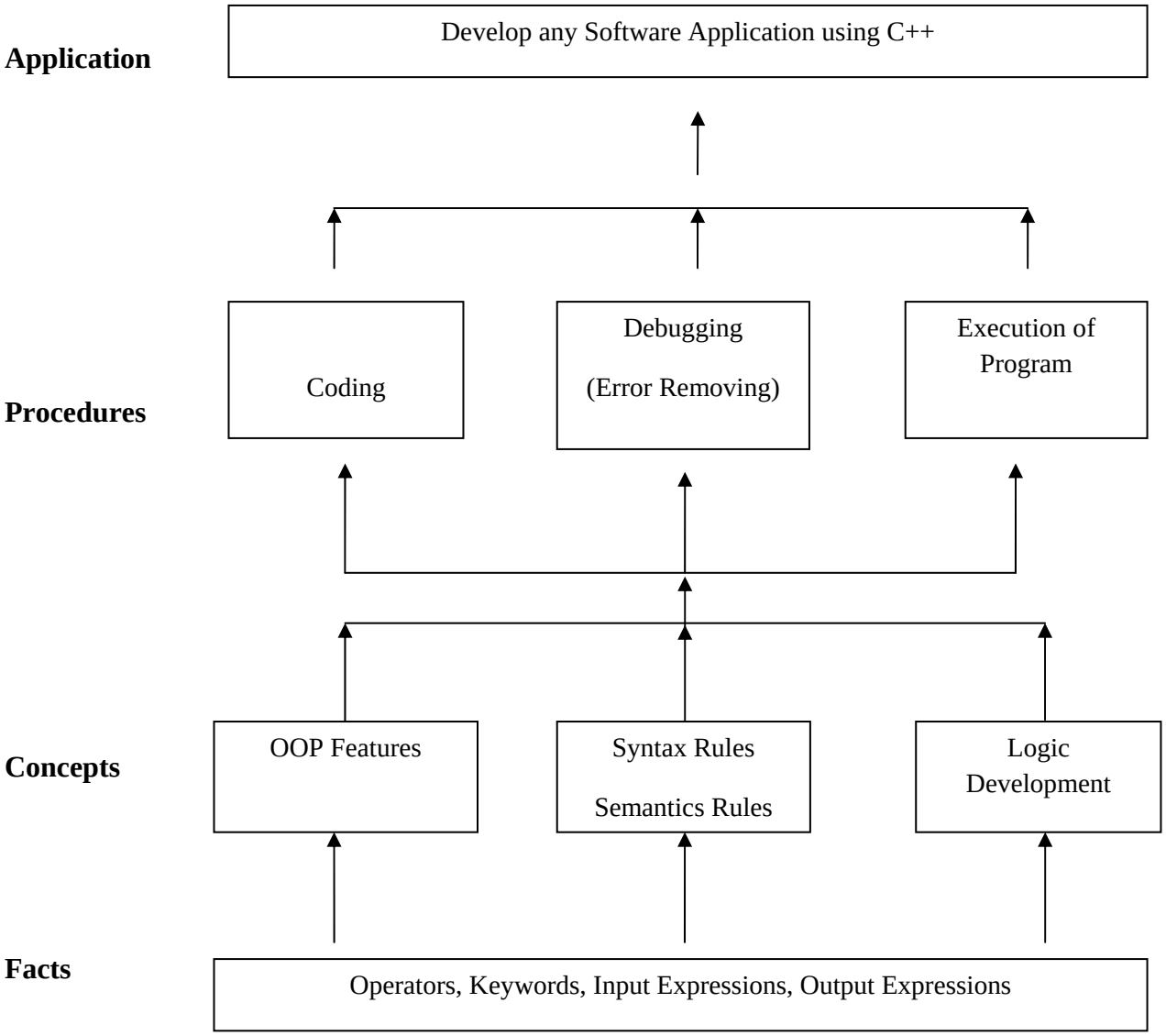
1. Understand the concepts of OOP.
2. Implement programs based on OOP concepts.

3. Understand basic fundamentals of C++.
4. Develop small software applications using C++.

Motor Skills:

1.Proper Handling of Computer System.

Learning Structure:



Theory:

Topic No	Contents	Hours	Marks
1	**Principles of Object Oriented Programming** **Objectives:** ➢ State OOP's basic Concepts. ➢ Difference between OOP & POP. ➢ C++ Programming structure. 1.1 Its need & requirement, Procedure Oriented Programming (POP) verses Object Oriented Programming (OOP), Basic concepts of Object Oriented Programming, Object Oriented Languages, Applications of OOP. 1.2 Beginning with C++: What is C++? , keywords, variables, constants basic data types, operators, scope resolution operator, memory management operators, console input/output, structure of C++ program.	06	12
2	**Classes & Objects:** **Objectives:** ➢ Defining classes & objects. ➢ Declaring & using static data member & static member function, friend function. ➢ Programs based on classes & objects. 2.1 Structures in C++. 2.2 Class & Object: Introduction, specifying a class, access specifies, defining member functions, creating Objects, memory allocations for objects. 2.3 Array of Objects, Object as function arguments. 2.4 Static data members, static member function, friend Function	08	20
3	**Constructors & Destructors** **Objectives:** ➢ State Concepts of constructor & destructor, types of constructor. ➢ Programs based on constructor & destructors	08	14

	3.1 Concepts of Constructors, Types of constructors: Default, Parameterized, Copy. 3.2 Overloaded Constructors :Multiple Constructors in a Class, Constructors with default arguments. 3.3 Destructors.		
4	**Inheritance: Concept of Reusability** **Objectives:** ➢ Concept of Inheritance & its types. ➢ Types of Visibility modes. ➢ Programs based on Inheritance. 4.1 Introduction, defining a derived class, visibility modes & effects. 4.2 Types of Inheritance : Single, multilevel, multiple, hierarchical, hybrid 4.3 Virtual base class, abstract class, constructors in derived class.	08	20
5	**Pointers in C++** **Objectives:** ➢ Declare Pointer & Pointer arithmetic. ➢ Pointer to Arrays, string & Object. ➢ "this" pointer concept. 5.1 Concepts of Pointer: Pointer declaration, Pointer operator, address operator, Pointer arithmetic. 5.2 Pointer to Array: Searching, Insertion, deletion 5.3 Pointer to String: Searching, finding length, comparisons, concatenation, reverse 5.4 Pointer to Object: Pointer to Object, this pointer, Pointer to derived class.	10	18
6	**Polymorphism** **Objectives:** ➢ Polymorphism concept & its types. ➢ Program for overloading operators & functions. 6.1 Introduction, Types of polymorphism: Compile time, Run time 6.2 Compile time Polymorphism: Function overloading, operator overloading: Overloading unary and binary operators, Rules for	08	16

	operator overloading. 6.3 Run time polymorphism: Virtual functions, rules for virtual functions, pure virtual function.		
	Total	**48**	**100**

List of Practical:

Sr. No.	Title of Experiment
1	Write a program to Input & Output data for exchanging values of two variables.
2	Develop a program to declare a class ‘person’ having data members name, age & salary. Accept and display this data for one object.
3	Write a program to declare a class ‘employee’ having data members name and age. Accept and display the data for three objects.
4	Write a program to show how static member is shared by multiple objects of the same class.
5	Develop a program to find out the mean value of a given number using friend function.
6	Develop a program to print student details of ‘stud’ class using constructor and destructor
7	Write a program to find prime number using default argument in constructor
8	Write a program to find out the payroll system using single level inheritance.
9	A. Write a program to find student details using multiple inheritance. B. Write a program to compute total marks of student using virtual base class.
10	Write a program to evaluate the largest number of an array using pointer
11	Write a program to search a character in a string using pointer.
12	Write a program to input and display code and price for two items using pointer to object.
13	Write a program to display roll_no and name of student using ‘this’ pointer.

14	Write a program to using function overloading to calculate volume of cube, cylinder & rectangular box
15	Write a program to overload unary '--' operator
16	Write a program to display the output using the virtual function.

Learning Resources:

1. **Books:**

Sr. No.	Author	Title	Publisher
1	E Balagurusamy	Object oriented Programming with C++	Mc Graw Hill
2	Rajesh K. Shukla	Object oriented Programming in C++	Wiley India
3	B. M. Harwani	C++ for Beginners	SPD
4	Robert Lafore	Object Oriented Programming in C++ (4^{th} edition)	Pearson

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

www.vikaspublishing.com/teachermanual.aspx (PPTs available)

www.pearsoned.co.in/prc (After Registration resources are available)

3. **Websites:**

www.cplusplus.com

www.learncpp.com

www.sourcecodesworld.com

www.softeam.com

5. IMPLEMENTATION STRATEGY

5.1 Planning of Lectures for a Semester with Content Detailing:

[The methods used to explain the contents are just guideline. Any relevant methods can be used for better understanding of students and effective teaching

learning process]

Topic I	NAME: Principles of object oriented programming

Knowledge Category	Example/s of category	Teaching methodology
FACT	**Object oriented programming approach Procedure oriented programming approach Keyword,constants,variable, data type**	**Teacher shall explain with an example in classroom**
CONCEPTS	**Use of variable, constant, data types, operators, console input / output**	**Teacher shall explain in class room with PPT or programs.**
PRINCIPLE	**--**	**--**
PROCEDURE	**Program coding,debugging and execution**	**Teacher shall conduct programs in Laboratory**
APPLICATION	**Basic program writing**	**Teacher shall give assignments for basic programs such as finding given number is even or odd,finding total and average for 5 subjects,etc.**

Reference Material:
Books: -
Title 1) Object Oriented Programming with C++ by E Balagurusamy
2) Object Oriented Programming in C++ by Robert Lafore

Teaching Aids:
Black board, Chalk, Transparencies, Power point presentation slides(PPTs), Reference books, notes, LCD projector/OHP Projector,

PPT with Sample: -

- http://www.authorstream.com/Presentation/aSGuest39073-333842-object-oriented-programming-education-ppt-powerpoint/
- http://search.snapdo.com/?category=Web&p=1&st=ds&q=object+oriented+programming+ppt

Websites:

- http://www.exforsys.com/tutorials/oops/object-oriented-programming-concepts.htm
- http://en.wikipedia.org/wiki/Object-oriented_programming

<table>
<tr><td></td><td>➢ http://docs.oracle.com/javase/tutorial/java/concepts/class.html</td></tr>
<tr><td>Lecture No.</td><td>Topic/ Subtopic to be covered</td></tr>
<tr><td>1</td><td>• Introduction to the concept of OOP
• Characteristics of OOP
• Characteristics of POP
• Comparison between OOP and POP</td></tr>
<tr><td>2</td><td>• Basic concepts of OOP
• It includes terms such as objects,classes,data abstraction and encapsulation,inheritance,polymorphism,dynamic binding and message passing
• Applications of OOP</td></tr>
<tr><td>3</td><td>• Object oriented languages
• Introduction to the concept of C++
• Includes terms such as keywords,variables, constant, and data type.</td></tr>
<tr><td>4</td><td>• Scope resolution operator
• Memory management operator</td></tr>
<tr><td>5</td><td>• Console input/output-cin and cout with syntax and example
• Structure of C++ Program</td></tr>
<tr><td>6</td><td>• Programs based on all above concepts.</td></tr>
<tr><td>Topic 2</td><td>Name:Classes and Objects</td></tr>
<tr><td></td><td>
<table>
<tr><th>Knowledge Category</th><th>Example/s of category</th><th>Teaching methodology</th></tr>
<tr><td>FACT</td><td>Structure
Class/object
Access specifier

Static data member

Friend function</td><td>Example of student record.for example creating templates and then making its multiple copies in the form of objects.
Explain meaning of each access specifier with one example.
Explain with interest rate as a static data member,common to all account holders
Define two classes and explain how to access data from two classes in a single function</td></tr>
<tr><td>CONCEPTS</td><td>Creating and defining class and object

Syntax for declaring static data member,static member function and freind function</td><td>Create a class for student and create its object
Teacher shall teach these concepts with program like calculating interest with fix interest rate</td></tr>
<tr><td>PRINCIPLE</td><td>Data abstraction</td><td>Define a class for</td></tr>
</table>
</td></tr>
</table>

		Data hiding	**student and exaplain data abstraction and hiding**
	PROCEDURE	**Program coding,debugging and execution**	**Teacher shall conduct programs in Laboratory**
	APPLICATION	**Program writing for data hiding,sharing of data**	**Programs based on class,friend function such as finding maximum of two numbers of different classes,static data member and member function such as calculating simple interest shall be conducted in lab.**

Reference Material:
Books: -
Title 1) Object Oriented Programming with C++ by E Balagurusamy
2) Object Oriented Programming in C++ by Robert Lafore

Teaching Aids:
Black board, Chalk, Transparencies, Power point presentation slides(PPTs), Reference books, notes, LCD projector/OHP Projector,

PPT with Sample: -

- http://search.snapdo.com/?category=Web&p=1&st=ds&q=object+oriented+programming+ppt

Websites:

- http://dictionary.reference.com/browse/object-oriented+programming

1	• Definition of structure • Syntax and example for structure
2	• Syntax to define class with explanation • Meaning of access specifiers used in class • Member functions declaration inside and outside the class
3	• Creating object for class • Accessing data members and member functions • Program based on creating objects and accepting input and displays them.
4	• Memory allocation for objects • Concept of array of objects. • Program based on array of objects.
5	• Concept of Object as a function argument. • Syntax and example for the same • Program based on object as a function argument.
6r	• Friend function • Syntax for declaration and definition

	• Characteristics of friend function • Program based on friend function
7	• Static data member-concept and characteristic • Syntax for creating static members. • Program based on static data member
8	• Static member function-concept and characteristic • Syntax for creating static member function. • Program based on static member function
Topic 3	**Name: Constructors and Destructors**

Knowledge Category	Example/s of category	Teaching methodology
FACT	**Constructor destructor**	**Explain initializatin of object and destroying object with example in classroom**
CONCEPTS	**Declaration ,defining and execution of constructor and destructor.**	**Teacher shall take programs with constructr and destructor.explain when constructor and destructor are invoked during execution of program.**
PRINCIPLE	**Initialization of object, Releasing memory**	**Show example to initialize a constructor and destroy the objects while executing destructor.also indicate how many times constructor and destructor are executed during program execution.**
PROCEDURE	**Program coding,debugging and execution**	**Teacher shall conduct programs in Laboratory**
APPLICATION	**Program writing using the concept of construtor and destructor**	**Programs for initialization of objects with constructor and destroying objects with destructor in lab.**

Reference Material:
Books: -
Title 1) Object Oriented Programming with C++ by E Balagurusamy
2) Object Oriented Programming in C++ by Robert Lafore

Teaching Aids:
Black board, Chalk, Transparencies, Power point presentation

	slides(PPTs), Reference books, notes, LCD projector/OHP Projector **PPT with Sample: Preferably prepare PPTs containing-** ➢ www.cse.unr.edu/~bebis/CS308/PowerPoint/ReviewConstDestr.ppt ➢ www.lsp4you.com/cpp/lsp4you_cpp_unit8.ppt ➢ www.slideshare.net/forwardblog4u/constructors-destructors **Websites:** ➢ www.learncpp.com
Lecture No.	**Topic/ Subtopic to be covered**
1	• Definition of constructor • Syntax to declare and define constructor • Execution of constructor • Characteristics of constructor.
2	• Definition of Default constructor • Program based on default constructor
3	• Definition of Parameterized constructor • Syntax to declare and define constructor • Execution of constructor • Program based on parameterized constructor
4	• Constructors with default argument • Syntax to declare and define constructor • Execution of constructor • Program based on constructor with default argument
5	• Copy constructor • Syntax to declare and define constructor • Execution of constructor • Program based on copy constructor
6	• Constructor overloading and Multiple constructors in a class • Execution of multiple constructor • Program based on constructor overloading
7	• Definition of destructor • Syntax to declare and define destructor • Execution of destructor • Characteristics of destructor.
8	• Program based on destructor • Difference between constructor and destructor • Examples based on output of constructor and destructor
Topic 4	**Name:Inheritance: Concept of Reusability**
	Knowledge Category / **Example/s of category** / **Teaching methodology** **FACT** / **Inheritance, Base class, Derived class** / **By taking example of parent child relationship teacher shall explain the concept of inheritance**

	Visibility mode **Virtual base class**	**where parent is base class and child is derived class.** **Explain visibility modes for access to variables by objects of same class and other classes(Inherited and not inherited)** **With example of grand parent,parent and child classes teacher shall explain properties inherited in child class**
CONCEPTS	**Defining inheritance with its types**	**Teacher shall explain each type with program in the classroom.**
PRINCIPLE	**Reusability**	**Teacher shall explain how properties of base are inherited in derived class**
PROCEDURE	**Program coding,debugging and execution**	**Teacher shall conduct programs in Laboratory**
APPLICATION	**Program writing for inheritance**	**Programs based on single,multiple,multilevel, heirarchical, Hybrid inheritance including virtual base class**

Books: -

Title 1) Object Oriented Programming with C++ by E Balagurusamy

2) Object Oriented Programming in C++ by Robert Lafore

Teaching Aids:

Black board, Chalk, Transparencies, Power point presentation slides(PPTs), Reference books, notes, LCD projector/OHP Projector

PPT with Sample: -

- http://www.slideworld.com/slideshow.aspx/OOPS-INHERITANCE-ppt-2768891
- http://search.snapdo.com/?category=Web&p=1&st=ds&q=inheitance+concept+in+oop+ppt

Websites:

- www.learncpp.com
- http://www.exforsys.com/tutorials/oops/the-inheritance-concept-in-oops.html
- http://en.wikipedia.org/wiki/Object-oriented_programming

Lecture No.	**Topic/ Subtopic to be covered**

<table>
<tr><td>1</td><td>• definition of inheritance
• benefits of inheritance
• base class, derived class
• syntax to define derived class
• visibility mode and its effects</td></tr>
<tr><td>2</td><td>• definition of single inheritance
• single inheritance example with diagram
• syntax to define single inheritance
• program based on single inheritance</td></tr>
<tr><td>3</td><td>• definition of Multilevel inheritance
• Multilevel inheritance example with diagram
• syntax to define Multilevel inheritance
• protected access specifier
• program based on Multilevel inheritance</td></tr>
<tr><td>4</td><td>• definition of Multiple inheritance
• Multiple inheritance example with diagram
• syntax to define Multiple inheritance
• program based on Multiple inheritance</td></tr>
<tr><td>5</td><td>• definition of Hierarchical inheritance
• Hierarchical inheritance example with diagram
• syntax to define Hierarchical inheritance
• program based on Hierarchical inheritance</td></tr>
<tr><td>6</td><td>• Definition of Hybrid inheritance
• Hybrid inheritance example with diagram
• Definition of Abstract class
• Example of abstract class</td></tr>
<tr><td>7</td><td>• Definition of Virtual base class
• With diagram explain necessity of virtual base class
• Syntax to declare virtual base class
• Program based on virtual base class</td></tr>
<tr><td>8</td><td>• Concept of Constructor in derived class
• Execution of constructor from base class and derived class
• Program based on constructor in derived class</td></tr>
<tr><td>Topic 5</td><td>Name:Pointers in C++</td></tr>
<tr><td></td><td>
<table>
<tr><th>Knowledge Category</th><th>Example/s of category</th><th>Teaching methodology</th></tr>
<tr><td>FACT</td><td>Pointer

String

This pointer</td><td>Teacher shall explain with example how pointer is used to access memory location(linked list)
Explain memory storage of string(NULL character to indicate end)
With example explain use of this pointer to access current object</td></tr>
</table>
</td></tr>
</table>

	CONCEPTS	**Pointer to array Pointer to string Pointer to object**	**Teacher shall explain each with one program in classroom.**
	PRINCIPLE	**Accessing actual parameters with memory address**	**Teacher shall explain with example how pointer is used to point and update data stored in memory location(with PPT)**
	PROCEDURE	**Program coding,debugging and execution**	**Teacher shall conduct programs in Laboratory**
	APPLICATION	**Program writing using pointers**	**Programs based on pointer to array(searching,inserting and deleting elements),pointer to string(concatenation,comparison, reverse,finding length),pointer to object,this pointer.**

Reference Material:
Books: -
Title 1) Object Oriented Programming with C++ by E Balagurusamy
2) Object Oriented Programming in C++ by Robert Lafore

Teaching Aids:
Black board, Chalk, Transparencies, Power point presentation slides(PPTs), Reference books, notes, LCD projector/OHP Projector,

PPT with Sample: -

- www.cse.psu.edu/~mif10/cse122/pointers%20in%20C++.ppt

Websites:

- **www.tutorialspoint.com/cplusplus/cpp_pointers.htm**
- www.learncpp.com
- http://cpp-tutotrial.cpp4u.com/compound_pointers.html

1	➢ definition of pointer ➢ declaration, initialization of pointer ➢ operators used with pointer
2	➢ concept of pointer arithmetic ➢ program based on pointer arithmetic
3	➢ explain concept of pointer to array ➢ searching operation ➢ program based on searching
4	➢ operations with pointer to array ➢ insertion operation ➢ deletion operation

	➢ program based on insertion and deletion
5	➢ explain concept of pointer to string ➢ searching operation ➢ program based on search operation
6	➢ program based on finding length of string using pointer to string ➢ program based on comparison of two strings using pointer to string
7	➢ program based on concatenation of two strings using pointer to string ➢ program based on reversal of string using pointer to string
8	➢ concept of pointer to object ➢ Syntax and example of pointer to object.
9	➢ **Definition of this pointer** ➢ **Syntax to use this pointer** ➢ **Program based on this pointer**
10	➢ Concept of pointer to derived class ➢ Program based on the above concept
Topic 6	**Name:Polymorphism**

Knowledge Category	Example/s of category	Teaching methodology
FACT	**Polymorphism** **Function** **Operator** **Virtual function**	**With example exaplin polymorphism.include run time polymorphism (function/operator overloading)and run time polymorphism (virtual function)** **Explain with example function overloading such as calculating area for rectangle,circle with same name functions.** **Teacher shall explain unary and binary operators such as plus for concatnation,minus for negation,etc for operator overloading. also teacher shall explain why virtual function is used with concept of function overriding.**
CONCEPTS	**Definig function /operator overloading and virtual function**	**Programs based on polymrphism and virtual function**
PRINCIPLE		
PROCEDURE	**Program coding,debugging and execution**	**Teacher shall conduct programs in Laboratory**

	APPLICATION	**Programs based on polymrphism and virtual function**	**Programs such as fuction overloading (calculating area of circle,ractangle with same name function) ,operator overloading(plus operator for concatenation,minus operator for negation), virtual function(declaring and defining dispaly function in base and derived classes)**

Reference Material:
Books: -
Title 1) Object Oriented Programming with C++ by E Balagurusamy
2) Object Oriented Programming in C++ by Robert Lafore

Teaching Aids:
Black board, Chalk, Transparencies, Power point presentation slides(PPTs), Reference books, notes, LCD projector/OHP Projector,

PPT with Sample: -

- **http://www.authorstream.com/Presentation/imranserielkiler-219545-function-overloading-entertainment-ppt-powerpoint**
- http://search.snapdo.com/?category=Web&p=1&st=ds&q=inheitance+concept+in+oop+ppt

Websites:

- **www.studytonight**
- www.learncpp.com

1	➢ Definition of polymorphism ➢ Types of polymorphism ➢ Diiference between compile time and run time polymorphism
2	➢ Concept of Compile time polymorphism ➢ Function overloading concept ➢ Program based on ion overloading
3	➢ Operator overloading ➢ Types of operators-unary and binary ➢ Rules of operator overloading
4	➢ Program based on unary operator overloading
5	➢ Program based on binary operator overloading
6	➢ Concept of function overriding ➢ Definition of virtual function ➢ Explain virtual function with diagram(why it is required)
7	➢ Program based on virtual function
8	➢ Rules for virtual function ➢ Pure virtual function

	➢ Difference between virtual function and pure virtual function

Planning and conduct of Test:

- There will be two tests each of 25 marks.
- The test will be conducted as per the MSBTE schedule.
- The schedule of the test and portion shall be declared at least one week in advance.
- The model answers with the marking scheme shall be displayed on the notice board.
- Teacher shall give the feedback to the students about their performance.

5.3 Details about conduct of Assignments.
Assignment no. 1-6: Give assignment on each topic of curriculum.
Assignment no. 7: Sample question paper of Object Oriented Programming to be solved by every student

[Students shall submit the assignments at the time of submission of Object Oriented Programming manual and teacher shall check the assignments at the time of checking respective topic experiments of Object Oriented Programming manual]

5.4 Strategies for Conduct of Practical.
5.4.1 Approach For Design of Manual
N/A
5.4.2 Suggestion For Effective Conduct of practical and assessment

Experiment No	Activity	Suggested Time
01 Write a program to accept and display data for exchanging values of two variables.	Teacher shall explain the concept of accept and display data in a program.(input output operations(cin ,cout))	10 mins
	Teaher shall explain logic of the program for exchanging the values of two variables.	10 mins
	Student shall perform sample program,exercise activities(output and errors)	20 mins
	Sttudents shall perform any two programs assigned by teacher from the given list and show output to teacher.	40 mins
	Teacher shall assess the manual by asking questions related to that experiment.	40 mins

1.4.3 Preparation For Conduct of Practical:-

- Check whether all computers are working.
- Install Turbo C++.

2. Mode Of Assessment

6.1 Class Test: -It is proposed that there will be two tests each of 25 marks. The tests will be conducted as per MSBTE schedule

6.1.1 Guideline for setting class test question paper:

The following instruction should be followed strictly by the paper setter (subject teacher):

1. The question paper should be set according to the given **Sample Test Paper format**.
2. Question paper for class tests first & second should be strictly based on the given syllabus.
3. Question 1 will be of 9 marks. The student will have to attempt any three out of four. This question will have each bit of 3 marks.

   Question 2 and 3 will be of 8 marks each. The student has to attempt any 2 out of 3. These questions will have each bit of 4 marks.
4. The teacher should ensure that the curriculum is covered by that time.
5. Duration of class test is one hour.
6. Instructions should be given at the top of the paper. k

Class Test-I

Syllabus for class test I:

1. Chapter 1
2. Chapter 2
3. Chapter 3-3.1 & 3.2

Class Test-II

Syllabus for class test II:

1. Chapter 3-3.3
2. Chapter 4
3. Chapter 5
4. Chapter 6

Note: While setting the question paper

40% questions should be based on Remember level.

40% questions should be based on Understanding level.

20% questions should be based on Application level.

Scheme – G

Sample Question Paper Unit Test 1

Course Name: - Computer Engineering Group

Course Code:- CO/CM/CD/IF/CW

Semester: - FOURTH

Subject Title: -OBJECT ORIENTED PROGRAMMING **17432**

Marks: - 25 Marks

Q.1. Attempt Any Three. **(3*3)**

a) Define following terms:

i) Data abstraction
ii) Data Encapsulation
iii) Dynamic Binding

b) Give any two methods to create object of a class.
c) Write any three characteristics of constructor.
d) How data hiding is done in C++? Give example showing data hiding.

Q.2. Attempt any Two. **(4*2)**

a) How to pass object as function argument in C++?explain with example.
b) What is static data member? Give reason why it is required in C++.
c) List and explain any two memory management operators with syntax and example.

Q.3. Attempt any Two. **(4*2)**

a) Write a program for swapping contents of two variable using friend function.
b) What is the use of copy constructor? Give one example for declaring copy constructor.
c) Write a program to calculate factorial of a given number.

Scheme – G

Sample Question Paper Unit Test 2

Course Name: - Computer Engineering Group

Course Code:- CO/CM/CD/IF/CW

Semester: - FOURTH

Subject Title: - OBJECT ORIENTED PROGRAMMING **17432**

Marks: - 25 Marks

Q1. Attempt any Three. **(3*3)**

a) State any three visibility modes with their use in inheritance.
b) What is pointer? How to declare and initialize pointer?
c) Write any three rules for virtual function?
d) Differentiate between constructor and destructor with respect to following terms :
   - Use
   - Syntax
   - execution

Q2. Attempt any Two. **(4*2)**

a) Explain how to insert an element in an array using pointer with an example.
b) What is hierarchical inheritance? Describe it with suitable diagram.
c) Define polymorphism? Differentiate between compile time polymorphism and run time polymorphism.

Q3. Attempt any Two. **(4*2)**

a) Explain why abstract class is used in C++ ?
b) Write a program to find length of the string using pointer
c) Write a program to using function overloading to calculate volume of cube and cylinder.

Scheme – G

Sample Question Paper

Course Name: - Computer Engineering Group

Course Code:- CO/CM/CD/IF/CW

Semester: - FOURTH

Subject Title: - OBJECT ORIENTED PROGRAMMING **17432**

Marks: - 100 Marks

Instructions

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

Q 1(a) Attempt any SIX of the following (12)

i. What is the use of scope resolution operator?

ii. Enlist any two operators used with pointers.

iii. Calculate the size of object S1 defined in following class:

```
class Student
{
        char name[10];
        introllno;
        float percentage;
};
Student S1;
```

iv. Define Constructor & give Syntax to declare it.

v. What is polymorphism? State its types.

vi. State different visibility modes used in inheritance.

vii. State the use of this pointer in C++.

viii. Give output for following code

```
class employee
        {
         public:
         employee()
         {
         cout<<"Welcome\n";
         }
         };
         void main()
         {
                 employee E1,E2,E3;
         }
```

.

Q 1 (b) Attempt any **TWO** of the following (08)

i. What is constructor overloading? Write one program with overloading of constructor.
ii. Enlist four types of inheritance. Give syntax and example for declaring any two types of inheritance.
iii. Differentiate between constructor and destructor on the basis of their use, syntax, execution and types?

Q 2 Attempt any **FOUR** of the following (16)

a) Write syntax and example for defining member function inside and outside class.
b) Differentiate between virtual function and pure virtual function.
c) Give the meaning of deriving a class with public and protected visibility modes. Which visibility mode can be used in multilevel inheritance to access data of parent classes and why?
d) Write any four features of Object Oriented Programming.
e) What is Friend function? Explain with suitable example why it is required.
f) Describe the concept of pointer to object.

Q 3 Attempt any **FOUR** of the following (16)

a) Write a program to find entered number is even or odd.
b) Can we pass default arguments in a constructor? Give one example to declare a constructor with default argument.
c) Explain with example, how to declare Constructor in derived class.also state when derived class constructor will execute.
d) Write a programme to overload '-' operator to negate data members of class.
e) Write a program to declare a class 'student' having data members as roll_no and percentage. Using this pointer invoke member functions to accept and display data for one object of the class.
f) Describe how memory is allocated for objects of class.

Q 4 Attempt any **FOUR** of the following (16)

a) Write a program to implement single inheritance with two classes. Declare parent class as furniture with data members material and price. Derive child class as table with data members as height and surface_area.Accept and display data for one table.
b) What is parameterized constructor? Give the syntax & example for it's declaration.
c) With syntax and example describe console input &outut functions used in C++.
d) Define and state two characteristics of static data member and static member function.
e) Differentiate between Multiple & Multilevel inheritance on the basis of their use and declaration syntax.

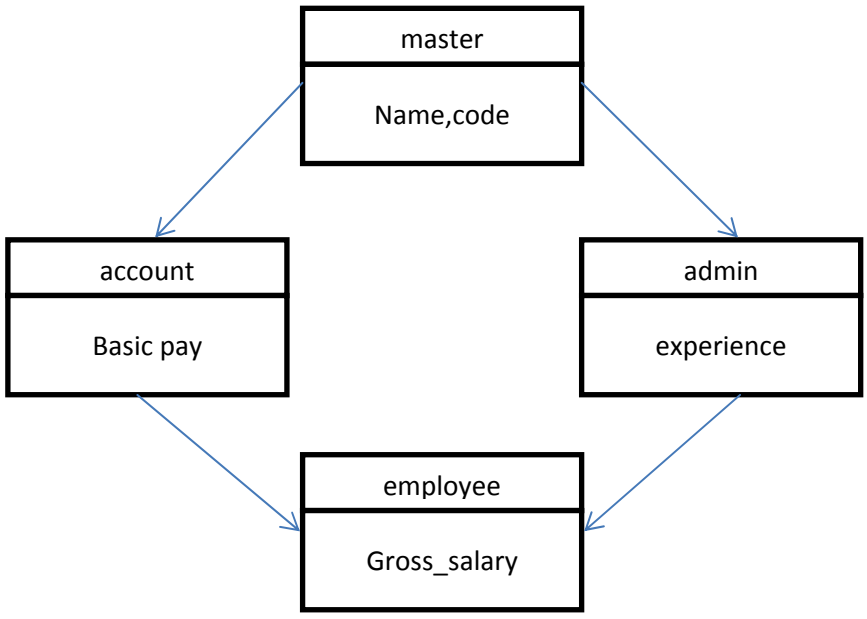
f) Write a program for searching a number in an array using pointer..

Q 5 Attempt any **FOUR** of the following (16)

a) Enlist any four rules for operator overloading.
b) What is structure? How to declare structure? Explain with example.
c) Write a program for declaring a class 'employee'. Derive two classes programmer and manager from employee class. Make display function virtual which is common for all and which will display information of one programmer.
d) Differentiate between OOP and POP.
e) Give any four pointer arithmetic operations with example.
f) How run time polymorphism differs from compile time polymorphism.

Q 6 Attempt any **TWO** of the following (16)

a) Write a program to declare a class 'Account' having data members as Account_no and balance. Accept the data for 5 accounts and display the data of accounts having balance greater than 5000.
b) Write a program to implement the concept of virtual base class for following figure. Accept and display information of one employee with his name, code, basic pay, experience and gross salary with the object of employee class.



c) Write a program to find whether the entered string is palindrome or not.