CURRICULUM REVISION PROJECT

2012

TEACHER GUIDE FORCOMPUTER NETWORK

DECEMBER 2013

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

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.

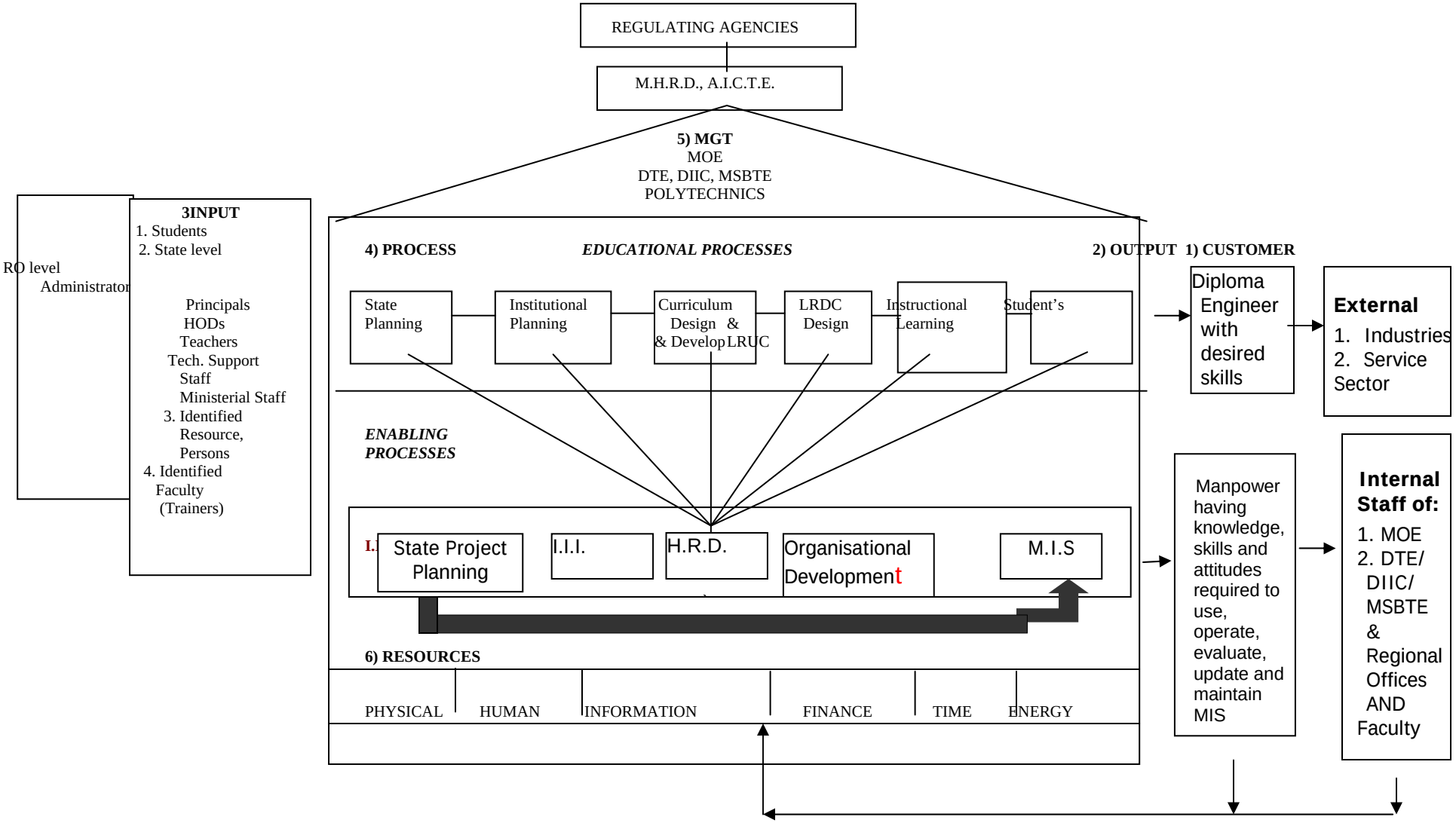


Fig 1 Systems Approach

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.

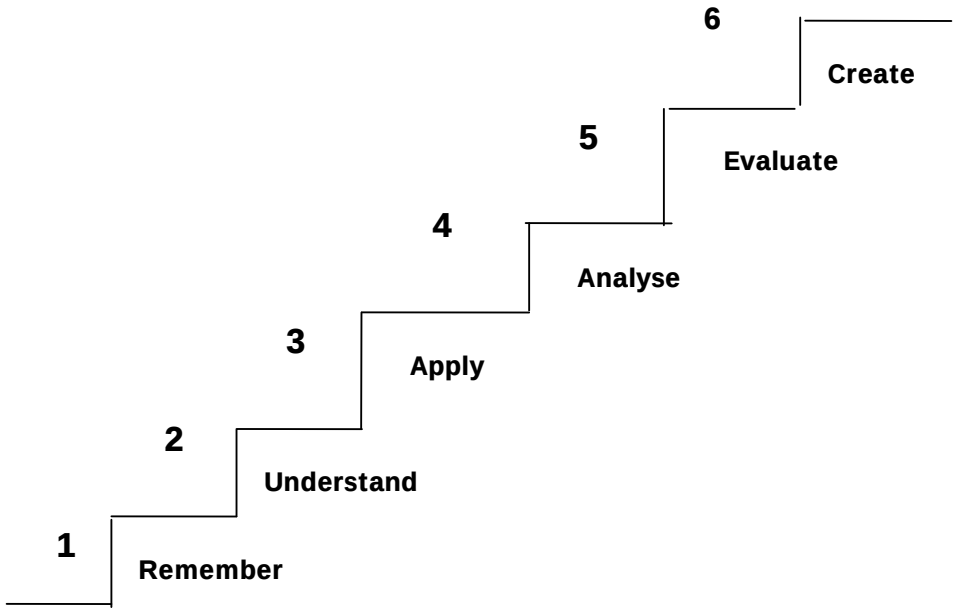
2.3 LEVELS OF LEARNING:

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	Understands fact, principles Interprets verbal material, Interprets charts, tables,	Convert, distinguish estimate, explain, extend, generalize, give examples; infer,

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.	graphs. Translates verbal material to mathematical formula. Estimates consequences implied in data. Justifies methods & procedures.	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	COGNITIVE PROCESS DIMENSION

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 ComponentsofContentAnalysis:

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.

4. Curriculum:

Course Name : Computer Engineering Group

Course Code : CO/CD/CM/CW

Semester : Fourth

Subject Title : Computer Network

Subject Code : 17429

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 world in the information era has become network centric. A Computer networks has been growing with rapid technological progress. Computer communication through networking becomes essential part of our life. We can manage many application like Air Line Reservation, Railway Reservation, E-banking, E-Governance, On-Line shopping, E-learning etc. by clicking mouse button from our own place. Because of this, world become the global village. By considering importance of networking towards all aspects of our life, we here introduce basic concept of networks, network classification, network topologies, network devices, Transmission media, Network reference models, concept of TCP/IP.

This knowledge explores the student for understanding current network management technology.

Objectives:

To develop following skills:

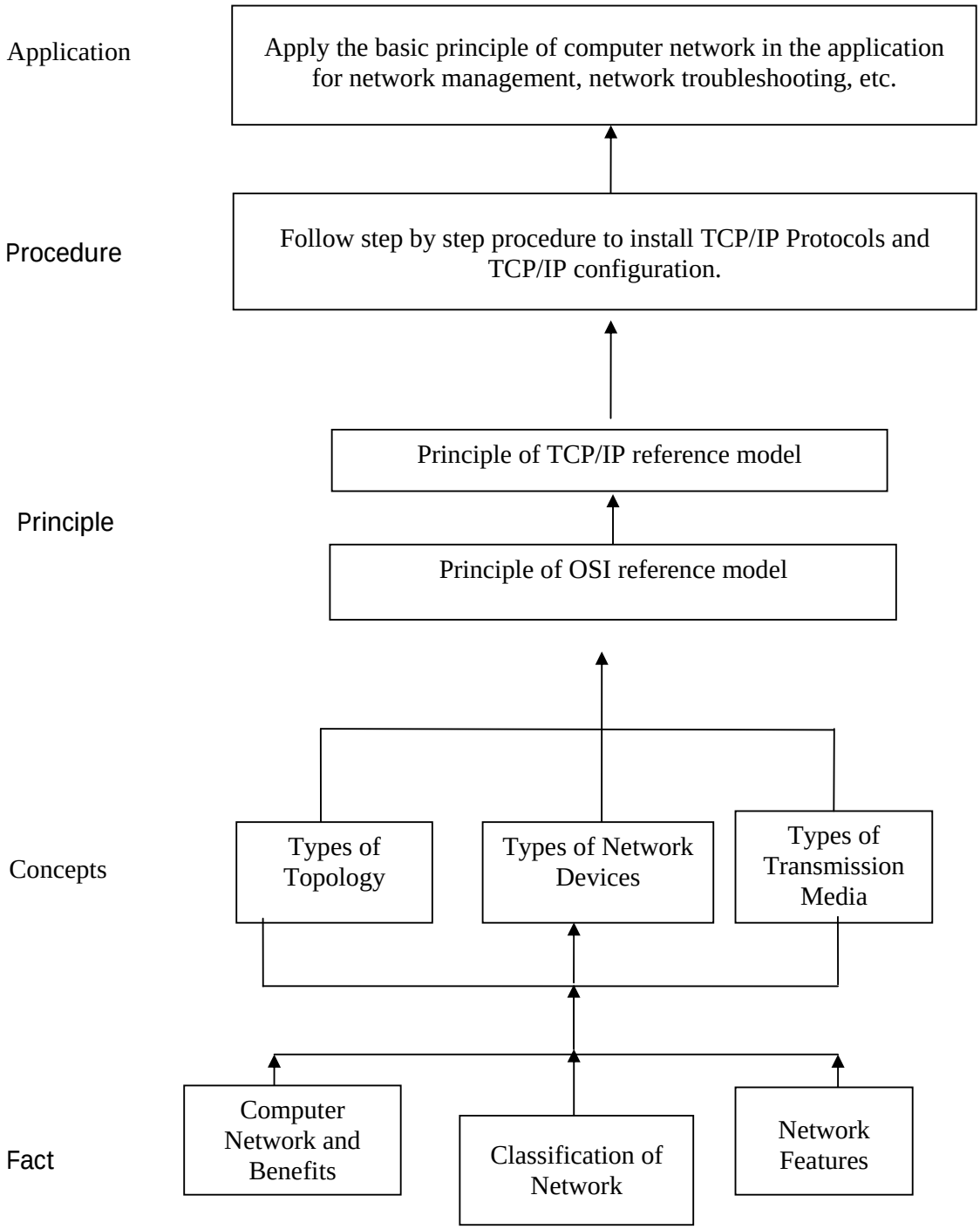
Intellectual Skills:

- Understand network & can identifying benefits of networks.
- Understand and describe communication media.
- Compare different types of Topology.
- Compare different types of network devices.
- Compare OSI and TCP/IP protocol suite.
- Configuration of TCP/IP

Motor Skills:

1. Able to handle Computer Network.
2. To develop a small Computer Network.

Learning Structure:



Contents: Theory

Topic	Content	Hours	Marks
1	**BASIC NETWORK CONCEPTS** **Objectives:-** ➢ Basic Concept of Network. ➢ Classification of Network. ➢ Benefits of Network. 1.1 Fundamentals of Computer Network- Definition Need of Computer Network, Applications, Component of Computer Network. 1.2 Network Benefits- Sharing Information(File Sharing, E-mail) - Sharing Resources (Printer Sharing, Application Services) - Facilitating Centralized Management-Managing Software, Maintaining the Network, Backing up data 1.3 Computer Network Classifications- Classification of Network by their Geography.-PAN, CAN, LAN, MAN, WAN 1.4 Classification of Network by their Component Role--Peer-to-Peer Network, Server-Based Network, Types of server	08	20
2	**NETWORK TOPOLOGIES AND NETWORKING DEVICES** **Objectives:-** ➢ Topology Concepts. ➢ Different types of Topology. ➢ Network Control Devices. 2.1 Network Topologies - Introduction, Definition, Selection Criteria, Types of Topology- i) Bus ii) Ring iii) Star iv) Mesh v) Tree vi) Hybrid. 2.2 Network Control / Connecting Devices - Need of Network Control devices, Role of Network Control devices in a Network, Connectors, Hub, Repeater, Bridges, Switches, Router, Gateway, Modem. 2.3 Network software: NIC Device Driver, client-server software eg. telnet, ftp	10	20
3	**TRANSMISSION MEDIA** **Objectives:-** ➢ Concept of Guided and Unguided Transmission Media. ➢ Types of Guided Media. ➢ Types of Unguided Media. 3.1 Introduction - Need of Transmission Media, Selection Criteria. 3.2 Types of Transmission Media- 1) Guided Media: Cable Characteristics, Types of Cable-Twisted Pair Cable, Co-axial Cable, Fiber Optic Cable. 2) Unguided media: Types of Communication Band-Microwave Communication, Radio wave Communication, Satellite Communication, Infrared Communication. 3.3 Latest Technologies in Wireless Network-Bluetooth Architecture, Wi-Fi, Wi- Max. 3.4 Cellular (Mobile) Telephone - Band in Cellular Telephony, Calls using Mobile Phones, Transmitting receiving / Handoff operations.	10	20

4	**OSI Reference Model** **Objectives:-** ➢ Concept of Reference Model. ➢ OSI Reference Model Concept. ➢ Layers of OSI Reference Model. 4.1 Introduction– Layered Architecture , Peer-to- Peer Processes-Interfaces between Layer, Protocols, Organization of the Layers, Encapsulation. 4.2 Layers of the OSI Reference Model (Functions of each Layer & Protocols used) – Physical Layer, Data-Link Layer, Network Layer, Transport Layer, Session Layer, Presentation Layer, Application Layer.	08	18
5	**TCP / IP SUITE** **Objectives:-** ➢ TCP/ IP Model Concept. ➢ Defining/functioning of different Layers of TCP / IP suite. 5.1 Introduction –Addressing mechanism in the Internet 5.2 IP Addressing – IP Address classes, classless IP addressing, Subnetting, supernetting, Masking, 5.3Layered Structure of the TCP / IP Model – Host-to-Network, Internet, Transport, Application 5.4 TCP / IP Protocol Suite : Host-to-Network-SLIP and PPP, Internet Layer-ARP,RARP and IP: Introduction, IPv4, IPv6 (Header Format), Difference between IPv4 & IPv6. Transport Layer- TCP and UDP (Frame Format,port addresses), Application Layer- FTP, SMTP, DNS. 5.5 Comparision between OSI and TCP / IP Network Model.	12	22
	Total	**48**	**100**

List of Practical:

Sr. No.	Title of Experiment	No. of Hours
1	To observe Components of Network in your Computer Network Lab. (To know your Network Lab.)	04
2	To understand network features	04
3	To connect and understand different Transmission Media and Network Control devices.	04
4	To Prepare a Straight Cable and Network Cross over Cable and test by Line Tester.	04
5	To install a network interface card	04
6	To Connect Computers in Star Topology using Wired Media and any Network control Device.	06
7	To connect two hubs/switch by creating crossover connection	04
8	To Configure Peer-to-Peer Network.	06
9	To Share Printer and Folder in Network.	04
10	To Install TCP/IP Protocols (Version 4 and version 6) and configure advanced features of TCP/IP Protocols.	04

11	Install Wireshark software to capture packet and Configure it to capture Ethernet packet. Verify Ethernet frame structure and its 48 bit address.	06
12	To Run Basic TCP/IP Utilities and Network Commands with all options.(Ping, Ping ::1, ipconfig, Tracert, Netstat, Wireshark, ARP, NBTSTAT.EXE, WINIPCFG.EXE),capture TCP, UDP,IP, ARP, ICMP, Telnet, FTP packets using Wireshark packet sniffer software	06
13	To understand Subnet Masking and create two subnets	04
14	To visit server room and prepare report on 1. Proxy Server 2. Server Configuration 3. Router Configuration 4. Firewall Configuration 5. Network setup details (Topology, Back up, IP range, network software, UPS)	04
	TOTAL	**64**

Learning Resources:
Books:

Sr. No.	Title	Author	Publisher
1	Data Communications and Networks	Achyut S. Godbole	Tata McGraw Hill
2	Data Communications and Networking (Forth Edition)	Behrouz A. Forouzan	Tata McGraw Hill
3	Complete Reference Networking	Craig Zacker	Tata McGraw Hill
4	Computer Networking	Tularam M Bansod	Dreamtech Press
5	Networking + Certification (Second Edition)	Microsoft Press	PHI(Prentice-Hall of India Private Limited)

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 1: BASIC NETWORK CONCEPTS

Knowledge Category	Example/s of category	Teaching methodology
FACT	Computer Networks, Essential Components of Computer Networks, Need of Computer Networks	Chalk-Board, PPT on basic network concepts, Interactive boards
CONCEPT	PAN CAN, LAN, MAN, WAN, Sharing Resources	
PRINCIPLE	Working of Peer to Peer and Client Server Networks	
PROCEDURE	------	-----
APPLICATION	------	-----

Learning Resources:

1) Data Communications and Networks Achyut S. Godbole Tata McGraw Hill
2) Data Communications and Networking (Forth Edition) Behrouz A. Forouzan Tata McGraw Hill
3) Complete Reference Networking Craig Zacker Tata McGraw Hill
4) Computer Networking Tularam M Bansod Dreamtech Press

Websites:

http://brweb.haltonrc.edu.on.ca/202204/ICE4/Networks/NetworkingConcepts.pdf
http://www.techiwarehouse.com/cms/engine.php?page_id=d9e99072

Lecture No.	Topic / Subject to be covered
1	Defined Computer Network, need of computer network, Basic network applications.
2	Components of Computer Network , network feature
3	Computer Network Classifications- Classification of Network by their Geography.- PAN, CAN, LAN
4	MAN, WAN ,compare network classifications
5	Classification of Network architecture : Peer-to-Peer Network and server client networks, details of peer to peer networks
6	Details of Server-Based Network.
7	Compare peer to peer and server client networks, different types of servers.
8	Facilitating Centralized Management-Managing Software, Maintaining the Network, Backing up data.

Topic 2: NETWORK TOPOLOGIES AND NETWORKING DEVICES

Knowledge Category	Example/s of category	Teaching methodology
FACT	Topology Concepts, Network Control Devices	Chalk-Board, PPT on basic network concepts,

CONCEPT	Topologies: Bus, Ring, Star, Mesh, Tree, Hybrid. Devices: Connectors, Hub, Repeater, Bridges, Switches, Router, Gateway, Modem.	Interactive boards
PRINCIPLE	Working of different topologies and network control devices.	
PROCEDURE	------	-----
APPLICATION	------	-----

Learning Resources:

1) Data Communications and Networks Achyut S. Godbole Tata McGraw Hill
2) Data Communications and Networking (Forth Edition) Behrouz A. Forouzan Tata McGraw Hill
3) Complete Reference Networking Craig Zacker Tata McGraw Hill
4) Computer Networking Tularam M Bansod Dreamtech Press

Websites:

For Topologies
http://www.giac.org/cissp-papers/32.pdf
http://brweb.haltonrc.edu.on.ca/202204/ICE4/Networks/NetworkingConcepts.pdf
http://compnetworking.about.com/od/networkdesign/a/topologies.htm
http://www.csl.mtu.edu/cs4451/www/notes/Network%20Topologies.pdf

For Network Control Devices
http://www.pearsonhighered.com/samplechapter/0789732548.pdf
http://computernetworkingnotes.com/comptia-n-plus-study-guide/network-devices-hub-switch-router.html
http://en.wikibooks.org/wiki/Network_Plus_Certification/Devices/Common_Devices

Lecture No.	Topic / Subject to be covered
1	Network Topologies - Introduction, Definition, SelectionCriteria
2	Types of Topologies, Bus topology, its need, implementation, advantages, disadvantages, applications.
3	Star topology, its need, implementation, advantages, disadvantages, applications.
4	Ring topology, its need, implementation, advantages, disadvantages, applications.
5	Mesh, tree topology, need, implementation, advantages, disadvantages, applications.
6	Hybridtopologies, comparison of different topologies.
7	Role of Network Control devices, Need of Network Control devices ,different Connectors used in the networks,
8	Hub, Repeater Bridges, Switches
9	Router, Gateway, Modem.
10	Network software: NIC Device Driver Client - Server software e.g. telnet, ftp

Topic 3: TRANSMISSION MEDIA

Knowledge Category	Example/s of category	Teaching methodology
FACT	Media	Chalk-Board, PPT on basic network concepts,
CONCEPT	Guided and Unguided media	

PRINCIPLE	Working of guided and unguided media	Interactive boards
PROCEDURE	------	-----
APPLICATION	------	-----

Learning Resources:

1) Data Communications and Networks Achyut S. Godbole Tata McGraw Hill
2) Data Communications and Networking (Forth Edition) Behrouz A. Forouzan Tata McGraw Hill
3) Complete Reference Networking Craig Zacker Tata McGraw Hill
4) Computer Networking Tularam M Bansod Dreamtech Press

Websites:

http://brweb.haltonrc.edu.on.ca/202204/ICE4/Networks/NetworkingConcepts.pdf
http://ecomputernotes.com/computernetworkingnotes/communication-networks/describe-the-different-transmission-mediahttp://arco.esi.uclm.es/~david.villa/redes-1/TransmissionMedia.2x4.pdf
http://www.di.unisa.it/~vitsca/RC-0809I/ch04.pdf

Lecture No.	Topic / Subject to be covered
1	Introduction – Need of Transmission Media, Selection Criteria. Types of Transmission Media- 1) Guided Media 2) Unguided media. Types of guided media: Twisted Pair Cable, Co-axial Cable, Fibre Optic Cable
2	Guided Media: Co-axial Cable Characteristics, working, types, advantages, disadvantages, applications
3	Twisted Pair Cable Characteristics, working, types, advantages, disadvantages, applications
4	Fibre Optic Cable Characteristics, working, types, advantages, disadvantages, applications
5	Unguided media: Types of Communication Band-Microwave Communication, Radio wave Communication
6	Satellite Communication, and Infrared Communication
7	Latest Technologies in Wireless Network Bluetooth Architecture, Wi-Fi, Wi-Max
8	Cellular (Mobile) Telephone – Band in Cellular Telephony Calls using Mobile Phones
9	Basic concept of cell, MTSO, base station, BLOCK Diagram of cellular phone.
10	Concept of Hand off procedure, cell splitting.

Topic 4: OSI Reference Model

Knowledge Category	Example/s of category	Teaching methodology
FACT	Media	Chalk-Board, PPT on basic network concepts, Interactive boards
CONCEPT	OSI Model, it's Layers	
PRINCIPLE	Working of each layers	
PROCEDURE	------	-----
APPLICATION	------	-----

Learning Resources:

1) Data Communications and Networks Achyut S. Godbole Tata McGraw Hill
2) Data Communications and Networking (Forth Edition) Behrouz A. Forouzan Tata McGraw Hill

3) Complete Reference Networking Craig Zacker Tata McGraw Hill
4) Computer Networking Tularam M Bansod Dreamtech Press

Websites:
http://www.routeralley.com/ra/docs/osi.pdf
http://en.wikipedia.org/wiki/OSI_model
http://www.infotransec.com/sites/infotransec.com/files/OSIModel.pdf

Lecture No.	Topic/Subject to be covered
1	Introduction– Layered Architecture
2	Peer-to- Peer Processes
3	Interfaces between Layer, Protocols, Organization of the Layers, Encapsulation
4	Layers of the OSI Reference Model
5	(Functions of each Layer & Protocols used) – Physical Layer.
6	Data-Link Layer, Network Layer
7	Transport Layer, Session Layer
8	Presentation Layer, Application Layer.

Topic 5: TCP / IP SUITE

Knowledge Category	Example/s of category	Teaching methodology
FACT		Chalk-Board, PPT on basic network concepts, Interactive boards
CONCEPT		
PRINCIPLE		
PROCEDURE	------	-----
APPLICATION	All application of internet.	-----

Learning Resources:
1) Data Communications and Networks Achyut S. Godbole Tata McGraw Hill
2) Data Communications and Networking (Forth Edition) Behrouz A. Forouzan Tata McGraw Hill
3) Complete Reference Networking Craig Zacker Tata McGraw Hill
4) Computer Networking Tularam M Bansod Dreamtech Press

Websites:
http://www.sis.pitt.edu/~icucart/networking_basics/4LayersofTCPIPModel.html
http://www-inst.eecs.berkeley.edu/~ee233/sp06/student_presentations/EE233_TCPIP.pdf

Lecturer No.	Topic / Sub topic to be covered
1	Introduction –Addressing mechanism in the Internet IP Addressing – IP Address classes
2	classless IP addressing, Sub netting , super netting, Masking

3	Layered Structure of the TCP / IP Model – Host-to-Network
4	Internet, Transport
5	Application Presentation Layer, Application Layer.
6	TCP / IP Protocol Suite : Host-to-Network-SLIP and PPP
7	Internet Layer-ARP,RARP and IP
8	Introduction, IPv4, IPv6 (Header Format), Difference between IPv4 & IPv6.
9	Transport Layer- TCP and UDP (Frame Format , port addresses),
10	Application Layer- FTP, SMTP, DNS.
11	SMTP, DNS.
12	Comparison between OSI and TCP / IP Network Model.

5.2 Planning and Conduct of Test:

Sr. No	Class Test	Marks	Topics
1	Class Test 1	25	• Topic 1, Topic 2, Topic 3.1 till unguided Media
2	Class Test 2	25	• Topic3.1from Latest Technologies in Wireless Network to end of the chapter. Topic 4. Topic 5

5.3 Details about conduct of assignments:

- Assignment no. 1: Give assignment on each topic of curriculum.
- Assignment no. 2: Sample question paper of Computer Network to be solved by every student

[Students should submit the assignments at the time of submission of **Computer Network** *Laboratory Manual and teacher should check the assignments at the time of submission of Laboratory* **Computer Network** *manual]*

5.4 Strategies for Conduct of Practical:

5.4.2. Suggestions for Effective Conduct of Practical and assessment guidelines for conduct of Practical's.

Note: Within a group each student may be asked to make connections for two ICs so that their motor skills of each student may be assessed.

Experiment No	Activity	Time
4. Fabricate a Straight Cable and Network Cross over Cable and test by Line Tester. **(4 hours)**	**PART 1 :Create straight cable.(2 hours)**	
	Kindly arrange devices , tools ,connectors required for	
	Divide the batch into group of 3 to 4 students / as mentioned in the Lab manual and allot a table. Call first three groups first.	05 minutes
	Call first three group .Tell them the concept of straight cable, application of straight cable.	10 minutes
	Show the diagram of straight cable connection	05 minutes
	Practically Show them how to create cable	10minuts
	Now test the cable with line tester.	05 minutes
	Give all devices ,connectors to students and Ask the students to perform the experiment	20 minutes
	The teacher may clarify doubts if any and ask the students to draw conclusions	05 minutes
	Call another three group for the practical's	01 hours
4. Fabricate a Straight Cable and Network Cross over Cable and test by Line Tester. **(4 hours)**	**Part 2 : Create cross cable (2 hours)**	
	Kindly arrange devices , tools ,connectors required for	
	Divide the batch into group of 3 to 4 students / as mentioned in the Lab manual and allot a table. Call first three groups.	05 mins
	Tell them the concept of straight cable, application of straight cable.	10 mins
	Show the diagram of cross cable connection	05 mins
	Practically Show them how to create cable	10mins
	Now test the cable with line tester.	05 mins
	Give all devices ,connectors to students and Ask the students to perform the experiment	20 mins
	The teacher may clarify doubts if any and ask the students to draw conclusions	05 mins
	Call another three group for the practical's	01 hours

6. Mode of assessment

6.1 Class Test Schedule (As per MSBTE):

- It is proposed that 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.
- Teacher should show the answer papers of class test to the students and maintain the records as per MSBTE norms.

6.1.1 Guidelines for Setting Class Test Question Paper:

Question No 1: Attempt any three out of four (3 x 3=9 Marks)

Question No 2: Attempt any two out of three (2 x 4=8Marks)

Question No 3: Attempt any two out of three (2 x 4 =8Marks)

Sample Question Paper-I
(CLASS TEST-1)
Maharashtra State Board of Technical Education

Course Name: **Computer Engineering Group** Course Code: **CO/ CD/ CM/ CW**
Semester: **Fourth Semester**
Title of the Subject: **Computer Network** Subject Code: **17429**
Marks: **25**. Time: **01 Hours**

Instructions:

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

Q.1) Attempt any three 9(3x3)

1) What is switch? Why switch is better than hub give the reason?
2) State three advantage of bus topology?
3) Enlist any three characteristics of LAN?
4) Define computer network? Enlist any four application of it?

Q.2) Attempt any two **8(2x4)**

1) Explain human network with an example.
2) Compare LAN, MAN and WAN (ANY 4 POINTS).
3) Describe gateway? Under which situation gateway is used in the network.

Q.3) Attempt any two **8(2x4)**

1) Whether ring is active or passive topology. Justify your answer
2) For efficient star topology we have to choose centralized device between hub and switch which device you prefer? Justify your answer.
3) For Network having 10 user, data and resource need to be restricted, network administrator is required .which network architecture you preferred.

Sample Question Paper-II
(CLASS TEST 2)
Maharashtra State Board of Technical Education

Course Name: **Computer Engineering Group** Course Code: **CO/ CD/ CM/ CW**
Semester: **Fourth Semester**
Title of the Subject: **Computer Network** Subject Code: **17429**
Marks: **25**. Time: **01 Hours**

Instructions:

6. All questions are compulsory
7. Illustrate your answers with neat sketches wherever necessary
8. Figures to the right indicate full marks
9. Assume suitable data if necessary
10. Preferably, write the answers in sequential order

Q.1) Attempt any three **9(3x3)**

a. Draw the diagram of UTP cable. Why cable which is used in network is twisted (UTP)?
b. Compare Wi-Fi and Wi-Max network (any three points)
c. Write down the range of all classes of IPV4 and their subnet mask
d. Explain the data encapsulation process in OSI models.

Q.2) Attempt any two **8(2x4)**

a. Write the name of the layers that performs the following function in OSI.
   a) Data Encryption b) Error Detection c) File Transfer d) Data Encoding
b. Compare SLIP and PPP Protocols. (Any 4 Points)
c. Describe the frame format of UDP protocols with neat diagram.

Q.3) Attempt any two **8(2x4)**

a. Describe any three function of session layer?
b. To design a bus topology which cable is preferred .justify your answer.
c. There are two different network in a company called account department and admin department network.

   User from one network wants to connect user of another network. Account department network IP is 192.168.2.10 to 192.168.2.20 having subnet mask 255.255.255.0 .while admin department network IP is 192.168.3.10 to 192.168.3.20 having subnet mask 255.255.255.0, which device is used to connect these two networks. Justify your answer.

Sample Question Paper

Exam Seat Number									

17429

Maharashtra State Board of Technical Education

Course Name: **Computer Engineering Group** Course Code: **CO/ CD/ CM/ CW**
Semester: **Fourth Semester**
Title of the Subject: **Computer Network** Subject Code: **17429**
Marks: **100.** Time:**03 Hours**

Instructions:

11. All questions are compulsory
12. Illustrate your answers with neat sketches wherever necessary
13. Figures to the right indicate full marks
14. Assume suitable data if necessary
15. Preferably, write the answers in sequential order

Q1 A. Attempt any six **Marks 12 (6 x 2)**

a. Enlist any two benefits of computer networks.
b. Define computer network.
c. Draw following topologies:
   i. Bus
   ii. Hybrid
d. Define network topology.
e. Give any two advantages of twisted pair cable.
f. Give the meaning of 10baseT and 10base2
g. Name two reference models.
h. What is layered architecture?

Q1 B. Attempt any two **Marks 08 (2 x 4)**

a. Describe any four situations in which server based networks are more superior to peer to peer network.
b. Under what circumstances ring topology is most suitable? Name all devices used in establishing ring topology.
c. In star topology which device is preferable as a star device between switch and hub? Justify your answer.

Q2. Attempt any four **Marks 16 (4 x 4)**

a. Distinguish between LAN, MAN and WAN (Any four points).
b. Enlist the essential components required to design computer network. Describe any one in brief.
c. Explain the different modes of fiber optic cable.
d. Two servers, one situated in Mumbai and another one is situated in Canada want to share data and resources with each other. Which transmission media is suitable to connect them with each other? Justify.

e. Describe the following services in brief:
   i. Backing Up Data
   ii. E - mail
f. Give four advantages and disadvantages of co-axial cable.

Q3. Attempt any four **Marks 16 (4 x 4)**

a. Describe PAN and CAN in brief.
b. Compare Tree Topology and Mesh Topology.
c. Explain OSI reference model with its layered structure.
d. Compare and contrast between OSI reference model and TCP/ IP network model.
e. Explain horizontal and vertical communication.
f. Classify the following protocols into connections oriented, connection less protocols and justify your answer
   i. TCP
   ii. IP
   iii. VDP
   iv. SLIP

Q4. Attempt any four **Marks 16 (4 x 4)**

a. Compare IPV4 and IPV6.
b. Explain subnet masking.
c. Distinguish between Wi – Fi and Wi-Max network (any two point). Write down any two characteristics of Wi – Fi
d. What is MAC address? How it is located?
e. Which services are provided by application layer? Give any two applications of any three services.
f. Give any four advantages and disadvantages of client server network.

Q5. Attempt any four **Marks 16 (4 x 4)**

a. Differentiate SLIP and PPP on any four points.
b. State the situations under which gateways are necessary in the network. Give one example.
c. Suppose there are two servers in a company one is of Novell NetWare and another one is of IBM. To share resources and data between them which device preferable and why?
d. Explain TCP/IP model with neat diagram.
e. What is Wireshark?
f. You are said to establish a small network with minimum cost, at least 10 computers and also necessary to use the centralized database. Which type of network and topology you will prefer in this situation. Justify your answer.

Q6. Attempt any two **Marks 16 (8 x 2)**

a. Explain OSI model with neat diagram. Which layer of OSI model packages raw data bit into data frames? Describe bit Stuffing with one example.
b. Explain how TCP/ IP basic and advanced properties are configured.
c. Justify the sentence: “Two similar devices are connected with cross cable and two dissimilar devices are connected with straight cable. Give pin configuration of RJ – 45 connectors.