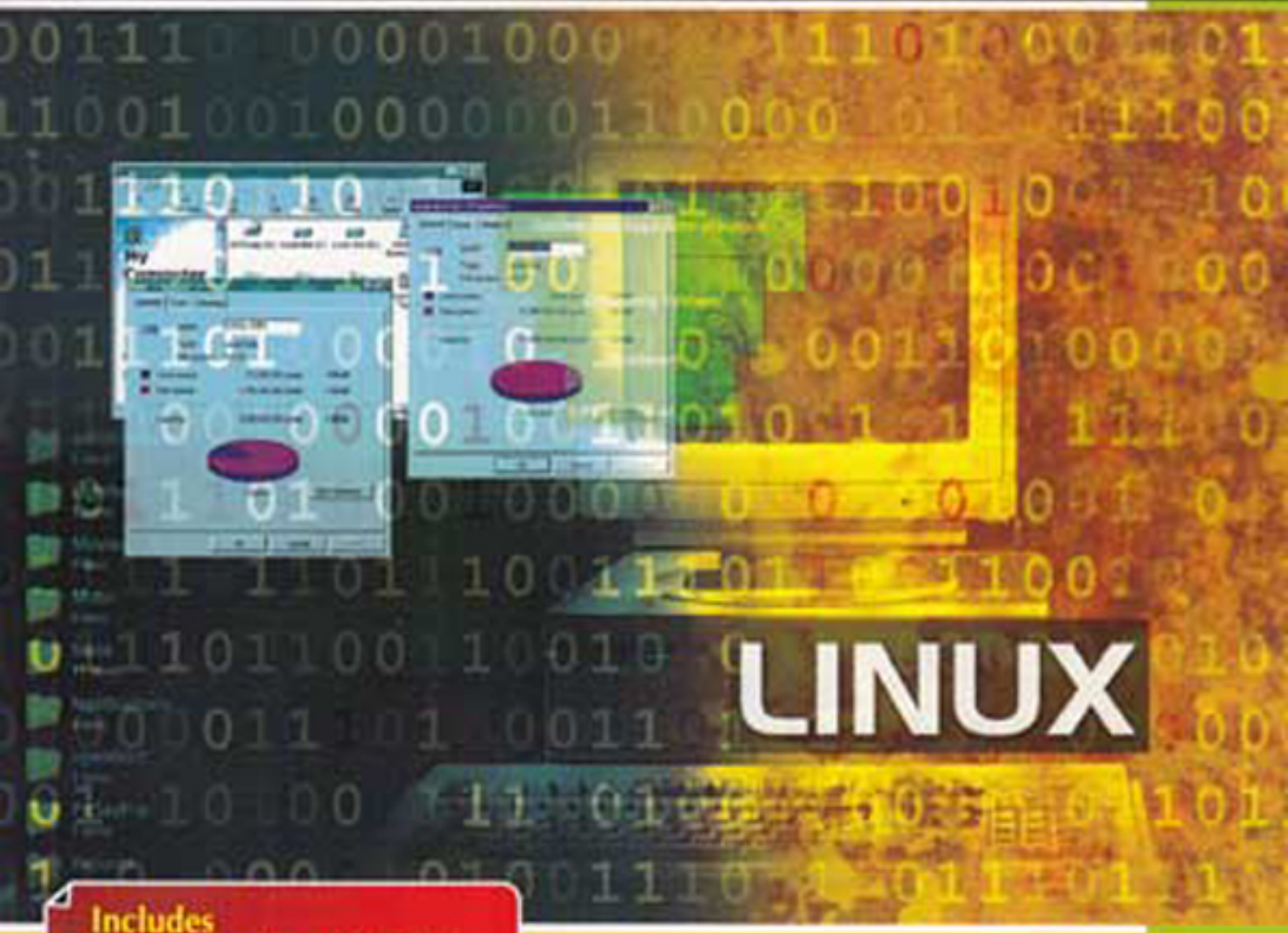
According to New Revised Credit System Syllabus

SPPU

Third Year Degree Course In

INFORMATION TECHNOLOGY (Sem - I)

OPERATING SYSTEM



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- Model Question Papers For Practice (In Sem-30 Marks & End Sem- 70 Marks)

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NIRALI PRAKASHAN
ADVANCEMENT OF KNOWLEDGE

A TEXT BOOK OF

OPERATING SYSTEM

FOR
SEMESTER – I

THIRD YEAR DEGREE COURSE IN INFORMATION TECHNOLOGY

Strictly According to New Revised Credit System Syllabus of Savitribai Phule Pune University
(w.e.f June 2017)

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PREFACE

It gives us great pleasure to present the book **'Operating System'** for the students of Third Year Degree Course in Information Technology of the Savitribai Phule Pune University. This book is strictly as per the new revised syllabus 2015 Pattern with effect from the Academic Year (2017-18).

As per New Revised Examination Scheme which has been implemented from this academic year, In-semester assessment carries 30 marks over first three units and End Semester Examination carries 70 marks over entire syllabus out of which first three units will carry 20 marks and units 4, 5, 6 will carry 50 marks. The theory course will have 4 credits.

The book is written such that all the basic concepts are explained in simplified manner. It is presented in a more conceptual manner rather than mathematical, as required by the new examination system. It is our objective to keep the presentation systematic, consistent, intensive and clear through explanatory notes and figures. Main feature of this book is, **Complete Coverage** of the New Credit System Syllabus with large number of Worked Solved Examples, Exercises, **Model Question Papers of In Sem.** and **End Sem. Exams.**

We are sure that this book will cater to all needs of students for this subject.

We would like to extend our sincere thanks to **Management** and **Dr. M. S. Gaikwad,** (Principal, SIT, Lonavala.)**, Dr. R. S. Prasad,** (Principal, NBNSSOE, Ambegaon, Pune.), **Prof. N. A. Dhawas** (HOD, IT Deptt., SIT, Lonavala.) and **Prof. S. P. Patil,** (HOD, IT Deptt., NBNSSOE, Ambegaon, Pune.) for their constant inspiration.

We also take this opportunity to express our sincere thanks to Shri. Dineshbhai Furia, Shri. Jignesh Furia, Mrs. Nirali Verma, Shri. M. P. Munde and entire team of Nirali Prakashan namely Mrs. Deepali Lachake (Co-ordinator), who really have taken keen interest and untiring efforts in publishing this text.

The advice and suggestions of our esteemed readers to improve the text are most welcomed, and will be highly appreciated.

Pune **Authors**

SYLLABUS

Unit – I : Overview of Operating System (08 hrs)

Operating System Objectives and Functions, The Evolution of Operating Systems, Developments Leading to Modern Operating Systems, Virtual Machines. BASH Shell scripting: Basic shell commands, shell as a scripting language.

Unit – II : Process Description and Control (08 hrs)

Process: Concept of a Process, Process States, Process Description, Process Control (Process creation, Waiting for the process/processes, Loading programs into processes and Process Termination), Execution of the Operating System.

Threads: Processes and Threads, Concept of Multithreading, Types of Threads, Thread programming Using Pthreads.

Scheduling: Types of Scheduling, Scheduling Algorithms, and Thread Scheduling.

Unit – III : Concurrency Control (08 hrs)

Process/Thread Synchronization and Mutual Exclusion: Principles of Concurrency, Requirements for Mutual Exclusion, Mutual Exclusion: Hardware Support, Operating System Support (Semaphores and Mutex), Programming Language Support (Monitors).

Classical Synchronization Problems: Readers/Writers Problem, Producer and Consumer problem, Interprocess communication (Pipes, shared memory: system V).

Deadlock: Principles of Deadlock, Deadlock Modeling, Strategies to deal with deadlock: The Ostrich Algorithm, Deadlock Prevention, Deadlock Avoidance, Deadlock detection and recovery, An Integrated Deadlock Strategy, Example: Dining Philosophers Problem.

Unit – IV : Memory Management (08 hrs)

Memory Management: Memory Management Requirements, Memory Partitioning: Fixed Partitioning, Dynamic Partitioning, Buddy System, Relocation, Paging, Segmentation.

Virtual Memory: Hardware and Control Structures, Operating System Software.

Unit – V : Input / Output and File Management (08 hrs

I/O Management and Disk Scheduling: I/O Devices, Organization of the I/O Function, Operating System Design Issues, I/O Buffering, Disk Scheduling(FIFO, SSTF, SCAN, C-SCAN, LOOK, C-LOOK), Disk Cache.

File Management: Overview, File Organization and Access, File Directories, File Sharing, Record Blocking, Secondary Storage Management.

Unit – VI : The Linux Operating System (08 hrs)

Linux Design Principles, Linux Booting Process, Kernel Modules, Process Management, Scheduling, Memory Management, File Systems, Input and Output, Inter-process Communication.

CONTENTS

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Unit I

OVERVIEW OF OPERATING SYSTEM

1.1 INTRODUCTION

Operating Systems (OS) is an important part of any computer system. So, learning on OS is an essential part of computer science education. This field is undergoing rapid change as computers are now prevalent in virtually every application, like games, government and multinational firms.

An OS is an intermediary between the user of computer and computer hardware. The purpose of an OS is to provide an environment in which a user can execute programs in a convenient and efficient manner.

An OS is a program that manages the computer hardware. It also provides base for application program. Mainframe OS are designed primarily to optimize utilization of hardware personal computer (PC) operating system support complex games, business applications and everything in between, OS for handheld computers are designed to provide an environment in which a user can easily interface with computer to execute programs. Thus some OS are designed to convenient others to be efficient and others are combination of two.

1.1.1 Job of Operating Systems

- A computer system can be divided roughly into four components, the hardware, the operating system, the application programs and the users.

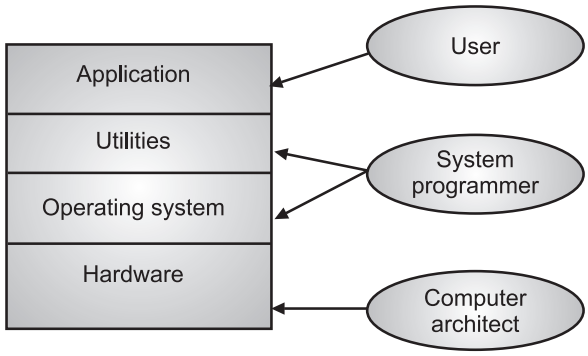


Fig. 1.1 : Functional layers in a computer system

- The above Fig. 1.1 shows the functional layers in operating system. The hardware, the CPU, memory and I/O devices, provides computing resources for the system.
- The application programs such as word processors, spread sheets, compilers and web browsers define the way in which these resources are used to solve users computing problems.

- The OS controls and co-ordinates the use of hardware among the various application programs for various users. We can also view a computer system as consisting of hardware, software and data. The OS provides the means for proper use of these resources in the operating of computer system.

1.1.2 Objectives and Functions of OS

Objectives of an Operating System

Main Objective of an operating system program is to:

- **Convenient to Use:** OS must be convenient for computing by lowering down the complexity of manual tasks.
- **Efficient:** OS must use all the resources very efficiently which will save users valuable time and money.
- **Ability to Evolve:** OS must have ability to evolve to adopt new changes without affecting the previous version functionalities.

Functions of OS

(1) Operating System a Resource Manager

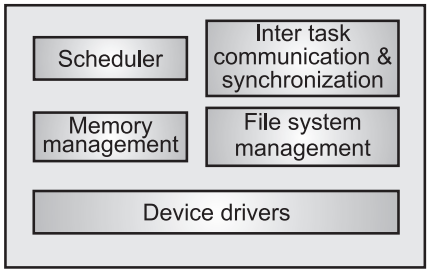
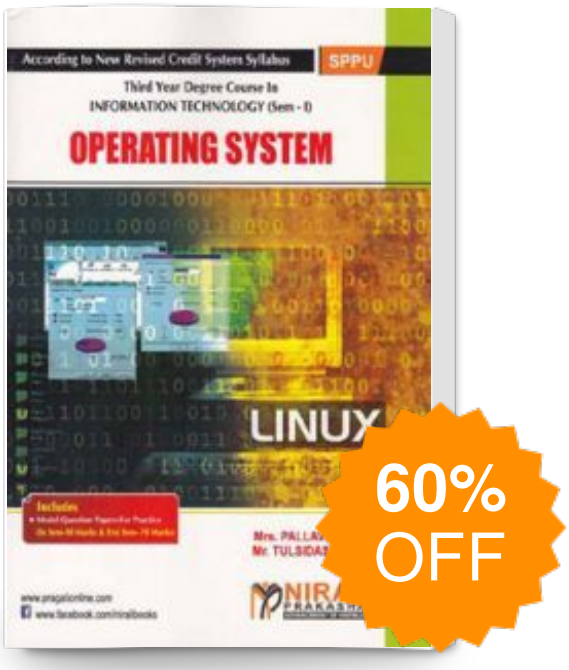


Fig. 1.2

- Computer system has three critical resources CPU, memory and input/output devices. An OS can be viewed as resource allocator or resource manager.
- A computer system is set of resources for the movement storage and processing of data and for the control of these functions. The OS acts as manager of these resources and allocate them to specific programs.
- The OS functions as ordinary computer software i.e. it is a program or a set of program executed by the processor. The OS directs the processor in the use of system resources.
- The processor is resource and OS decides how much processor time should be given for the execution of particular user program.
- The allocation of another resource, main memory is controlled jointly by OS and memory management hardware in the processor.
- The OS decides when an I/O device can be used by the program. It controls access to and use of files. An OS is control program.

Operating System



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