CURRICULUM REVISION PROJECT

2012

TEACHER GUIDE FOR

(OPERATING SYSTEM – 17512)

FIFTH SEMESTER
COMPUTER ENGINEERING GROUP

June 2014

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.

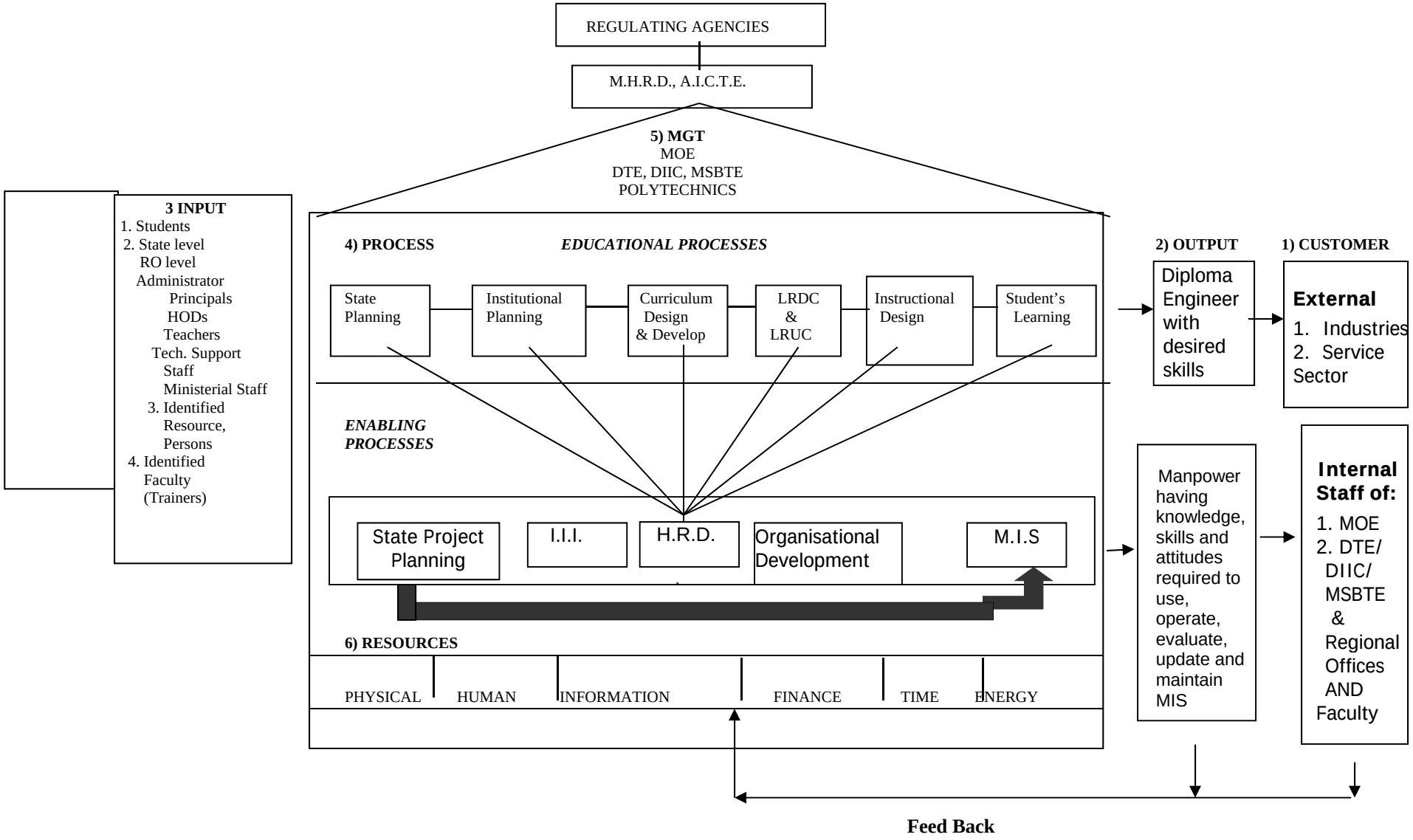


Fig 1 Systems Approach

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. For IF course, Information Security 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:

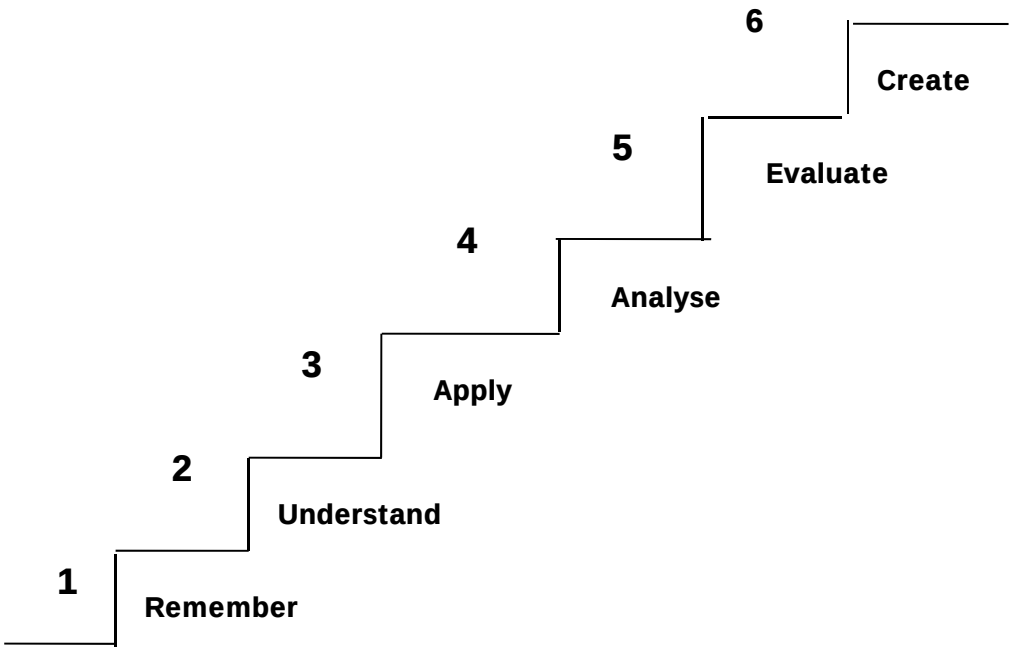
Question paper is a tool/ instrument designed to test the extent of learning of the student. Various questions set in a question paper should assess the abilities of students to respond to level of

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

2. **Abstract Concepts:** those which cannot be seen and touched and handled but can only be imagined e.g. force, work, fractions, decimal, bending moment, moment of

inertia, friction, heat, and induction. Teaching of concrete concepts is not that difficult because the teacher can show the object physically or its picture. On the contrary, teaching of an abstract concept offers difficulty to the teacher as well as for students to understand. These concepts can be learned by heart without understanding as children mug up Nursery Rhymes without understanding even a single word. But at the stage of higher tearing, this type of rote learning is not desirable. Adolescents (teenagers) and adults do not accept things without understanding.

3.1.3 Concept Attributes:

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

Example: The Concept **of Friction**

Attributes:

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

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

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

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

3.1.4 PRINCIPLES:

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

For Example: (related concepts are underlined)

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

3.1.5 APPLICATIONS:

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

For example:

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

3.1.6 PROCEDURES:

While analysing the content of a topic you might come across certain standard procedures which are prescribed to perform an operation or a given task. These procedures should be

clearly identified and taught accordingly not to be left to chance. We should not pre-suppose that the students understand them. We cannot afford to take these things for granted.

For Example:

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

3.1.7 SKILLS (PSYCHOMOTOR):

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

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

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

For Example:

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

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

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

3.2 TEACHING OF CONCEPTS;

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

Steps Suggested:

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

3.3 TEACHING OF PRINCIPLES:

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

Steps:

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

3.4 CONCLUSION:

To sum up, it can be said that. it is essential for the teachers to develop the skills of 'Content Analysis' of their subjects. It brings content clarity 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.

4.0 CURRICULUM

Course Name : Computer Engineering Group

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

Semester : Fifth for CO/CM/CW/IF and Sixth for CD

Subject Title : Operating System

Subject Code : 17512

Teaching and Examination Scheme:

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS	TH	PR	OR	TW	TOTAL
03	--	02	03	100	--	--	25@	125

NOTE:

- **Two tests each of 25 marks to be conducted as per the schedule given by MSBTE.**
- **Total of tests marks for all theory subjects are to be converted out of 50 and to be entered in mark sheet under the head Sessional Work (SW).**

Rationale:

Operating system is the software that makes a computers system operational. It is an interface between the human and machine. It drives all the hardware parts of the computer and is the first piece of software to run on the machine when the system boots.

OS is a core technology subject, the knowledge of which is mandatory for every user. If familiarizes a learner with the OS concepts, structure internal functionality and services and resource sharing. It will help a learner with OS design concepts. This subject will give a learner an overview of UNIX / LINUX OS.

General Objectives:

To develop following skills:

Intellectual skills:

1. Learn the various milestones in the history of Operating Systems and various Generations of computers as well as the modern trends in Operating Systems.

2. Understand the kernel architectures, the functions of operating systems and the use of system calls.
3. Understand the concept of processes, multiprogramming, Process Control Blocks, context switching.
4. Learn about the scheduler and implement various scheduling algorithms.
5. Understand about Deadlocks, Inter-process communications.
6. Learn about Memory Management and File Management techniques of the OS.
7. Understand the structure and file system structure of Unix OS.
8. Use UNIX commands, vi editor and file utilities and write shell scripts.

Theory:

Topic No.	Contents	Hours	Marks
01	**Introduction:** **Objectives:** ➢ Distinguish between various generation of computer. ➢ Classify different types of operating system. 1.1 Operating System - Evaluation, Generations 1^{st}, 2^{nd}, 3^{rd} 1.2 Different Types of Operating systems- Batch operating system, Multi Programmed, Multitasking, Time Shared OS. Multiprocessor Systems, Distributed Systems, Cluster Systems, Real time systems.	04	12
02	**Operating System Structures**: **Objectives:** ➢ State services & functions of Operating Systems. ➢ Use system calls ➢ Distinguish between different kernel architecture. 2.1 Different Services of Operating System. 2.2 System Calls- Concept, Types and Uses 2.3 Simple Structure, Layered, Monolithic, Microkernel. 2.4 Components activities- Process Management, Main Memory Management, File Management, I/O System management, Secondary storage management.	08	18
03	**Process Management** : **Objectives:** ➢ Describe Process, process scheduling, schedulers. ➢ Describe inter-process communication & synchronization. ➢ Describe critical section problem & solution to ensure the consistency of shared data ➢ Describe multithreading models. 3.1 Process-Concept, process states, Process Control Block. 3.2 Process Scheduling- Scheduling Queues, Schedulers, Context switch. 3.3 Inter-process communication- Introduction, shared memory system & message passing system, critical section problem, semaphores. 3.4 Threads - Benefits, users and kernel threads, Multithreading Models - Many to One, One to One, Many to Many.	10	22
04	**Scheduling :** **Objectives:** ➢ Describe CPU scheduling. ➢ Describe various CPU-scheduling algorithms. ➢ Solve problems based on them.	10	20

	➢ Describe deadlock and its algorithm. 4.1 Scheduling & its types - Objectives, concept, CPU and I/O burst cycles, Pre-emptive, Non- Pre-emptive Scheduling, Scheduling criteria. 4.2 Types of Scheduling algorithms - First come first served (FCFS), Shortest Job First (SJF), Shortest Remaining Time(SRTN), Round Robin (RR) Priority scheduling, multilevel queue scheduling 4.3 Deadlock - System Models, Necessary Conditions leading to Deadlocks, Deadlock Handling - Preventions, avoidance, Banker's algorithm		
05	**File System and Memory Management** : **Objectives:** ➢ Distinguish between memory allocation methods ➢ Distinguish between various file access methods. ➢ Describe files, file attributes and file structure. 5.1 Basic Memory Management - Partitioning, Fixed and Variable, Free Space management Techniques - Bitmap, Linked List. 5.2 Virtual Memory – Concept, Segmentation, Paging, Page table, Page fault. 5.3 File – Concepts, Attributes Operations, Types, and File System Structure. 5.4 Access Methods – Sequential, Direct, Swapping, File Allocation Methods- Contiguous, Linked, Indexed. 5.5 Directory Structure – Single level, Two levels.	10	20
06	**UNIX : A Case Study** **Objectives:** ➢ Draw system structure and file system structure of UNIX ➢ Distinguish between UNIX and LINUX system Introduction, Overview of UNIX, Structure of UNIX OS, Booting, File System Of UNIX, UNIX and LINUX Comparison.	06	08
	Total	**48**	**100**

List of Practical:

Sr. No.	Title of Experiment	No. of Hours
1	Differentiate between various Operating System	02
2	Use of file processing and Communication command – tr, wc, cut, paste, sort	02
3	Use of file processing and Communication command- who, who am I, mesg, talk, wall, write, news, mail.	02

4	Use of general purpose and process commands- date, time, cal, clear, banner	02
5	Use of general purpose and process commands- , tty, man, bc, ps, wait, sleep, exit, kill.	02
6	Work with file and directory commands viz, pwd, cat, ls, cd, mkdir, rmdir, rm, mv	02
7	Work with file and directory commands viz cp, join, split, head, tail, omm., pr, chmod, cmp.	02
8	Use of vi editor and editor commands	04
9	Write and execute menu driven shell scripts using case structures(any two)	02
10	Write and program to implement the Shortest Job First algorithm.	04
11	Write and program to implement the Priority scheduling algorithm.	04
12	Write and program to implement the Round-Robin algorithm.	04

****Students can perform any ten practical**

Learning Recourses:

1. Books:

Sr. No	Book Title	Author	Publication
01	Operating System Concepts- VIIIth Edition	Silberschatz Galvin	John Wiley and Sons
02	Operating System	Achyut S. Godbole	Tata McGraw Hill
03	Operating System	William Stallings	Pearson
04	Modern Operating systems	Andrew tanenbaum- 3rd edition	PHI
05	Unix Concept and Programming	Sumitabha Das	Tata McGraw Hill
06	UNIX Programming	Kumar Saurabh	Wiley India

2. Websites:

1. cs.wisc.edu/~ bart/537 lecture notes-University of Wisconsin Madison.
2. www.cs.kent.edu/osf o3/notes/index.html- Vilinius Gediminas Technical University
3. http://www.howstuffworks.com/operating-system1.htm
4. www.computerhope.com/jargon/o/os.htm
5. en.wikipedia.org/wiki/Operating system

Demo lectures with power point presentations using LCD projector should be arranged to develop programming concepts of students.

5.0 IMPLEMENTATION STRATEGY:

5.1 Planning of Lectures for a Semester with Content Detailing:

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

[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]

<table>
<tr><td>Topic I</td><td>Name: Introduction</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>Operating system

Generation of operating system</td><td>With help of diagram showing interaction between user and computer. Refer ppt for introduction to operating system.
Discuss technology used in each generation with the help of ppt.
For example first generation included vaccum tubes.
Discuss disadvantages of vaccum tubes.
For example, Machine containing vaccum tube used to generate lot of heat. Due to this vaccum tubes used to get burnt.</td></tr>
<tr><td>CONCEPT</td><td>Batch operating system
Multiprogramming system
Multitasking system
Multiprocessor system
Distributed system
Cluster system</td><td>Discuss different types of Operating system by giving live example of each type.
For example, compiler compiles a program which is batch of statements.</td></tr>
<tr><td>PRINCIPLE</td><td>Time shared OS
Real time OS</td><td>Discuss the principle by giving live example.
Real time operating system is used in boiler temperature control where immediate response is required.</td></tr>
</table>
Live example: - In time sharing system, resources are shared between processes for specific time period. So for example, one reference book can be shared by 5 students where each student will get it for 1 hr.
Reference Material:
Books: -
</td></tr>
</table>

	Title 1)Operating system Concepts by Silberschatz Galvin VIIIth Edition publication:John Wiley and Sons 2) Operating Systems By Achyut Godbole publication:Tata McGraw Hill **Teaching Aids:** Black board, Chalk, Transparencies, Power point presentation slides(PPTs), Reference books, notes, LCD projector/OHP Projector, **PPT with Sample: -** Introduction:- http://www.slideshare.net/vabajaj/operating-systemppt-1 Evolotion: u.cs.biu.ac.il/~ariel/download/os288/ppts/os1-2_int.ppt **Websites:** en.wikipedia.org/wiki/Operating system
Lecture No.	**Topic/ Subtopic to be covered**
1	➢ Introduction Start with asking questions: ▪ What is operating system? ▪ Name few latest operating systems. ▪ Which operating system students are using with their PC? • Fundamental Concepts of Operating System Definition,structure,example of operating system Ppt:- http://www.slideshare.net/vabajaj/operating-systemppt-1 • Introduction of Generation of Operating system Characteristics: Technology used,adavantages,disadvantages Refer to: Operating Systems By Achyut Godbole publication:Tata McGraw Hill Chapter 1, page 1-10 • Comparison of Various generations of Operating system *Ppt: u.cs.biu.ac.il/~ariel/download/os288/**ppt**s/os1-2_int.**ppt***
2	➢ Batch operating system Discuss concept, diagram ,real life example Refer to: Operating Systems By Achyut Godbole publication:Tata McGraw Hill Chapter 1 ➢ Multiprogramming system Discuss concept, diagram ,real life example Refer to:Operating system Concepts by Silberschatz Galvin VIIIth Edition publication:John Wiley and Sons,chapter 1 ➢ Multitasking system Discuss concept, diagram ,real life example Refer to:Operating system Concepts by Silberschatz Galvin VIIIth Edition publication:John Wiley and Sons,chapter 1

	➢ Difference between multiprogramming and multitasking
3	➢ Time shared system Discuss concept, diagram ,real life example Refer to: Operating system Concepts by Silberschatz Galvin VIIIth Edition publication:John Wiley and Sons,chapter 1 Refer to: Operating system Concepts by Silberschatz Galvin VIIIth Edition publication:John Wiley and Sons,chapter 1 ➢ Real time system Discuss concept,real life example,types –hard real and soft real Refer to: Operating system Concepts by Silberschatz Galvin VIIIth Edition publication:John Wiley and Sons,chapter 1 ➢ Distributed system Discuss concept,real life example Refer to: Operating system Concepts by Silberschatz Galvin VIIIth Edition publication:John Wiley and Sons,chapter 1,page 28-29
4	➢ Multiprocessor system, • Introduce single processor system • Discuss concept, diagram ,real life example • Benefits: increased throughput,economy of scale,increased reliability. • Types –symmetric and asymmetric • Comparison between single processor and multiprocessor Refer to: Operating system Concepts by Silberschatz Galvin VIIIth Edition publication:John Wiley and Sons,chapter 1,page 12 to 14 ➢ Cluster system Discuss concept,real life example Refer to: Operating system Concepts by Silberschatz Galvin VIIIth Edition publication:John Wiley and Sons,chapter 1,page 14-15

Topic 2	**Name: Operating system Structures**		
	Knowledge Category	**Example(s) of Category**	**Teaching Methodology**
	FACT	➢ **Operating system structure** ➢ **System component**	With help of ppt showing different operating system structure **http://codex.cs.yale.edu/avi/os-book/OS8/os8c/slide-dir/**
	CONCEPT	➢ **Operating System services.** ➢ **System call**	Discuss services of Operating system. Example user interface. Windows Operating system provides graphical user interface (GUI) as a service to user. Demonstrate working of system

		➢ **Operating system structure**	call .Example handling of user application invoking open( ) system call With help of ppt show monolithic, layered, microkernel structure **http://codex.cs.yale.edu/avi/os-book/OS8/os8c/slide-dir/**

Reference Material:
Books: -
Title 1) Operating system Concepts by Silberschatz Galvin VIIIth Edition publication:John Wiley and Sons
2) Operating Systems By Achyut Godbole publication:Tata McGraw Hill

Teaching Aids:
Black board, Chalk, Transparencies, Power point presentation slides(PPTs), Reference books, notes, LCD projector/OHP Projector,
PPT with Sample: -
http://codex.cs.yale.edu/avi/os-book/OS8/os8c/slide-dir/
(select chapter 2)

Websites:
http://codex.cs.yale.edu

Lecture No.	**Topic/ Subtopic to be covered**
1	➢ **Services of Operating system** • Concept of operating system service ➢ Operating system services provided to help the user • User interface • Program execution • I/O operations • File system manipulation • Communication • Error detection ➢ Operating system services provided to help the system itself ▪ Resource allocation ▪ Accounting ▪ Protection and security **http://codex.cs.yale.edu/avi/os-book/OS8/os8c/slide-dir/ (**ppt 2-4 to2-6)

2	➢ Concept of system call • Definition of system call • Uses of system call ➢ Discuss working of system call . **http://codex.cs.yale.edu/avi/os-book/OS8/os8c/slide-dir/ (**ppt2-15 to2-16**)**
3	➢ Types of system call –discuss system call required for each type • Process control • File management • Device management • Information maintenance • Communication **http://codex.cs.yale.edu/avi/os-book/OS8/os8c/slide-dir/ (**ppt2-20 to 2-21)
4	➢ Concept of kernel ➢ Concept of Simple structure- refer to **(**ppt2-32 to ppt2-33) • Structure (Diagram) • Description (Operating system Concepts by Silberschatz Galvin VIIIth Edition publication:John Wiley and Sons , page 56,57) • Advantages • Disadvantages **ppt : http://codex.cs.yale.edu/avi/os-book/OS8/os8c/slide-dir/**
5	➢ Concept of Layered structure- refer to **(**ppt2-34 to ppt2-37) • Structure (Diagram) • Description (Operating system Concepts by Silberschatz Galvin VIIIth Edition publication:John Wiley and Sons, page 57-59) • Advantages • Disadvantages ➢ Concept of Monolithic structure- • Structure (Diagram) • Description • Advantages • Disadvantages **ppt : http://codex.cs.yale.edu/avi/os-book/OS8/os8c/slide-dir/** **refer to:** Operating Systems By Achyut Godbole publication:Tata McGraw Hill
6	➢ Concept of Microkernel structure- • Structure (Diagram) • Description • Advantages • Disadvantages Refer to: Operating Systems By Achyut Godbole publication:Tata McGraw Hill

	➢ Discuss Comparisons of various operating structure
7	➢ System component activities • Process management –description and activities (Operating system Concepts by Silberschatz Galvin VIIIth Edition publication:John Wiley and Sons , Page no 20 -21) • Memory management –description and activities (Operating system Concepts by Silberschatz Galvin VIIIth Edition publication:John Wiley and Sons, Page no 21 -22) • File management description and activities (Operating system Concepts by Silberschatz Galvin VIIIth Edition publication:John Wiley and Sons , Page no 22 -23)
8	➢ System component activities • I/O system management description and activities (Operating system Concepts by Silberschatz Galvin VIIIth Edition publication:John Wiley and Sons ,Page no 26) • Secondary storage management description and activities (Operating system Concepts by Silberschatz Galvin VIIIth Edition publication:John Wiley and Sons , Page no 23 -24)

Topic 3	**Name: Process management**		
	Knowledge Category	**Example(s) of Category**	**Teaching Methodology**
	FACT	➢ **Process**	➢ Definition of process ➢ Example of process is word processing program run by an individual user on a PC.
		➢ **Process control block**	➢ Discuss block diagram of process control block with its parameters with help of ppt **http://codex.cs.yale.edu/avi/os-book/OS8/os8c/slide-dir/**
	CONCEPT	➢ **Process state diagram**	➢ With help of diagram discuss life cycle of process including five states.
		➢ **Threads**	➢ Define thread by giving an example of web browser. A web browser can have one thread to display images while another thread retrieves data from network.
		➢ **Multithreading**	➢ Discuss concept of multithreading by giving an example of word processor.
		➢ **Critical section problem**	➢ With role play discuss critical section problem

PRINCIPLE	➢ **Process scheduling** ➢ **Semaphores**	➢ Discuss requirement of process scheduling. Example multiple users accessing a single printer. ➢ Discuss the principle of semaphores to solve critical section problem.

Reference Material:
Books: -
Title 1) Operating system Concepts by Silberschatz Galvin VIIIth Edition publication:John Wiley and Sons

Teaching Aids:
Black board, Chalk, Transparencies, Power point presentation
slides(PPTs), Reference books, notes, LCD projector/OHP
Projector,
Role play: on one electronic circuit only one student can perform practical and take readings in exam ,other students are restricted. Only when that student complete its exam or time over then only that circuit be allotted to other. So in one region only one entry is allowed.
PPT with Sample: -
http://codex.cs.yale.edu/avi/os-book/OS8/os8c/slide-dir/
(select chapter 3)

Websites:

http://codex.cs.yale.edu

Lecture No.	**Topic/ Subtopic to be covered**
1	➢ Process • definition • example ➢ Process states • diagram (ppt ch3-slide 7 to ch 3-slide 8) • Description of each state listed below • New • Ready • Running • Waiting • terminated

	http://codex.cs.yale.edu/avi/os-book/OS8/os8c/slide-dir/
2	➢ Process control Block • Block diagram (ppt ch 3-slide 9 to ch 3-slide 10) • description of each block ➢ Process scheduling (ppt ch 3- slide 14) • Description (Operating system Concepts by Silberschatz Galvin VIIIth Edition publication:John Wiley and Sons, page 83,84) **http://codex.cs.yale.edu/avi/os-book/OS8/os8c/slide-dir/**
3	➢ Scheduling queues • Queueing diagram (ppt ch 3-slide 15) • Description of job queue, ready queue, device queue(Operating system Concepts by Silberschatz Galvin VIIIth Edition publication:John Wiley and Sons ,page 84,85) **http://codex.cs.yale.edu/avi/os-book/OS8/os8c/slide-dir/**
4	➢ Schedulers (ppt ch 3-slide 16 -18) • Define scheduler • Function of Short term scheduler • Function of Medium term scheduler • Function of Long term schedulers scheduler • Comparison between schedulers **http://codex.cs.yale.edu/avi/os-book/OS8/os8c/slide-dir/**
5	➢ Context switch • Diagram (ppt ch 3-slide 19) • Description (Operating system Concepts by Silberschatz Galvin VIIIth Edition publication:John Wiley and Sons ,page 86-87) **http://codex.cs.yale.edu/avi/os-book/OS8/os8c/slide-dir/**
6	➢ Interprocess communication • Define independent and cooperating process • Reasons for providing environment for cooperating process • Shared memory system (Operating system Concepts by Silberschatz Galvin VIIIth Edition publication:John Wiley and Sons ,page 93-96) • Diagram • Description • Advantages • Disadvantages
7	➢ Message passing system system (Operating system Concepts by Silberschatz Galvin VIIIth Edition publication:John Wiley and Sons ,page 96-99) • Diagram • Description –naming, synchronization, buffering • Advantages • Disadvantages
8	➢ Critical section problem(Operating system Concepts by Silberschatz Galvin VIIIth Edition publication:John Wiley and Sons , page 189-191) • Description • Requirements to be satisfied to solve critical section problem

	▪ Mutual exclusion ▪ Progress ▪ Bounded waiting ➢ Semaphores (Operating system Concepts by Silberschatz Galvin VIIIth Edition publication:John Wiley and Sons , page 196-197) • Description • Usage
9	➢ Threads (Operating system Concepts by Silberschatz Galvin VIIIth Edition publication:John Wiley and Sons ,page 123 and 125) • Definition • Single threaded and multithreaded process (Diagram ,Operating system Concepts by Silberschatz Galvin VIIIth Edition publication:John Wiley and Sons,page 124) • Benefits of threads ▪ Responsiveness ▪ Resource sharing ▪ Economy ▪ Utilization of multiprocessor architecture • Kernel threads • User threads
10	➢ Multithreading Models (Operating system Concepts by Silberschatz Galvin VIIIth Edition publication:John Wiley and Sons , page 125-127) Types of Multithreading Models (Diagram, description ,advantages, disadvantages) • One to one • Many to many • Many to one

Topic 4	**Name: Scheduling**		
	Knowledge Category	**Example(s) of Category**	**Teaching Methodology**
	FACT	CPU burst cycle ,I/O burst cycle Scheduling criteria	Discuss CPU and I/O burst cycle with a diagram. Using any real life scheduling criteria can be defined. For example, Bank account opening 1. A person waits for getting account opening form. 2. He fills details into the form. 3. Submits form to the bank counter with all documents. 4. Bank officer verifies the documents.

	Mutual Exclusion	5. He pays initial amount for opening an account. 6. Waits for getting account opening slip. 7. Gets a slip after completion of a procedure. So the sum of time required for filling form, submission of form, paying amount and waiting in queue is called as **turnaround time**. Demonstrate mutual exclusion with the help of example. For example: each process executing the shared data (variables) excludes all others from doing so simultaneously. Only one process is allowed to update variable at a time.
CONCEPT	Deadlock	Demonstrate the concept with the help of real life example such as Road traffic.
PRINCIPLE	Scheduling	Discuss why scheduling is required with the help of example. Example: A doctor gives appointment to patients for consultancy. Here a doctor is a resource and patient is a process. If multiple processes require same resource then scheduling of resource is done.
PROCEDURE	Scheduling algorithm Bankers algorithm	Scheduling algorithms are FCFS, SJF, SRTN, RR, Priority and multilevel scheduling. Demonstrate each algorithm with example and scheduling criteria. Example: - FCFS algorithm works on first come first serve basis. People standing in queue for purchasing ticket for a movie. A person standing first will get the ticket first. Demonstrate how to use bankers algorithm to avoid deadlock with example.
APPLICATION	Implementing scheduling algorithm(only for lab practical)	Discuss how to write program for shortest Job First algorithm, priority scheduling and round robin scheduling algorithm.

Reference Material:

Books: -

Title 1) Operating system Concepts by Silberschatz Galvin VIIIth Edition publication:John Wiley and Sons

2) Operating Systems By Achyut Godbole

	Teaching Aids: Black board, Chalk, Transparencies, Power point presentation slides(PPTs), Reference books, notes, LCD projector/OHP Projector, **PPT with Sample: -** **http://codex.cs.yale.edu/avi/os-book/OS8/os8c/slide-dir/** select related chapter **Websites:** **http://codex.cs.yale.edu**
Lecture No.	**Topic/ Subtopic to be covered**
1	➢ Define what is scheduling ➢ Demonstrate with example why it is required. • Example: A doctor gives appointment to patients for consultancy. Here a doctor is a resource and patient is a process. If multiple processes require same resource then scheduling of resource is done. ➢ Define CPU burst cycle and I/O burst cycle with the diagram.(Operating system Concepts by Silberschatz Galvin VIIIth Edition publication:John Wiley and Sons , Page-150) • Diagram • Description
2	➢ Scheduling criteria-define each criteria with an example mentioned above. • CPU utilization • Throughput • Turnaround time • Waiting time • Response time ➢ Types of scheduling- define each type with their characteristics • Preemptive scheduling • Non-preemptive scheduling ➢ Discuss comparison between preemptive and non-preemptive algorithm
3	➢ FCFS scheduling algorithm • Demonstrate how it works • Examples to calculate average waiting time. • Application **Refer to video:** http://www.youtube.com/watch?v=FiGKndlvO8I
4	➢ SJF scheduling algorithm • Demonstrate how it works • Examples to calculate average waiting time. • Application **Refer to video:** http://www.youtube.com/watch?v=E5uBHhfcx34

	➢ SRTN scheduling algorithm • Demonstrate how it works • Examples to calculate average waiting time. • Application **Refer to video:** http://www.youtube.com/watch?v=67ZDlvwgSV8
5	➢ Round Robin scheduling algorithm • Demonstrate how it works • Examples to calculate average waiting time. • Application **Refer to video:** http://www.youtube.com/watch?v=29GsBR5rlj0 ➢ Priority scheduling algorithm • Demonstrate how it works • Examples to calculate average waiting time. • Application
6	➢ Multilevel queue scheduling algorithm • Demonstrate how it works • Examples • Application **Refer to video:** http://www.youtube.com/watch?v=e3WCqgkpk4w
7	➢ Deadlock • Define what is deadlock. Give example of road traffic. • Discuss system model following a sequence of actions as request-use-release for utilization of a resource.(Operating system Concepts by Silberschatz Galvin VIIIth Edition publication:John Wiley and Sons ,Page 237-240) • Discuss necessary conditions leading to deadlocks by giving example(Operating system Concepts by Silberschatz Galvin VIIIth Edition publication:John Wiley and Sons ,Page 240) ▪ Mutual exclusion ▪ Hold and wait ▪ No preemption ▪ Circular wait **Refer to video:** http://www.youtube.com/watch?v=e3WCqgkpk4w **Refer to video:** http://www.youtube.com/watch?v=8qPqQWnPEdk
8	➢ Deadlock Handling • Define what is deadlock prevention • Discuss how to prevent occurrence of deadlock by ensuring that at least one of the condition cannot hold.(Galvin page 244-247) ▪ Mutual exclusion –non-sharable resources ▪ Hold and wait- discuss two methods. 1. Allocating all requested resources to the process before it starts its execution. 2. A process can request resources only when it has none. ▪ No preemption:-if a process holds some resources and request another

	resource that cannot be immediately allocated to it, then all resources currently held are preempted. ▪ Circular wait: Discuss ordering of all resource types.
9	➢ Deadlock Avoidance(Operating system Concepts by Silberschatz Galvin VIIIth Edition publication:John Wiley and Sons ,page 247-250) • Define what is deadlock avoidance • Discuss safe state • Discuss resource allocation graph algorithm
10	➢ Banker's Algorithm(Operating Systems By Achyut Godbole publication:Tata McGraw Hill , page 266-270 or Operating system Concepts by Silberschatz Galvin VIIIth Edition publication:John Wiley and Sons ,page 251-253) • Discuss banker algorithm for deadlock avoidance(steps) • Example of deadlock avoidance **Refer to video:** http://www.youtube.com/watch?v=q71pmJYE86U

Topic 5	**Name: File System and Memory Management**		
	Knowledge Category	**Example(s) of Category**	**Teaching Methodology**
	FACT	**Partitioning**	With the help of diagram given in topic description discuss What is Partitioning.
		Free Space management Techniques	Discuss Free Space management Techniques with the help of related ppt http://www.slideshare.net/myrajendra/free-space-managment46
	CONCEPT	**Memory Management**	Discuss Memory Management with the help of diagram given in topic description.
		Virtual Memory	Discuss Virtual Memory with the help of related ppt http://www.cs.umd.edu/class/sum2003/cmsc311/Notes/Memory/virtual.html
		File	With the help of ppt discuss file concept www.cise.ufl.edu/~helal/classes/s10/notes/ch10.**ppt**

	Swapping	Discuss the concept of swapping with the help of diagram given in topic description.
PRINCIPLE	**Access Methods**	Discuss different Access Methods with the help of diagram.
	Directory Structure	Discuss different Directory Structure with the help of diagram
PROCEDURE	**Sequential access method**	Demonstrate with the help of magnetic tape example
	Direct access method	Demonstrate with the help of CD example
	Bitmap free space management method	Discuss Bitmap with the help of related ppt http://www.slideshare.net/myrajendra/free-space-managment46
	Linked List free space management method	Discuss Linked List with the help of related ppt http://www.slideshare.net/myrajendra/free-space-managment46

Reference Material:

Books: -

1) Operating system Concepts by Silberschatz Galvin VIIIth Edition publication:John Wiley and Sons
2) Operating Systems By Achyut Godbole publication:Tata McGraw Hill

Teaching Aids:

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

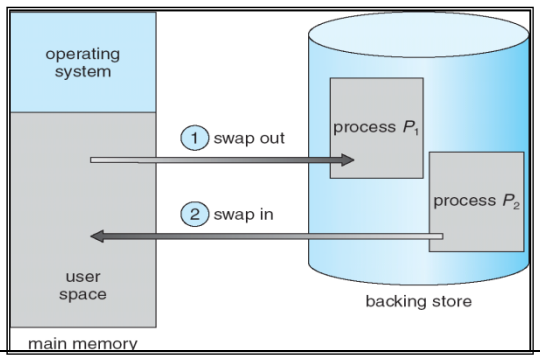
PPT with Sample: -

1. **For File System**
   www.cs.columbia.edu/~nahum/w4118/lectures/ch10.**ppt**
2. **For Memory Management**
   www.cise.ufl.edu/~helal/classes/s10/notes/ch08.**ppt**

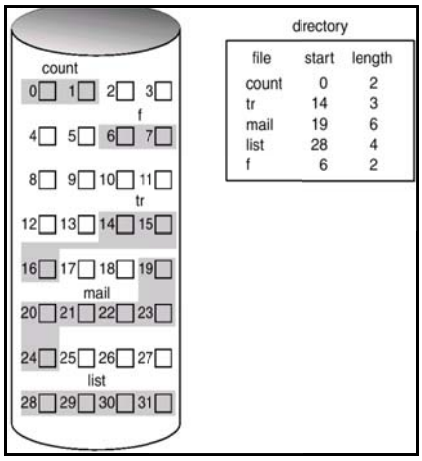
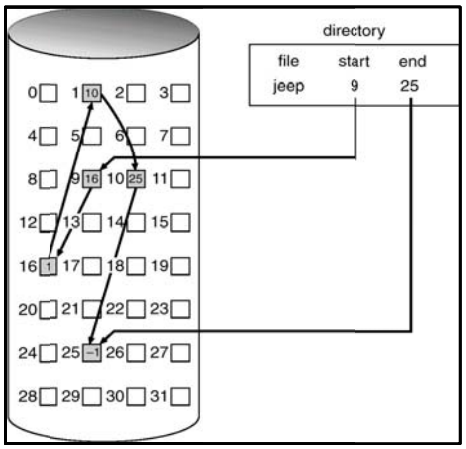
Video :

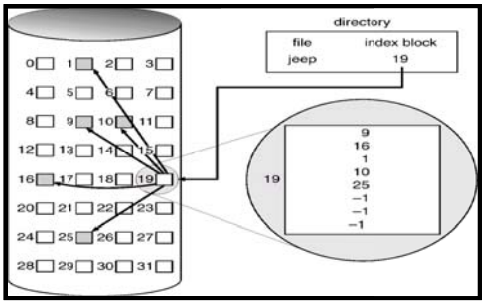
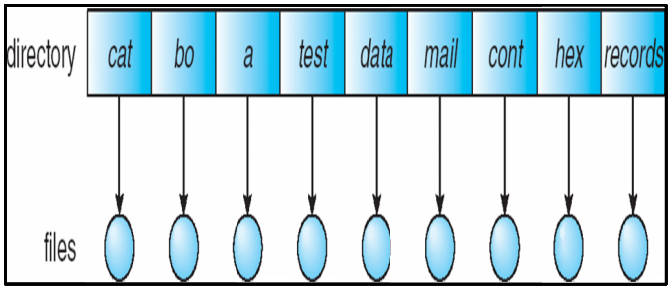
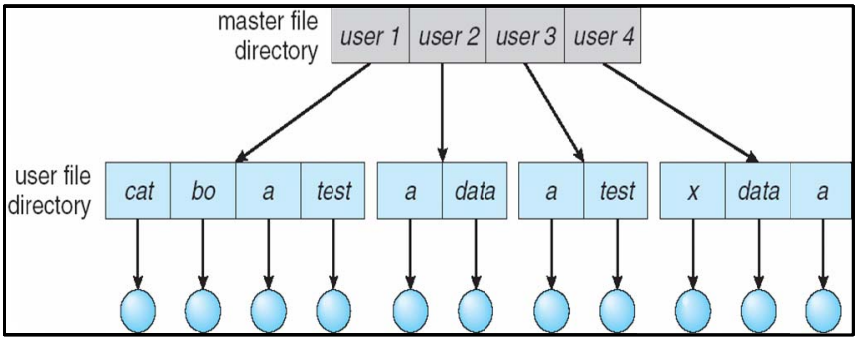
http://www.youtube.com/watch?v=9GidBWigKnA

	Websites: **http://www.tutorialspoint.com/operating_system/os_file_system.htm**
Lecture No.	**Topic/ Subtopic to be covered**
1	➢ Partitioning, • Discuss what is Partitioning? • Discuss why it is required with help of example. • Types of Partitioning • Fixed Partitioning What is Fixed Partitioning • Variable Partitioning What is Variable Partitioning • Comparison between them **Refer to ppt:** www.cse.usf.edu/~anda/cop6611/notes/lec13-memmgnt.ppt Refer to book: Operating Systems By Achyut Godbole publication:Tata McGraw Hill 3rd edition chapter 9.
2	➢ Free Space management Techniques • What is Free Space management • Why the need of Free Space management ➢ What are different Free Space management Techniques • Bitmap • Approach • Example • Advantages • disadvantage Refer to ppt:- http://www.slideshare.net/myrajendra/free-space-managment46 • Linked List. • Approach • Example • Advantages • Disadvantage Refer to ppt:- http://www.slideshare.net/myrajendra/free-space-managment46
3	➢ Virtual Memory • Concept of Virtual Memory • Uses of Virtual Memory • How Virtual Memory Works Refer to ppt:-http://www.cs.umd.edu/class/sum2003/cmsc311/Notes/Memory/virtual.html Refer to book:- Operating system Concepts by Silberschatz Galvin VIIIth Edition publication:John Wiley and Sons,chapter 9,page 303-306 ➢ Segmentation-basic method, hardware • What is Segmentation

	• What is the need of segmentation? Refer to book:- Operating system Concepts by Silberschatz Galvin VIIIth Edition publication: John Wiley and Sons, chapter 8,page 292-295
4	➢ Paging- paging hardware, basic method • What is Paging • What is the need of paging? ➢ Page table-structure of page table ➢ Page fault-definition, example Refer to ppt: **www.cs.gsu.edu/~cscbecx/csc4320%20Chapter%208-2.ppt** Refer to book:- Operating system Concepts by Silberschatz Galvin VIIIth Edition publication:John Wiley and Sons,chapter 8,page 278-292
5	➢ File • Concepts-definition • (page 360)Attributes –Name, Identifier, type, location, size, protection, time, date and user identification. • (page 361-363)Operations:- discuss various operations with steps involved to perform it. ▪ Basic six operations such as creating a file, writing a file, reading a file, repositioning within a file, deleting a file, truncating a file. ▪ Common operations including appending, renaming. • Types of file:- refer figure 10.1 common file types. Refer to book:- Operating system Concepts by Silberschatz Galvin VIIIth Edition publication: John Wiley and Sons,chapter 10
6	➢ File System Structure • What is file System Structure Refer to book:- Operating system Concepts by Silberschatz Galvin VIIIth Edition publication: John Wiley and Sons,chapter 10,page 365-367 ➢ Swapping • What is Swapping? • Discuss with the help of diagram why it is required? 

	Refer to book:- Operating system Concepts by Silberschatz Galvin VIIIth Edition publication: John Wiley and Sons,chapter 8,page 272-274
7	➢ Access Methods • Define what is access method. • Discuss why it is required. • Types of access methods • Sequential access method:- (page 367-figure 10.2 sequential access file) • What is Sequential access method? • How sequential access done? • What are the advantages and disadvantages of sequential access. • Direct access method:- (page 368) • What is direct access method? • How direct access done? • What are the advantages and disadvantages of direct access. Refer to book:- Operating system Concepts by Silberschatz Galvin VIIIth Edition publication: John Wiley and Sons,chapter 10

8	• File Allocation Methods
	  • What is File Allocation
	  • What are different File Allocation Methods
	• Contiguous allocation:-
	  • How Contiguous allocation is done discuss with following diagram.
	  • Discuss advantages and disadvantages.
	 
	
	• Linked
	  • How linked allocation is done discuss with following diagram.
	  • Discuss advantages and disadvantages.
	 
	
	Refer to book:- Operating system Concepts by Silberschatz Galvin VIIIth Edition publication: John Wiley and Sons

9	➢ Indexed  • How Indexed allocation is done • What are the advantages and disadvantages? ➢ Comparison of three file allocation methods Refer to book:- Operating system Concepts by Silberschatz Galvin VIIIth Edition publication: John Wiley and Sons
10	➢ Directory Structure • What is directory Structure • Different types of directory structure ➢ Single level-description of structure,advantgaes,disadvantages  ➢ Two levels:- description of structure,advantgaes,disadvantages  Refer to book:- Operating system Concepts by Silberschatz Galvin VIIIth Edition publication: John Wiley and Sons

Topic 6	**Name:UNIX:A Case study**

Knowledge Category	Example(s) of Category	Teaching Methodology
FACT	**1. Booting**	With the help of ppt discuss booting process
CONCEPT	**1. Structure of UNIX OS**	With the help of diagram discuss Structure of UNIX OS
	2. File System Of UNIX	With the help of ppt discuss File System UNIX OS https://webserver.ignou.ac.in/virtualcampus/adit/course/cst101/block4a/unit1/cst101-bl4a-u1-03.htm
APPLICATION	**1. UNIX and LINUX Comparison.**	Discuss in terms of parameters such as user interface, number of shells, providers, processing speed.

Reference Material:

Books: -

1) Title Unix Concepts and programming by Sumitabha Das
2) UNIX Programming by Kumar Saurabh

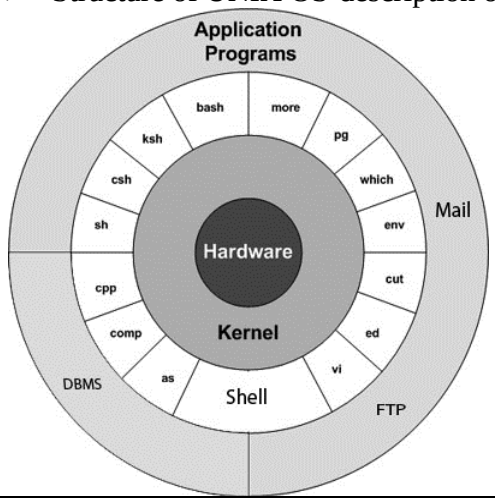
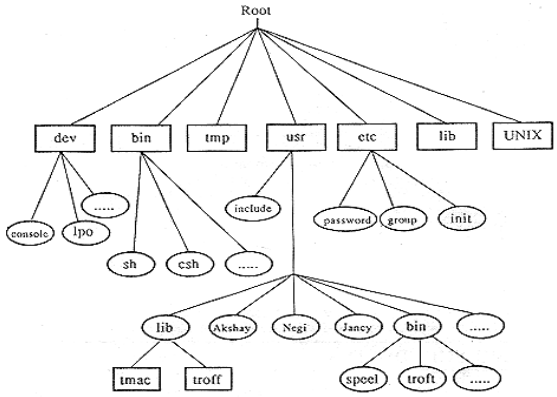
Teaching Aids:

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

PPT with Sample: -

www.iem.iitkgp.ernet.in/old/mj/**UNIX**_Brief.**ppt**

Lecture No.	**Topic/ Subtopic to be covered**
1	➢ Introduction **https://www.cs.drexel.edu/~kschmidt/CS571/Lectures/Unix/intro.ppt**
2	➢ Overview of UNIX http://www.powershow.com/view1/dd344-ZDc1Z/Unix_Architecture_powerpoint_ppt_presentation

3	➢ Structure of UNIX OS-description of each layer 
4	➢ Booting • Why is booting required? • How Boot process occurs?(stepwise procedure) www.cse.iitb.ac.in/~cs431/student_slides/Booting.ppt
5	➢ File System Of UNIX  https://webserver.ignou.ac.in/virtualcampus/adit/course/cst101/block4a/unit1/cst101-bl4a-u1-03.htm
6	➢ UNIX and LINUX Comparison. Discuss in terms of parameters such as user interface, number of shells, providers, processing speed.

5.2 Planning and Conduct of Test:

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

Sr. No	Class Test	Marks	Topics
1	Class Test 1	25	Topic 1, Topic 2, Topic 3.1, Topic 3.2
2	Class Test 2	25	Topic 3.3,Topic 3.4, Topic 4, Topic 5, Topic 6

5.3 Details about conduct of assignments:

- ✓ After completion of each chapter one assignment should be given.
- ✓ Assignment question shall be given from sample question paper, old MSBTE question papers
- ✓ It shall be assessed by subject teacher before giving next Assignment.
- ✓ Evaluation of Assignment should be done effectively.
- ✓ Sample question paper of Operating System to be solved by every student.

5.4 Strategies for Conduct of Practical:

5.4.1 Suggestions for effective conduct of practical and assessment:

- Display the Date wise schedule of the experiment to be performed in the Laboratory.
- At the beginning of the semester teacher/lab assistant should check and ensure that the Computers and Assembler software used for the experiments are installed.
- Before start of any practical Teachers should explain the specific objective of that particular practical.
- Teacher should divide total students into number of group as given in practical manual.
- Teacher should refer the guidelines given in the lab manual.
- Teacher should make the students aware of instructions given in the lab manual.
- Teacher should ensure that the activities given in the Lab Manual are performed by the student and observations should be tabulated.
- Teacher shall assess the performance of students continuously as per norms prescribed by MSBTE CIAAN norms.
- During assessment teacher is expected to ask questions to the students to tap their achievements regarding related knowledge and skills so that students can prepare while submitting record of the practical. Focus should be given on development of enlisted skills rather than theoretical / codified knowledge.

5.4.3 Preparation for conduct of practical

Sr. No.	Activity	Duration
1.	Teacher shall explain the objectives of the experiment.	10 Min.
2.	Teacher shall demonstrate the execution and the desired output.	20 Min
3.	Teacher shall make the students perform the execution of commands or programs and check the output by changing the input.	30 Min.
4.	Teacher shall make the students perform student activity and write answers to questions.	30 Min.
5.	Teacher shall evaluate the student’s performance as per the CPA table.	30 Min.

6.0 Mode of assessment:

6.1 Class Test:

- There will be two tests each of 25 marks.
- The tests will be conducted as per the MSBTE schedule.
- Teacher should prepare model answer of class test question papers.
- After completion of test, subject teacher should display model answer on Department Notice Board.
- Teacher should show the answer paper of class test to the student and discuss about the mistakes.
- Teacher should maintain the record of class test as per MSBTE norms (CIAAN)
- Format for question paper should be as per the sample question paper supplied by MSBTE.
- Guidelines for Setting Class Test Question Paper:
    - ❖ Question no.1 Attempt any three out of four (3X3=9 Marks)
    - ❖ Question no.2 Attempt any two out of three (2X4=8 Marks)
    - ❖ Question no.3 Attempt any two out of three (2X4=8 Marks)

6.1.1 Sample Test Papers:

Sample Test Paper

Sample Test Paper (Test 1) **17512**

Roll No.				

Institute Name:

Course Name: **Computer Engineering Group** Course Code: **CO/CD/CM/CW/IF**

Semester: **Fifth**

Subject**: Operating System**

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

Instructions:

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

Q1. Attempt any THREE of the following: 9

a) Differentiate between multiprogramming and multitasking system w.r.t. following points:
   i. Definition
   ii. Diagram
   iii. Throughput.

b) Describe any three operating system services provided by operating system for user.

c) Describe any three advantages of third generation operating system.

d) Write any three activities of memory management component.

Q2. Attempt any TWO of the following 8

a) Describe working of clustered system with suitable diagram.

b) Describe working of system call by using suitable diagram.

c) With suitable block diagram describe Process Control Block.

Q3. Attempt any TWO of the following 8

a) Differentiate between Long term scheduler and Short term scheduler w.r.t. following points:
   i. Diagram
   ii. Working principle
   iii. Frequency of execution

b) Describe working of Layered structure of operating system by using diagram.

c) With queuing diagram of process scheduling describe scheduling queues.

6.1.2 **Sample Test Paper (Test 2)**

Roll No.				

17512

Institute Name:

Course Name: **Computer Engineering Group** Course Code: C**O/CD/CM/CW/IF**

Semester: **Fifth**

Subject**: Operating System**

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

Instructions:

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

Q1. Attempt any THREE of the following: 9

a) Draw many to many multithreading model and state its any two advantages.

b) State any three benefits of interprocess communication .Give reasons for each benefit.

c) Describe Multilevel queue scheduling with labeled diagram.

d) Define following terms:

i. Paging

ii. Segmentation

iii. page fault

Q2. Attempt any TWO of the following 8

a) With suitable example describe how to use bit map method for free space management.

b) Describe CPU burst cycle and I/O burst cycle with labeled diagram.

c) Describe critical section problem.

Q3. Attempt any TWO of the following 8

a) With suitable diagram explain file system of UNIX.

b) Describe working of contiguous file allocation method.

c) Calculate average waiting time with Shortest Job First for following table:

Process	Burst time
P1	6
P2	8
P3	7
P4	3

6.2 Sample Question Paper:

Scheme G
Sample Question Paper

Exam Seat No.									

17512

Maharashtra State Board of Technical Education

Course Name: Computer Engineering Group **Course Code: CO/CD/CM/CW/IF**

Semester: Fifth

Title of the Subject: Operating System

Marks: 100 **Time: 3 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

Q1. a) Attempt any THREE of the following: **12**

i. List different generations of Operating system. Describe any one with its advantages.
ii. State and describe services provided by an Operating System.
iii. Draw two level directory structures and describe its use.
iv. State any three advantages of multiprocessor system. Give reason for each advantage.

Q1. b) Attempt any ONE of the following: **06**

i. With labeled diagram describe how memory partitioning is done with fixed partitioning technique.
ii. Differentiate between Monolithic and Microkernel system w.r.t. following points:
- Structure (diagram)
- Working
- Example of supporting Operating system.

Q2. Attempt any FOUR of the following: **16**

a) Compare UNIX and LINUX w.r.t. following points:
- User interface
- Number of shells

- Providers
- Processing speed.

b) With suitable diagram describe working of distributed system.
c) State type of file access methods. Describe any one method with diagram.
d) Describe stepwise booting process of UNIX along with diagram.
e) Describe how context switching is done with help of suitable diagram.
f) List any four scheduling criteria. State the meaning of each scheduling criteria.

Q3. Attempt any FOUR of the following: 16

a) Describe any four activities of memory management and file system management.
b) List six basic operations on file. Describe any two with required steps.
c) Describe with suitable example how semaphore helps to overcome critical section problem.
d) Describe preemptive and non preemptive scheduling with respect to working principle and one example of scheduling algorithm used in each type.
e) State and describe necessary conditions for deadlock.

Q4. a) Attempt any THREE of the following: 12

i. List any four system calls for device management and communication.
ii. Draw process state diagram with label. Describe each state from the diagram.
iii. Describe any four secondary storage management activities.
iv. State any two types of schedulers. Describe how each of them schedules the job.

Q4. b) Attempt any ONE of the following: 06

i. Describe many to one and one to one multithreading model with diagram and advantages.
ii. With suitable diagram describe how linked allocation is performed.

Q5. Attempt any TWO of the following: 16

a) List types of interprocess communication models. With suitable diagram describe any one Model. Also state any two advantages of explained model.
b) Calculate average waiting time for First Come First Serve(FCFS) and Shortest Remaining Time Next(SRTN) for following table:

Process	Arrival time	Burst time
P1	0	8
P2	1	4
P3	2	9
P4	3	5

c) Write steps for Banker's algorithm to avoid deadlock. Also give one example showing working of Banker's algorithm.

Q6. Attempt any FOUR of the following: **16**

a) What is system call? With the help of diagram describe open () system call.
b) Draw structure of UNIX operating system. Describe role of each layer.
c) What is real time system? Describe its types.
d) Describe segmentation and paging w.r.t.diagram and working.
e) Describe any four benefits of Multithreaded programming.