GOA UNIVERSITY
THIRD YEAR OF BACHELOR'S DEGREE COURSE IN COMPUTER ENGINEERING
(Revised in 2007-08)
SCHEME OF INSTRUCTION AND EXAMINATION

SEMESTER V

Sub Code	Subjects	Scheme of Instruction Hrs/Week			Scheme of Examination					
		L	T	P	Th. Dur (Hrs)	Marks				
						Th.	S	P	O	Total
CE 5.1	Organizational Behaviour and Cyber Law	3	0	0	3	100	20+5	-	-	125
CE 5.2	Automata Language and Computation	3	0	2	3	100	20+5	-	-	125
CE 5.3	Microprocessors and Microcontrollers	3	1	2	3	100	20+5	50	-	175
CE 5.4	Computer Hardware Design	3	1	2	3	100	20+5	-	-	125
CE 5.5	Database Management system	3	1	2	3	100	20+5	50	-	175
CE 5.6	Operating Systems	3	1	2	3	100	20+5	-	-	125
	TOTAL	18	04	10	-	600	150	100	-	850

L-Lectures, T-Tutorials P-Practicals
Th-.Dur.- Duration of Theory paper
Th-Theory, S-Sessional, P-Pratical, O-Oral.

25 Sessional marks will be split as follows:

20 marks are for the Internal Test
5 marks are for continuous evaluation of Practicals/Assignments

Annexture – II

CE 5.1OBCL Organizational Behavior and Cyber Law

Course Objective: Organizational behavior is the systematic study and careful application of knowledge about how people act within an organization. It is becoming very important in the global economy as people with diverse backgrounds and cultural values have to work together effectively and efficiently. Cyber law describes the legal issues related to use of inter-networked information technology. While grounded in real individuals, physical computers and other electronic devices, the Internet is independent of any geographic location. Hence the laws should be fundamentally different from laws that govern geographic nations today.

Instructional Objective:
At the end of the course, the students would be familiar with the following:

- Organizational and Interpersonal Behavior
- Employee Leadership, Motivation and Appraisal
- Cyber Crimes and jurisdiction in the cyber world
- IT Contracts and Copyright Protection

Lectures per week : 3+0+0
Max. Marks for Theory paper : 100
Max. Marks for Practical : 0
Max. Marks for Sessionals : 20 + 5
Duration of paper : 3 hours
Total no. of modules : 4
No. of questions from each module : 2
Total no. of questions to be answered : 5
(At least one question from each module with two compulsory questions from any one module.)

Module 1

Fundamentals of OB (2hr)

Understanding of Organizational Behavior
Fundamentals Concepts
Nature of Organizations

Models of OB (2hr)

OB system
Models of OB
McGregor's Theory X and Theory Y
Autocratic, Custodial, Supportive and Collegial Models of OB

Communication (2hr)

Nature and Importance of Communication
The Two-Way Communication Process
Communication Barriers
Communication Symbols
Downward and Upward Communication/ Formal and Informal Communication.
Forms of Communication

Leadership (2hr)

- Meaning and Nature of Leadership
- Traits of Effective Leaders
- Leadership Behavior
- Behavioral Approaches to Leadership
- Contingency Approaches to Leadership
- Emerging Approaches to Leadership Theories

Employee Attitudes and their effects (1hr)

- Nature of Employee attitudes
  - Job Satisfaction
  - Job Involvement
- Effects of Employee attitude
- Survey Design and Follow-up

Module 2

Motivation (3hrs)

- Model of Motivation
- Motivational Drives
- Human Needs
  - Types of Needs
  - Maslow's Hierarchy of Needs
  - Hezberg's Two-Factor Theory
- Behavior Modification
- Goal Setting
- Motivational Applications
  - The Expectancy Model

Appraising and Rewarding Performance (2hr)

- Money as a means of Rewarding Employees
- Organizational Behavior and Performance Appraisal
- Economic Incentives Systems
- The Reward Pyramid

Interpersonal Behavior (2hrs)

- Nature and Levels of Conflict
- Sources of Conflict
- Effects of Conflict
- Model of Conflict
  - Participant Intentions
  - Resolution Strategies
- Transactional Analysis
  - Ego States
  - Types of Transactions
  - Benefits
- Power and Politics
- Organizational Politics

Managing Change (2 hrs)

Nature of Work Change
Three Stage in Change
Reaching a New Equilibrium
The Organizational Learning Curve for Change

Understanding Organization Development (1hr)

Foundations of OD
Characteristics of OD
OD Process
Benefits and Limitations of OD

Organizational Behavior across Cultures (1 hr)

Conditions affecting Multinational Operations
Managing an International Workforce

Module 3

Power of Arrest without Warrant under the IT Act, 2000: A Critique (1hr)

Section 80 of the IT Act, 2000
Forgetting the line between Cognizable and Non-Cognizable Offences
Necessity of Arrest without warrant from any place, public or otherwise

Cyber Crime and Criminal Justice (4 hrs)

Concept of Cyber Crime and the IT Act 2000
Hacking
Teenage web vandals
Cyber fraud and cyber cheating
Virus on the Internet
Defamation, harassment and E-mail abuse
Cyber pornography
Monetary penalties, adjudication and appeals under IT Act, 2000
Nature of cyber criminality, strategies to tackle cyber crime and trends
Criminal justice in India and Implications on Cyber crime

Contracts in the Infotech World (3 hrs)

Contracts in the Infotech world
Click-wrap and Shrink-wrap contracts
Contract formation under the Indian Contract Act, 1872
Contract formation on the Internet
Terms and Conditions of Contracts
Software product license

Jurisdiction in the Cyber World (2 hrs)

Civil law of Jurisdiction in India
Cause of action
Jurisdiction and the Information Technology Act, 2000
Place of cause of action in contractual and IPR disputes
Exclusive clauses in Contracts
Abuse of exclusive clauses
Legal principles on jurisdiction in the United States of America

MODULE 4

Battling Cyber Squatters and Copyright Protection in the Cyber World (4 hrs)

Concept of Domain name and reply to Cyber Squatters
Battle between freedom and control on the internet
Works in which copyright subsists and meaning of Copyright
Copyright Ownership and Assignment
License of Copyright
Copyright term and respect for foreign works
Copyright Infringement, Remedies and Offences
Copyright protection of content on the Internet, copyright notice, disclaimer and acknowledgement
Legal development in the US
Napster and its Cousins
Computer Software Piracy

Digital Signatures, Certifying Authorities and E-Governance (2 hrs)

Digital signatures
Digital Signature Certificate
Certifying Authorities and Liability in the Event of Digital Signature Compromise
E-Governance in India

The Indian Evidence Act of 1872 v/s Information Technology Act, 2000 (2 hrs)

Status of Electronic Records as Evidence
Proof and Management of Electronic Records
Proving Digital Signature
Proof of Electronic Agreements
Proving Electronic Messages
Other Amendments in the Indian Evidence Act by the IT Act

Protection of Cyber Consumers in India (2 hrs)

Are Cyber Consumers Covered Under the Consumer Protection Act?
Goods and Services
Consumer Complaints
Defect in Goods and Deficiency in Services
Restrictive and Unfair Trade Practices
Instances of Unfair Trade Practices
Relief under CPA
Consumer Foras, Jurisdiction and Implications on Cyber Consumers in India

TEXTBOOKS

1. Organizational Behavior (Human Behavior at Work) by John W. Newstrom and Keith Davis, Tenth Edition, Tata McGraw Hill ISBN0-07-463764-9,
2. Cyber Law Simplified By Vivek Sood, Tata McGraw Hill, ISBN 0-07-043506-5

Note

Textbook (1) is for Modules I and II
Textbook (2) is for Module III and IV

CE5.2ALC AUTOMATA LANGUAGE AND COMPUTATION

Course Objectives: The major objective of this course is to introduce the student to the concepts of theory of computation in computer science. The student should acquire insights into the relationship amongst formal languages, formal grammars and automata.

Instructional Objective:
At the end of the course, the students would be familiar with the following:

- logic and set theory, functions and relations, formal languages and grammars
- finite-state automata, pushdown automata
- Turing machines, Church's Thesis, undecidability
- Recursively Enumerable Languages and Unsolvable Problems.

Lectures per week	**:**	**3+0+2**
Max. Marks for Theory paper	**:**	**100**
Max. Marks for Sessionals	**:**	**20 + 5**
Duration of paper	**:**	**3 hours**
Total no. of modules	**:**	**4**
No. of questions from each module	**:**	**2**
Total no. of questions to be answered	**:**	**5**

(At least one question from each module with two compulsory questions from any one module).

Module-1

Introduction (2hrs)
Sets, Logic, Functions, Relations, Languages
Proofs, Mathematical Induction, Recursive definitions, Structural Inductions

Regular Languages and Finite Automata (5hrs)
Regular Languages and Regular Expressions
The memory required to recognize a language
Finite Automata (DFA)
Distinguishing one string from another
Union, Intersection, and Complement

Nondeterministic and Kleene's theorem (5hrs)
NFA, Converting NFA to DFA,€-NFA ,Kleene's theorem
Converting an €-NFA to an NFA
Regular Languages
MyHill-Nerode theorem
Minimal finite Automata
The pumping lemma for regular languages
Closure properties
Decision Problem

Moore and Mealy Machine

Module 2

Context –free Grammars and Push down Automata (6hrs)
Context –Free Grammars and Languages
Derivation Trees and Ambiguity
An unambiguous CFG for algebraic Expression
Simplified forms and Normal Forms – CNF, GNF
Pumping Lemma,Closure Properties

Push Down Automata (6hrs)
DPDA
PDA corresponding to a given CFG – Top-down PDA, Bottom-up PDA
CFG corresponding to a given PDA
Closure properties of CFG

Module-3

Turing Machine and their languages (12hrs)
Turing Machine Introduction
Computing a Partial function with a Turing machine
Combining Turing machine
Variations of Turing Machine
Nondeterministic Turing Machine
Universal Turing Machine
Church-Turing Thesis

Module-4

Recursively Enumerable Languages (8hrs)
Recursively Enumerable and Recursive
Enumerating a Language
General Grammars
Unrestricted Grammars and Turing Machine
Context-Sensitive Language and Grammar
Linear Bounded Automata
Chomsky Hierarchy

Unsolvable Problems (4hrs)
A non recursive language and unsolvable Decision problems
Reducing one problem to another
The halting problem
Rice's Theorem
Closure Properties of families of languages

TEXT BOOKS

1. Introduction to languages and the theory of computation, By John C. Martin, Tata McGraw Hill
2. Introduction to Automata Theory, Languages and Computation - By Hopcraft and Ullman, Narosa Publishing House.

REFERENCE BOOKS

1. Theoretical Science - By Krishnamurthy, AWEP.
2. Theory of Computer Science - By Brady, McGraw Hill.
3. Computations, Finite and Infinite Machines - By Minsky, Prentice Hall

CE5.3MPMC MICROPROCESSOR AND MICROCONTROLLER

Course Objective: The objectives of this course are to learn the architecture and programming of 8086 family of microprocessors thoroughly and later study the newer processors, their features and how these features are used in multiuser, multitasking systems.

Instructional Objective:
The student at the end of the course will be able to:

- Write assembly language programs using 8086 instructions.
- Interface 8086 to common peripherals such as keyboards, printers etc.
- Learn the features of 80286,80386, and higher processors to meet the needs of multiuser, multitasking Systems.

Lectures per week	**:**	**3+1+2**
Max. Marks for Theory paper	**:**	**100**
Max. Marks for Practicals	**:**	**50**
Max. Marks for Sessionals	**:**	**20 + 5**
Duration of paper	**:**	**3 hours**
Total no. of modules	**:**	**4**
No. of questions from each module	**:**	**2**
Total no. of questions to be answered	**:**	**5**

(At least one question from each module with two compulsory questions from any one module.)

MODULE 1

(10 Hrs)

Microprocessor 8086:
Pin diagram,
Instruction cycle,
Architecture,
Instruction Set,
Assembly Language instructions.
8086 Basic configuration in maximum mode,
System timing diagrams,
Programming with macros,
Procedures.

MODULE 2

(10 Hrs)

Use of 8086 Interrupt instructions in programming,
Developing libraries for string manipulation operations,
Input and output of integer numbers.
Introduction to multiprocessor configurations,
8087 Numeric data processor:
Numeric data processors Data types,
Its architecture,
Instruction set,
Connections with 8086 and programming with 8087 instructions.
Introduction to I/O processors.

MODULE 3

(12 Hrs)

Interfacing:
Introduction to I/O interfacing,
I/O interfacing techniques:
Memory mapped I/O ,
I/O mapped I/O,
Interfacing 8 bit ports/16 bit ports and their comparison.
Programmable Peripheral Interface (PPI) –
Basic Description of 8255,
Architecture,
Modes of operation,
Programming the 8255.
Interfacing seven segment display,
Printers, and keyboards and stepper motors.,
A/d and D/A interfaces

Programmable timer 8253/8254:
Pin descriptions,
Functional descriptions,
Block diagram,
Command word description and different operating modes .

8051 USART :
Features of synchronous and asynchronous communications,
Pin configurations,
Functional configurations,
Operational descriptions,
Applications.

Introduction and overview of the following chips 8259, 8237, 8279.

MODULE 4

(12 Hrs)

System Design:
Design of 8086 using Memory chips and simple I/O devices using interfaces.

Microprocessor 80286 and 80386:
Brief features,
Architecture,
Memory management system,
Task switching protection etc. in 80286.
Review processors from 80486,
Pentium and RISC family processors.

Introduction to Microcontrollers:
Control oriented microcontroller 8051,
Pin descriptions,
Design considerations,
Types of memory,
Basic registers,
Addressing modes,
Interrupts,
Serial communication timers,
Description of TMOD SFR, TCON SFR

TEXT BOOKS

1. Microprocessors and Interfacing: Programming and Hardware, - By Douglas V. Hall, TMH., Revised Second Edition
2. Microprocessor Systems: The 8086/8088 family architecture programming and design – By Liu and Gibson, PHI
3. Microcontrollers –hardware ,architecture, programming- By Kenneth Ayala ,Second edition

REFERENCE BOOKS

1. Microprocessor and Microcomputer Based Systems – By M. Rafiquzzaman, PHI.
2. The Intel microprocessors 8086/8088, 80186/80188, 80286, 80386, 80486, Pentium, and Pentium pro processor Architecture, Programming and Interfacing - By Barry B. Brey, PHI
3. Microprocessor – Abhishek Yadav , University Science Press , Laxmi Publications Pvt Ltd

CE5.4CHD COMPUTER HARDWARE DESIGN

Course Objective: The objective of this course is to involve the students in the design of a wide variety of Digital Hardware Systems through the use of a register transfer level hardware description language. They learn the technologies used in VLSI systems which make possible the design of potentially fast digital circuits that are extremely economical in terms of space, power requirements and cost.

Instructional Objective:
At the end of the course, the student will be able to:

- Write Control sequences using AHPL (a hardware programming Language)
- Translate control sequences to control unit hardware.
- Design Digital Systems.

Lectures per week	**:**	**3+1+2**
Max. Marks for Theory paper	**:**	**100**
Max. Marks for Sessionals	**:**	**20 + 5**
Duration of paper	**:**	**3 hours**
Total no. of modules	**:**	**4**
No. of questions from each module	**:**	**2**
Total no. of questions to be answered	**:**	**5**

(At least one question from each module with two compulsory questions from any one module.)

MODULE 1

Introduction to Computer Hardware Design (2 hrs)
Design methodology:
System design
The Register Level
The Processor Level

Architecture of a representative 32 bit processor (2 hrs)
Levels of description
Registers and Memory
Single Address Instructions
Two Address Instructions
Branch Instructions, Stacks and Subroutines
Shift and Miscellaneous Instructions

System building blocks (2 hrs)
Introduction
Logic Elements
Speed, Delay and Fanout in Logic Circuits
Flip-flops and Register Memory
Random Access Memory
Direct Access Storage
Sequential Access Storage
Read Only Memory

Design Conventions (4 hrs)
Introduction
Register transfers
Busing
Inter System Busing
Sequencing of control
Electronic Realization of control unit
The conditional transfer

MODULE 2

Study of AHPL
Introduction to a Hardware Programming Language (AHPL) (4 hrs)
Introduction
Operand Conventions
AHPL Operators
AHPL Modules
AHPL Statements
Using Combinational Logic Units
Combinational Logic Unit Descriptions
Handling of Memory Arrays in AHPL
A Timing refinement

Machine Organization and hardware programs (4 hrs)
Introduction
Basic Organization Of RIC
Register Transfers
Fetch and Address Cycles
Execute Cycles for Addressed Instructions
Register Only Instructions
Branch commands
Special Purpose Instructions

Hardware realizations (3 hrs)
Introduction
Starting, Stopping And Resetting
Hardware Compilers

MODULE 3

Micro Programmed Control
Microprogramming (4 hrs)
Introduction
Controlling the Microprogram
A Microprogrammable RIC
Flags And Special Bits
Microcoding
An Assembly Language for Microprograms

High speed addition (3 hrs)
Introduction
Ripple- Carry Adder
The Minimum Delay Adder
The Carry Look-Ahead Principle
Group Carry Look-Ahead
Section Carry Look-Ahead
CL Unit Description of Look-Ahead
Multiplication and division (2 hrs)
Signed Multiplication
Division

Floating Point arithmetic. (2 hrs)
Introduction
Notation and Format
Floating Point Addition and Subtraction
Floating Point Multiplication and Division
Hardware Organization Floating Point Arithmetic

MODULE 4

Introduction to VLSI Design
Introduction to MOS Technology (3 hrs)
Introduction to Integrated Circuit Technology
Basic MOS Transistors
Enhancement/depletion Mode Transistor Action
nMOS Fabrication
CMOS Fabrication

Electrical properties of MOS (4 hrs)
Drain to Source Current v/s voltage Relationships
Aspects of MOS transistor threshold voltage
MOS transistor transconductance & o/p conductance
MOS transistor figure of merit
The Pass Transistor
The nMOS Inverter
The CMOS Inverter

MOS circuit design process. (4 hrs)
MOS Layers
Stick Diagrams
nMOS Design Style
CMOS Design style
Design Rules and Layout
General Observations on Design Rules
Layout Diagrams

TEXT BOOKS

1. Digital Systems, Hardware Organization and Design - By Hill and Peterson, John Wiley & Sons. Third Edition, ISBN 0-471-85936-2
2. Computer Architecture and Organization - By J. P. Hayes, McGraw Hill, Third Edition ISBN 0-07-027355-3
3. Basic VLSI Design- By Douglas Pucknell, PHI, Third Edition ISBN 81-203-0986-3

REFERENCE BOOKS

1. Computer Engineering and Hardware Design-By Morris Mano PHI. ISBN 0-162710-4
2. Principles of CMOS VLSI Design - By Niel Weste & Kamran Eshraghian, Addision Wesley Second Edition ISBN 81-7808-222-5

CE 5.5DBMS DATABASE MANAGEMENT SYSTEM

Course Objective: This course introduces Database Management System (DBMS) which is computer software designed for the purpose of managing databases. It is a collection of programs that enables you to store, modify, and extract information from a database. The students will learn Database concepts, Data Models, various approaches to Database Design, Relational Model, Optimization principles and Control.

Instructional Objective:
At the end of the course the student will be able to:

- Understand the key concepts and terminology of RDBMS
- Learn the basics of database modeling.
- Understand database design and normalization techniques.
- Implement access to the data using various techniques.
- Know the strategies and methods for query processing, optimization, database transaction processing and security.

Lectures per week : 3+1+2
Max. Marks for Theory paper : 100
Max. Marks for Practical : 50
Max. Marks for Sessionals : 20 + 5
Duration of paper : 3 hours
Total no. of modules : 4
No. of questions from each module : 2
Total no. of questions to be answered : 5
(At least one question from each module with two compulsory questions from any one module.)

MODULE 1

(10 Hours)

Introduction
General Introduction to database systems;
Database-DBMS distinction,
Approaches to building a database
Implications of the Database Approach

Data Modeling
Data models, Schemas and Instances
Three-schema architecture of a database
Database Languages and Interfaces

E/R Model
Conceptual data modeling - motivation,
Entities, Entity types,
Various types of attributes,
Relationships, Relationship types,
E/R diagram notation,

Extended ER Diagram
Examples.

MODULE 2

(12 Hours)

Relational Data Model

Concept of relations, Schema-instance distinction,
Keys, referential integrity and foreign keys.

Relational Algebra Operators

Selection, Projection, Cross product,
Various types of joins, Division, Example queries,
Tuple Relational Calculus
Domain relational Calculus
Converting the database specification in E/R notation to the relational schema.

SQL

Introduction

Data definition in SQL,
Table, key and foreign key definitions,
Update behaviors.

Querying in SQL

Basic select- from- where block and its semantics,
Nested queries - correlated and uncorrelated,
Notion of aggregation,
Aggregation functions group by and having clauses,
Embedded SQL.

Views

Specification of views in SQL
Embedded SQL & Dynamic SQL

Security mechanism with related Commands.

Other Relational languages:

QBE (Query-By-Example)

Relational Database Design:

Pitfalls
Functional dependencies
Closure of set of FD's
Closure of attribute set
Canonical cover
Keys

MODULE 3

(12Hours)

Dependencies and Normal forms

Importance of a good schema design,
Problems encountered with bad schema designs,
Motivation for normal forms
Normal Forms: 1NF, 2NF, 3NF and BCNF
Domain key Normal form DKNF
Multi-valued dependencies and 4NF
Join dependencies and definition of 5NF

Query Processing

Measures of query cost selection
Translating SQL queries into Relational algebra
Sorting
Join
Nested Loop Join
Block Nested Loop Join
Merge Join
Hybrid-Hash Join

Using Heuristics in Query Optimization

Query tree
Query graph
Converting query trees into Query evaluation plan

MODULE 4

(10 Hrs)

Transaction processing and Error recovery

Concepts of transaction processing
ACID properties
Schedules and Recoverability
Serializability of Schedules

Concurrency Control

Concurrency control
Locking based protocols for CC

Text Books:

1. Fundamentals of Database Systems – By Elmasri & Navathe, Third Edition, Addison Wesley
2. Database System Concepts, Abraham Silberschatz, Henry F. Korth, Third Edition, Mc Graw Hill

Reference Books:

1. An Introduction to Data Base Systems Pearson Education, C. J. Date, Addison Wesley
2. An Introduction to Database Concepts, Desai B, Galgotia

CE5.6OS OPERATING SYSTEM

Course Objective: The Operating System is a program that acts as an intermediary between a computer user and the computer hardware. The primary aims of an operating system are resource management, scheduling and access control. This course aims to describe the fundamental concepts behind operating systems, and examine the ways in which its design goals can be achieved.

Instructional Objective:
At the end of the course, the students should know:

- The fundamental concepts of operating systems, its evolution and various architectures.
- The terminologies associated with operating system concepts such as processes, threads, concurrency control, synchronization, CPU scheduling and semaphores.
- The general concepts and algorithms used in process management, deadlock handling, memory management, file systems, I/O systems and security.
- Implementation specific issues based on the Linux and Windows Operating Systems.

Lectures per week	**:**	**3+1+2**
Max. Marks for Theory paper	**:**	**100**
Max. Marks for Sessionals	**:**	**20 + 5**
Duration of paper	**:**	**3 hours**
Total no. of modules	**:**	**4**
No. of questions from each module	**:**	**2**
Total no. of questions to be answered	**:**	**5**

(At least one question from each module with two compulsory questions from any one module.)

MODULE 1

Introduction (1Hr)
What is an Operating System?
Types of Operating Systems

Process management (9 Hrs)
Processes
Process description and control
What is a process?
Process description
Unix SVR4 process management

Threads
Processes and threads.
Microkernels
Windows Threads
Linux Process and Thread management

CPU Scheduling
Basic Concepts
Scheduling Criteria
Scheduling Algorithms
FCFS
SJF
SRTF / SRTN
Priority Scheduling
Round Robin Scheduling
Multilevel Queue Scheduling
Multilevel Feedback Queue Scheduling
Fair Share Scheduling
Multiprocessor Scheduling
Real – Time Scheduling
Linux Scheduling
Unix SVR4 Scheduling
Windows Scheduling

Mutual Exclusion & Synchronization
Principles of Concurrency
Mutual Exclusion hardware support
Semaphores
Producer – Consumer problem
Readers – Writers problem
Dining philosophers Problem
(solution using semaphores)
Critical regions and conditional critical regions
Monitors
Dining philosophers Problem
(Solution using monitors)
Message Passing
Unix concurrency mechanics
Linux Kernel Concurrency Mechanics
Windows Concurrency mechanics

MODULE 2

Deadlocks (3 Hrs)
System model
Deadlock characterization
Methods for handling deadlocks
Deadlock Prevention
Deadlock Avoidance
Deadlock Detection
Recovery from deadlock

Memory Management (4Hrs)
Background
Logical v/s Physical address space
Swapping
Contiguous allocation
Paging
Basic method
Structure of the page table
Multilevel paging
Inverted page table
Shared pages
Segmentations
Protection & Sharing
Fragmentations

Virtual Memory (4Hrs)
Demand Paging
Operating system software
Fetch policy
Placement Policy
Replacement Policy
Resident set management
Cleaning Policy
Load control
Thrashing
Unix Memory Management
Linux Memory Management
Windows Memory Management

MODULE 3

File System Interface (3Hrs)
File Concept
Access methods
Directory Structure
Unix File Management
Linux File Management
Windows File Management

I/O Systems (4Hrs)
I/O Hardware
Application I/O Interface
Kernel I/O subsystem
Operating system design issues
Unix SVR4 I/O
Linux I/O
Windows I/O

Secondary Storage structure (3Hrs)
Disk structure
Disk scheduling
Disk management
Swap – Space management

MODULE 4

Security (3Hrs)
Security threats
Protection
Intruders
Malicious software
Windows security

Linux Commands (7 Hrs)
Shell Programming in UNIX/LINUX
Getting Started
Understanding the Unix commands
General purpose utilities
The file system
Handling ordinary files
Basic file attributes
The Shell
Simple Filters
Filters using regular expressions
Essential Shell Programming

TEXT BOOKS

1. The Operating System Concepts – By Silberschatz and Galvin, Wesley Publishing Co., Addison Wesley. ISBN-0-201-35251-6
2. Operating Systems – By W Stallings. Prentice Hall of India. ISBN-978-81-203-2796-2
3. UNIX – Concepts and applications – By Sumitabha Das, Tata McGraw Hill

REFERENCE BOOKS

1. Operating systems, Design and implementation – By A.S Tanenbaum,PHI.
2. Operating Systems – By Milenkovic, Tata McGraw Hill.
3. Operating Systems – By Achyut S. Godbole, Tata McGraw Hill.
4. The Design of the UNIX Operating System – By Maurice J. Bach, PHI
5. Linux Kernel Internals – By M Beck, H Bohme, M Dziadzka, U Kunitz, R Magnus, D Verworner, Addison Wesley
6. Unix System Programming using C++, Terence Chan, PHI