

3.1 PROGRAMMING IN 'C'

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Periods/week 4 4

RATIONALE

Computers play a vital role in present day life, more so, in the professional life of technician engineers. People working in the field of computer industry, use computers in solving problems more easily and effectively. In order to enable the students use the computers effectively in problem solving, this course offers the modern programming language C along with exposition to various applications of computers. The knowledge of C language will be reinforced by the practical exercises.

DETAILED CONTENTS

1. Algorithm and Programming Development (04 Periods)
Steps in development of a program, Flow charts, Algorithm development, Debugging
2. Program Structure (06 Periods)
I/O statements, assignment statements. Constants, variables and data types, Operators and Expressions, Use of Header files & Library functions, Key word, data Types and Identifiers
3. Control Structures (10 Periods)
Introduction, Decision making with IF – statement, IF – Else and Nested IF, While and do-while, for loop, Break and switch statements
4. Functions (10 Periods)
Introduction to functions, Function Declaration, Standard functions, Parameters and Parameter Passing, Call by value/reference, Global and Local Variables, Recursion
5. Arrays (8 Periods)
Introduction to Arrays, Array Declaration and Initialization, Single and Multidimensional Array. Arrays of characters
6. Pointers (8 Periods)
Introduction to Pointers, Address operator, pointer and functions, Declaring and Initializing pointers, Assignment through pointers, Pointers and Arrays
7. Structures and Unions (8 Periods)
Declaration of structures, Accessing structure members, Structure Initialization, Arrays of structures, Unions, Memory allocation functions.
8. Strings (5 Periods)
Introduction, Declaring and Initializing string variables, Reading and writing strings, String handling functions, Array of strings
9. Files (05 Periods)
Introduction, File reading/writing in different modes, File manipulation using standard function types

LIST OF PRACTICALS

1. Programming exercises on executing and editing a C program.
2. Programming exercises on defining variables and assigning values to variables.
3. Programming exercises on arithmetic and relational operators.
4. Programming exercises on arithmetic expressions and their evaluation
5. Programming exercises on formatting input/output using printf and scanf
6. Programming exercises using if statement.
7. Programming exercises using if – Else.
8. Programming exercises on switch statement.
9. Programming exercises on do – while statements.
10. Programming exercises on for – statement.
11. Programs on one-dimensional array.
12. Programs on two-dimensional array.
13. (i) Programs for putting two strings together.
(ii) Programs for comparing two strings.
14. Simple programs using structures.
15. Simple programs using pointers.
16. Simple programs for reading from a file and writing into a file.

INSTRUCTIONAL STRATEGY

The subject is totally practical based. Students should be given clear idea about the basic concepts of programming. In practical session student should be asked to draw flow chart write algorithm and then write program for the algorithm and run on computer. It is required that students should maintain records (files with printouts).

RECOMMENDED BOOKS

1. Programming in ANSI C by E Balaguruswami, , Tata McGraw Hill Education Pvt Ltd , New Delhi
2. Application Programming in C by RS Salaria, Khanna Book Publishing Co(P) Ltd. New Delhi
3. Programming in C by Gottfried, Schaum Series, , Tata McGraw Hill Education Pvt Ltd , New Delhi
4. Exploring C by Yashwant Kanetkar – BPB Publications, New Delhi
5. Programming in C by Stefin G. Coachin
6. Programming in C by R Subburaj, Vikas Publishing House Pvt. Ltd., Jangpura, New Delhi
7. Elements of C by M.H. Lewin, Khanna Publishers, New Delhi
8. Programming in C by Stephen G Kochan
9. Programming in C by BP Mahapatra, Khanna Publishers, New Delhi

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time allotted (Period)	Marks Allotted (%)
1	4	6
2	6	10
3	10	16
4	10	16
5	8	12
6	8	12
7	8	12
8	5	8
9	5	8
Total	64	100

3.2 BASICS OF ELECTRICAL AND ELECTRONICS ENGINEERING

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Periods/week 4 3

Rationale : The objective of this subject is to impart fundamental knowledge and skills regarding basic electrical and electronics engineering and digital electronics which diploma holders will come across in their professional life. This course will enable the students to understand the basic concepts and principles of d.c. and a.c. fundamentals, and batteries. The students will also learn basic electronics including diodes and transistors and their applications and digital electronics devices & systems.

DETAILED CONTENTS

1. **Overview** (04 Period)
Basic concepts of electrical parameters, AC and DC, Use of Electrical Engineering. Ohm's law, Kirchhoff's Law. Concept of voltages & current sources and their conversion.
2. **AC fundamentals** (04 Period)
Representation of sinusoidal quantity, Equation of sinusoidal wave form, Simple RLC circuits
3. **Batteries** (06 Period)
Basic idea about primary and secondary cells, Construction, working and applicants of Lead-Acid, Nickel-Cadmium and Silver oxide batteries, Charging methods used for lead-acid battery(accumulator), Care and maintenance of lead-acid battery, Series and parallel connections of batteries, General idea of solar cells, solar panels and their applications, Introduction to maintenance free batteries.
4. **Semi Conductor Physics** (04 Period)
Conductors, Insulators, Semiconductors, Idea of Energy Level, Energy Band Diagrams of Insulators, Conductors and Semiconductors, Effect of Temperature, Recombination of holes and electrons, n-type semiconductor, p-type semiconductor, Majority and Minority Carriers.
5. **Semi Conductor Diode & Transistor** (06 Period)
Mechanism of current conduction and characteristics of ordinary diode, zener diode, LED, Principle of operation characteristics and applications of BJT and concept of configurations.
6. **Electrical & Electronics Measuring Instruments** (06 Period)
Operations methods and applications of induction type energy meter, Analog/Digital multimeter, CRO

7. **Earthing & Discharge** (04 Period)
Concept of earthing and grounding, importance of Earthing, Mechanism and procedure of earthing provided in computer centre, checking of earthing, Static Discharge, Methods to reduce discharge, Provision for the safety of computers from high electrical discharge, Magnetic effect etc.
8. **Number System** (06 Period)
Distinction between analog and digital signal, Applications and advantages of digital signals, Binary, Octal and hexadecimal number system: conversion from decimal and hexadecimal to binary and vice-versa, binary addition, subtraction, multiplication and division including binary points. 1's and 2's complement method of addition/subtraction.
9. **Codes and Parity** (04 Period)
Concept of code, weighted and non-weighted codes, examples of 8421, BCD, excess-3 and Gray code, Concept of parity, single and double entry and error detection, Alpha numeric codes : ASCII and EBCDIC
10. **Logic Gates and Families** (04 Period)
Concept of negative and positive logic, Definition, Symbols and truth tables of NOT, AND, OR, NAND, NOR, EXOR Gates, NAND and NOR as universal gates, Logic family classification: Definition of SSI, MSI, LSI, VLSI, TTL and CMOS families.
11. **Logic Simplification** (04 Period)
Postulates of Boolean algebra, De Morgan's Theorems . Various identities. Formulation of truth table and Boolean equation for simple problem. Implementation of Boolean (logic) equation with gates. Karnaugh map (upto 4variables) and simple applications in developing combinational logic circuits.
12. **Arithmetic Circuits** (04 Period)
Half adder and Full adder circuit, design and implementation, Half and Full subtractor circuit, design and implementation, 4 bit adder/subtractor, Adder and Subtractor IC
13. **Decoders, Multiplexers and De Multiplexers** (04 Period)
Four bit decoder circuits for 7 segment display and decoder/driver ICs, Multiplexers and De-Multiplexers, Basic function and block diagram of MUX and DEMUX. Different types and ICs.
14. **Latches and flip flops** (04 Period)
Concept and types of latch with their working and applications, Operation using waveforms and truth tables of RS, T, D, Master/Slave JK flip flops, Difference between a latch and a flip flop.

LIST OF PRACTICALS

1. Verification of Kirchoff's current law and voltage law in a D.C. Circuit.
2. To test a lead – acid storage battery for charged & discharged condition (with hydrometer & to recharge it)
3. Use of analog & digital multimeter and measure resistance, voltage & current.
4. Use of CRO & measurement of frequency & voltage.

5. Verification & interpretation of truth tables for AND, OR, NOT NAND, NOR and Exclusive OR (EX-OR) gates.
6. To design a half adder & full adder using gates and verification of their operation construction of a full adder circuit using XOR and NAND gates and verify its operations.
7. To design a half subtractor & full subtractor circuit with the help of gates & verify their operations.
8. Verify of truth table for decoder ICs.
9. Verification of truth table of JK & JK Master slave flip flops.
10. Verification of MUX & DEMUX using ICs
11. To find the voltage & current relationship in single phase RLC circuit
12. Draw V.I. characteristics of ordinary semiconductor diode & LED.
13. Draw input & output characteristics of transistor in CB & CE configurations.
14. Demonstration of earthing, provided for computer center & testing of proper earthing.

INSTRUCTIONAL STRATEGY

The Electrical, Analog and digital systems have significant importance in the area of computer. Adequate competency needs to be developed by giving sufficient practical knowledge in Electrical, Electronics and digital circuit. Help may be taken in the form of charts, simulation packages to develop clear concepts of the subject.

LIST OF RECOMMENDED BOOKS

1. Digital Electronics: Principles and Integrated Circuits by A.K Maini, Wiley-India Pvt Ltd. Daryaganj, New Delhi
2. Digital Electronics and Applications by Malvino Leach, Tata McGraw Hill Education Pvt Ltd, New Delhi
3. Digital Logic Designs by Morris Mano, Prentice Hall of India, New Delhi
4. Digital Electronics by Soumitra Kumar Mandal, Tata McGraw Hill Education Pvt Ltd,

5. Digital Electronics by V K Sangar , Raj Publishers, Jalandhar
6. Digital Electronics by Tokheim, Tata McGraw Hill Education Pvt Ltd,
7. Digital Electronics by RP Jain, Tata McGraw Hill Education Pvt Ltd, New Delhi
8. Digital Electronics by KS Jamwal, Dhanpat Rai and Co., New Delhi
9. Digital Electronics by Rajiv Sapra, Ishan Publication, Ambala
10. Digital Electronics by BR Gupta, Dhanpat Rai & Co., New Delhi
11. Digital Systems: Principles and Applications by RJ Tocci, Prentice Hall of India, New Delhi
12. Digital Electronics by Rajaraman V., Prentice Hall of India, New Delhi
13. Fundamentals of Digital Electronics by Naresh Gupta, Jain Brothers, New Delhi
14. Principle of Electrical Engineering by V.K. Mehta, S Chand Publication.
15. Basic Electrical Engineering by J.B. Gupta, S.K. Kataria & sons
16. Basic Electrical Engineering by Sahdev & Sahdev, Uneek Publication
17. Fundamental of Elex for polytechnics by Subhadeep Chaudhary, Paragon international Publication
18. Electrical machines by S.K. Bhattacharya Tata McGraw Hill Education Private Limited.

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time allotted (Period)	Marks Allotted (%)
1	04	05
2	04	05
3	06	05
4	04	05
5	06	10
6	06	10
7	04	05
8	06	10
9	04	05
10	04	05
11	04	10
12	04	05
13	04	10
14	04	10
Total	64	100

3.3 COMPUTER WORKSHOP

L T P
- - 5

RATIONALE

The course aims at making the students familiar with various parts of computers, peripherals and various operating systems. In addition, the course will provide the students with necessary knowledge and skills in computer software installation, maintenance and make him comfortable to diagnose computer system faults.

DETAILED CONTENTS

1. Components and parts of personal computers
Mother-Board Details, Hard Disk: SATA, PATA, File Systems: FAT, NTFS, Partitioning Hard Disk, Using Partition Magic Software, External Hard Disk Drive, Floppy Disk Drive, CD/ DVD Drive, RAM, CMOS/BIOS Configuration, Update BIOS Software.
2. Installation of Operating Systems
Study & Configuration of BIOS, Create Bootable: USB, CD and DVD, Installation of Operating System: Unix, Linux, Windows, Mac OS, Working With OS: Define Users, Groups, Profiles, and Policies, Manage Users, Groups, Profiles, and Policies, Use Security and Access Controls, Remote Access.
3. Installation of application softwares
Installation and configuration of Microsoft Visual Studio, J2SDK-SE, J2SDK-EE, J2SDK-ME, database softwares :sql server, oracle, web servers: Apache Tomcat, JRUN, IIS, Installation of drivers: Network, Display, Sound and Chipset.
4. Firewall & Security Softwares
Installation of Firewall Softwares, Configuring Firewall, Antivirus Softwares, Virus Detection, Cure and Recovery.
5. Printer & Scanner
Installation & Sharing of Printer, Installation & Sharing of Scanner, Installation of Overhead Projector.
6. Remote & : Source/Version Control Softwares
Installation Configuration & Working With: Source/Version Control Softwares (TFS, VSS, SOS), Remote Control Softwares (Hemachi, TeamViewer, Ultra VNC).
7. Troubleshooting of Windows
Command-line tools and Recovery Console, Use DOS commands on files & disks, Backup strategies: Perform normal and incremental backups, Restore files from normal, incremental backups, Using Windows Backup, Using System Restore, Describe the Booting process, Boot with various boot options, Create Setup and Emergency Repair Disk, Use the Check Disk utility, Windows Registry: Windows Registry Editor, Structure and Organization of Registry, Export and Edit Registry settings.

INSTRUCTIONAL STRATEGY

As the subject is fully practical oriented, sufficient exercises on installation of operating systems and application softwares should be given. Exercises in repair and fault finding of computer and peripheral devices like printers, display devices, disk drive should be given to the student. Field visits too the places where Installation of computers is taking place will be helpful to the students.

RECOMMENDED BOOKS

1. Modern Computer Hardware Course by Manahar Lotia (Author) BPB (Publisher)
2. PC Upgrade of Maintenance Guide 16th Edition by Mark Minasi, BPB (Publisher)
3. Windows NT 4: The Complete Reference by Griffith Kadnier (Author), McGraw-Hill
4. A+ Guide to PC Hardware Maintenance & Repair By Michael Graves (Author)
5. Comptia A+ Certification Study Guide, 7th Edition By Jane Holcombe, Charles Holcombe (Author)
6. Comptia A+ Guide: Essentials Lab Manual, Third Edition By Michael Meyers (Author)

3.4 COMPUTER SYSTEM PERIPHERALS

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Periods/week 5 - 2

RATIONALE

A computer engineer should be able to interface and maintain key-board, printer, mouse, monitor etc along with the computer system. The course provides the necessary knowledge and skills regarding working construction and interfacing aspects of peripherals. The students will get to know how various peripherals communicate with central processing unit of the computer system. The student will be able to maintain keyboard, printer, monitors and Power Supplies (CVTs and UPSs) along with computer system. This subject provides the required background of computer installation, maintenance and testing of peripherals with microcomputers.

DETAILED CONETENTS

1. Video Display (10 Period)
The basic principle of working of video monitors(CRT/TFT/LCD/LED), video display adapters, video modes
Video display EGA/VGA/SVGA/PCI adapters and their architecture
2. Key Board and Mouse (8 Period)
Types and basic principle of working of wired /wireless key board and wired /optical/wireless mouse, scan codes.
3. Disk Drivers (14 Period)
Features and working of hard disk drive, floppy disk drive, optical and DVD disk drives and CD writer, Pen Drive, Logical structure of disk and its organization and boot record
4. Peripheral Devices, Ports and Connectors (14 Period)
Working principle of various input devices such as Scanner, Tablets, touch screen, light pen, digitizers and joystick, Serial, Parallel, PS/2, USB, RJ- 45, BNC
5. Printers (14 Period)
Principle and working of deskjet, Inkjet, dot matrix and laser printers and plotters
6. Networks Peripherals (Features and Working) (12 Period)
Hub, Switches, Gateway, Router, Bridge, Modem, Patch Panel, I/O Box, Patch Cord, Wireless access point, LAN card(wired/wireless access)
7. Power Supplies (Working Principle) (8 Period)
SMPS, Constant voltage transformers, On Line/Off Line uninterrupted power supplies (UPS)

LIST OF PRACTICALS

- 1) To identify various components and peripheral devices of computer.
- 2) Demonstration of different Peripherals of a computer system.
- 3) To study the operation of SMPS

- 4) To study the operation of CVT.
- 5) To study the operation of UPS.
- 6) To study the Video display Unit
- 7) To study the Network Connections

INSTRUCTIONAL STRATEGY

While teaching the subject the teacher may take the interfacing devices like disk drives, printers, key-boards, scanners, plotters etc. physically and explain its working. Additional practical exercise on maintenance and repair of peripheral devices will help the students to develop adequate skills.

LIST OF RECOMMENDED BOOKS

1. B. Govinda Rajalu, IBM PC and Clones. Hardware Trouble Shooting and Maintenance, Tata McGraw Hill 1991
2. Robert, S Lai: The waite group writing MS DOS Device, Drives, Addison, Wesley Publishing Co. 2nd Ed. 1992.
3. SK Bose “Hardware and Software of Personal Computers” Wiley Eastern Limited, New Delhi.
4. Hall, Douglas “Microprocessors and Interfacing” McGraw Hill
5. Uffenbeck, Microprocessors and Interfacing
6. Sukhvir Singh, Fundamental of Computers, Khanna Publishers, New Delhi
7. Levis Hahensteu, Computer Peripherals for Micro Computers, Microprocessor and PC
8. Peter Norton, Inside the PC (Eight Edition), Tech media

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time allotted (Period)	Marks Allotted (%)
1	10	12
2	08	10
3	14	18
4	14	18
5	14	18
6	12	14
7	08	10
Total	80	100

3.5 COMPUTER APPLICATIONS

L T P

Periods/week 4 - 4

RATIONALE

The objective of this subject is to enable the students to understand the fundamentals of multimedia and to work on MS Office, Photoshop and Coral Draw. Using these software, students will be able to create business cards, pamphlets, banners, news papers, and books.

DETAILED CONTENTS

1. Features and Applications of MS Office (15 Periods)

Fundamentals of MS Word: Using all tools & effect of text formatting, Importing and Exporting files and images, tables formatting, border, Charts/ Graphs, Forms, Tools, Equations and macros function, Mail Merge concept. Features & applications of Excel, Rows, Columns, Cell Menus; Creating Worksheets; Applying formula and function, formatting, Printing, Graph/ Charts, Establishing worksheet links, Macros, Database, Tables; Features, Applications, Views, Create slide presentation, Slide Show, Animation and Printing Presentation, Multimedia feature

2. Desktop Publishing (04 Periods)

Overview, features, applications and advantages of Desktop Publishing

3. Page-Maker (10 Periods)

An introduction, basics menus & tools, Guides & rulers, Drawing tools, Fills & outlines, Working with- text, paragraphs, tabs & indents, graphics, tables, Importing & exporting, story editing and printing, Tips and Shortcut key, Creating book works-introduction-building booklets, completing the book.

4. CorelDraw (10 Periods)

Corel draw –An overview, menus and tools, Drawing –lines, shapes .inserting-pictures, objects, tables, templates, Adding special effects, Exporting drawings, outlining & filling objects, inserting symbols & Clip arts, Working in Corel draw presentation –adjusting the position, resizing, positioning, merging, color shades & shadows .working with advanced effects, special interactive effects, Creating- business cards, pamphlets, banners, news papers, books. Shortcut keys in Corel draw.

5. Photo-shop (15 Periods)

Creating converting and viewing and graphic documents including: PD and PS Files Using Adobe Acrobat Reader, Inserting picture and shapes, filling colors, text effects, working with layers, filters, Creating design patterns, Photoshop presentations -static & dynamic presentation, WEB & WEB GALLERY using internet explorer in photo shop, creating animations using image ready, creating animations & presentations, Tips and tricks in Photoshop.

Types of Printing an Introduction-Letterpress printing-lithography-offset printing-different printing process-machines for letterpress, offset, gravure, flexography and screen printing-printing materials, planning a printing, design factors, color application-film assembly and plate making-binding & finishing, Image editing, color correction, color management, poly master, methods of color proofing, Different types of font, text file formats, vector & raster graphics, graphics file formats, Page setting, character & paragraph formatting, indentation, alignments, hyphenation, single & double sided documentation.

LIST OF PRACTICALS

1. Exploring settings using windows control panel
2. Creating, editing and formatting documents using MS Word, macro function and Mail Merge concept using MS Word
3. Creating and manipulating worksheets using MS Excel, MS Excel functions and formulas, MS Excel charts and Graphs
4. Creating, attractive presentations including about the department, about your institute and course material using MS Power Point, insert a picture in the existing image background?
5. Create a 3D text in Corel Draw
6. Create an advertisement for a Textile company in Corel
7. Design a business card for a company embed photo in it.
8. Design a banner for a marriage function Making presentations including diagrams, charts, graphics and images using CorelDraw
9. Creating 2-fold, 3- fold, 4-fold, 6- fold cards and brochures using CorelDraw
10. Creating, Converting and opening PD and PS files
11. To make smooth curved lines in Photoshop
12. Extract an object from a given picture
13. Create a new picture. Make it 300 pixels high and 400 pixels wide. The resolution should be 72 pixels / inch.
14. To create your very own animated beating heart in Photoshop
15. To make falling objects that will work as seamless backgrounds and have objects falling at different paces in Photoshop

INSTRUCTIONAL STRATEGY

This course is more of practical importance hence care should be taken to use as many features as possible of the tools discussed in theory more effectively and efficiently

RECOMMENDED BOOKS

1. Photoshop 7 The Complete Reference By Laurie Ann Ulrich, McGraw Hill Professional
2. R.K. Teral: PC Software made simple, Tata Mc Graw Hill
3. Crawford and Russel: Getting Ready for Windows 95, BPB Publication
4. Russel A. Stultz: Learn Excel for Windows in a day, BPB Publication
5. Mansfield: Mastering Word 6.0 for Windows, BPB Publications.
6. Peter Dyson: Understanding PC Tools, Sybex/ Tech. Asian Ed., Tech. Pub User guide, Adobe page Maker 6.5

7. CorelDraw 8 user Manual
8. Corel Photo Paint 8 user Manual
9. Quark- Express 7 user Manual
10. Steve Rimmer, Mastering CorelDraw 3 Tech publications PTE. Ltd
11. William D. Harrell; Illustrated Page Maker 4.0, Jaiko Book

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time allotted (Period)	Marks Allotted (%)
1	15	24
2	4	6
3	10	16
4	10	16
5	15	22
6	10	16
Total	64	100

3.6 OPERATING SYSTEMS

L T P
Periods/week 6 - 3

RATIONALE

The course provides the students with an understanding of human computer interface existing in computer system and the basic concepts of operating system and its working. The students will also get hand-on experience and good working knowledge to work in DOS and Windows environments. The aim is to gain proficiency in using various operating systems after undergoing this course.

DETAILED CONTENTS

1. Brief Introduction to System Software (4 Period)
Compiler, Assembler, Loader, Operating system, Linking, Loading and Executing a Program
2. Overview of Operating Systems (8 Period)
Definition of Operating Systems, Functions of Operating System, Types of Operating Systems – Batch Processing, Time Sharing, Multiprogramming, Multiprocessing and Real Time Systems, Distributed Systems, Importance of Operating System
3. Process Management Functions (16 Period)
Job Scheduler, Scheduling Criteria, Process Scheduler, Scheduling algorithms, Process synchronization, Critical section
4. Dead Locks (16 Period)
Introduction and necessary conditions of dead lock, Dead lock avoidance, Dead lock detection, Dead lock Recovery
5. Memory Management Function (20 Period)
Introduction, Logical and Physical address space, Virtual memory, Swapping, Single contiguous memory management, Fixed partition, Contiguous allocation, Paging, Segmentation, Demand paging, Page replacement algorithms, Thrashing
6. I/O Management Functions (16 Period)
Dedicated Devices, Shared Devices, Virtual Devices, Storage Devices, Buffering, Spooling
7. File Management (16 Period)
File concept, Access Methods, Directory Structure, Protection, File system structure, allocation methods, Directory implementation

LIST OF PRACTICALS

1. Demonstration of all the controls provided on Control Panel, and exercises using Windows
2. Practical exercises involving various internal and external DOS commands
3. Practical exercises involving various UNIX/LINUX commands

INSTRUCTIONAL STRATEGY

As per the above information, it is clear that the subject is both theory and practical oriented. Therefore, the stress must be given on both the theory and practical teaching. In the practical classes, the laboratory must be equipped with all the basic operating system software i.e DOS, UNIX, LINUX, WINDOWS etc. While imparting instructions, the teachers are expected to lay more emphasis on concepts and principles of operating systems, its features and practical utility.

LIST OF RECOMMENDED BOOKS

1. Operating systems by John J Donovan; Tata McGraw Hill, New Delhi
2. Operating System Concept by Ekta Walia, Khanna Publishers, New Delhi
3. System programming by Dhamdhare
4. Unix operating system by Vijay Mukhi
5. Operating system by C. Ritchie
6. MS DOS by Peter Norton, BPB Publications
7. Microsoft Windows Manual
8. First Course in Computers by Sanjay Saxena; Vikas Publishing House Pvt. Ltd., Jungpura, New Delhi

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time allotted (Period)	Marks Allotted (%)
1	04	04
2	08	08
3	16	16
4	16	18
5	20	22
6	16	16
7	16	16
Total	96	100