SAMRAT ASHOK TECHNOLOGICAL INSTITUTE

(Engineering College), Vidisha, MP
(An autonomous Institute Affiliated to RGPV, Bhopal)

COMPUTER SCIENCE & ENGINEERING

Course Evaluation Scheme & Syllabus

V SEM B.Tech.	Subject Code	Subject Name / Title	Maximum Marks Allotted						Contract Hrs.			Total Credits
			Theory			Practical						
			End Sem	Mid Sem Exam	Quiz/ Assign ment	End Sem	Lab Work & Sessional	Total Marks	L	T	P	
	CS-1851	Operating System	70	20	10	30	20	150	3	-	2	4

Prerequisites: Basic knowledge of computers, its components and programming skills

Course Objectives:

To understand operating system architecture and functioning along with in-depth knowledge of internals and working of OS modules like process management, Storage management, file system, security and protection

COURSE CONTENTS

UNIT I :

Overview-Introduction to Operating Systems, Evolution of Operating System mainframe, desktop, multiprocessor, Distributed, Network Operating System, and Clustered and Handheld System), Operating System Structure- Operating System Services and System Calls, System Programs. Types of Operating Systems: Batch Processing, Real Time, Multitasking and Multiprogramming, time-sharing system and Distributed Operating systems, Objectives and functions of OS .

UNIT II:

Process Management-Concept, Process Control Blocks (PCB), Process Scheduling.
Scheduling Criteria, Scheduling Algorithms and their evaluation. Threads Overview and Multithreading .

UNIT III:

Inter Processes Communication and Critical Section Problem and Solution-Semaphores and Monitors,Deadlock Characterization, Methods for deadlock handling, deadlock prevention, deadlock avoidance, deadlock detection and recovery from deadlock

UNIT-IV:

Storage Management-Memory Hierarchy, Concepts of memory management, MFT and MVT, logical and physical address space, swapping, contiguous and non- contiguous allocation, Paging and Segmentation Structure and Implementation of Page table, Virtual memory, Cache Memory Organization, Demand paging, Page replacement Algorithms. Thrashing, Demand segmentation

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Mr. Ajay Kumar Goyal Ms. Shaila Chugh Dr. Sunil Joshi Dr. Kanak Saxena

UNIT V:

File and Disk Management-File concepts, Access methods, Directory Structure, File Sharing and Protection, Free space management,Disk Scheduling, Efficiency and Performance- Case study on Unix, Linux and Windows.

References Books:

1. Peterson, J.L. &Silberschatz, A.: Operating System Concepts, Addison, Wesley-Reading.
2. Brinch, Hansen: Operating System Principles, Prentice Hall of India.
3. Haberman, A.N.: Introduction to Operating System Design Galgotia Publication, New Delhi.
4. Tanenbaum, A.S.: Operating Systems.
5. Hansen, P.B.: Architecture of Concurrent Programs, PHI.
6. Shaw, A.C.: Logic Design of Operating Systems, PHI.

Course Outcomes: The students would be able to

CO1: Explain the inherent mechanism involved in functioning of an operating system. Differentiate and justify the need of various operating systems.

CO2:Analyse various scheduling techniques with their comparisons .

CO3:Analyse various synchronisation techniques with their comparisons derive the solution for deadlock situation.

CO4: Describe memory management system of an operating system. Analyse and compare various management schemes.

CO5:Describe and Analyze File and Disk management Techniques.

COs and POs,PSOs Mapping:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	P08	PO9	PO10	PO11	PO12	PSO1	PSO2
CO-1		2			2							2	1	2
CO-2	2	3		2	1						1	2	3	3
CO-3	2	3	3	2								2	2	2
CO-4	2	2		2								2	3	3
CO-5	2	2	2									2	3	3

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	CS-1852	Compiler Design	70	20	10	30	20	150	3	-	2	4

Prerequisites: Basic knowledge in Theory of Computations. Experience with programming languages such as C/C++.

Course Objectives:

The purpose of the course is to give the participants knowledge of concepts and techniques required to implement and understand different phases of compiler design

COURSE CONTENTS

UNIT I:

Introduction to Compiler and Lexical Analysis: Introduction to Compiler, single and multi-pass compilers, Major data Structure in compiler, Overview and use of linker and loader, Interpreter and assembler, Bootstrapping, Role of Lexical Analyzer, Various Phases of Compiler, Input buffering, Regular expression, Finite automata, Specification and Recognition of tokens, LEX.

UNIT II:

Syntax Analysis And Parsing Techniques: Syntactic specification of programming languages: Context free grammars, derivation and parse trees, Ambiguous grammar, Introduction to Parsing and its techniques, Top-Down Parsing, Bottom Up Parsing, LR parsers(SLR, LALR, LR), Operator precedence parsing, Error Handling.

UNIT III:

Syntax Directed Translation & Intermediate Code Generation: Syntax-Directed Definitions, Construction of Syntax Trees, Bottom-Up Evaluation of S-Attributed Definitions, L-Attributed Definitions and Implementation of Syntax directed Translators, translation schemes.

Intermediate code and translation of assignment statements, Boolean expression and control structures, Postfix notation, Three address codes, quadruples, triples and indirect triples.

UNIT IV:

Run Time Environment and Storage Allocation: Storage organization, activation records, Storage allocation strategies, Access to Non local Names, Parameter passing, symbol table, data structure used for symbol table generation, dynamic storage allocation techniques.

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UNIT V:

Code Generation and Code Optimization: Global data flow analysis, Basic Block and Flow graphs, Directed Acyclic Graph, DAG representation of Basic Blocks, Back patching, Simple Code Generator, Issues in the design of Code generator, Local optimization, dead code elimination, Loop optimization, Peephole Optimization.

Reference Books:

1. Alfred Aho, Ravi Sethi, V.Jeffery Ullman D. "COMPILERS PRINCIPLES, TECHINQUES AND TOOLS ", Addison- Wesley, 1988.
2. Alfred V Aho, Jeffrey D. Ullman, "Principles of Compiler Design", Narosa pub.
3. Compiler construction (Theory and Practice), A.Barret William and R.M. Bates, Galgotia.
4. A. C. Holub, "Compiler Design in C", Prentice-Hall Inc., 1993.
5. Raghavan, "Compiler Design", TMH Pub

Course Outcomes: The students would be able to

CO1: Discuss fundamentals of language translator and compiler design.

CO2: Design algorithms for Parsers (Top-down and Bottom-Up).

CO3: Classify types of SDT and various intermediate code generation techniques.

CO4: Use techniques of symbol table organization, fundamentals of runtime environment and Code generation.

CO5: Apply various Code Optimization techniques for data flow analysis.

COs and POs,PSOs Mapping:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO-1	3	1	2		1							2	2	2
CO-2	1	2	3	2	3							2	2	2
CO-3	1	2	3	2									1	
CO-4	2	2	1	2								1	1	1
CO-5	2	3	2	2										

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	CS-1853	Analog and Digital Communication	70	20	10	30	20	150	3	-	2	4

Prerequisites: Knowledge of calculus**.**

Course Objectives:

Throughout the course, students will be expected to demonstrate their understanding of Analog and digital communication by being able to do each of the following:

A) To introduce the concepts of analogue communication systems.

B) To equip students with various issues related to analogue communication such as modulation, demodulation, transmitters and receivers and noise performance.

COURSE CONTENTS

UNIT I:

Signals Analysis: Review of Fourier Transformation, signal transformation and its properties through linear system, signal distortion in transmission, bandwidth and rise time, energy and power density and Parseval's theorem for energy and power signals, convolution &correlations.

UNIT II:

Linear Modulation: Necessity of modulation, principal of amplitude modulation generation and detection of DSB-SC, SSB-SC and VSB-SC, AM-LC, Comparison of various AM systems, FDM and TDM.

UNIT III:

Angle Modulation - Definition and relationship between PM ad FM frequency deviation, Bessel's function , spectrum and transmission BW of FM , NBFM,WBFM , phase diagram of FM signals in FM system s, comparison of AM and FM systems.

Digital Modulation: Block diagram of PCM system, Inter-symbol Interference, Compounding, Delta Modulation (DM), Limitation of DM, ADM, Comparison between PCM & DM, DPCM

UNIT IV:

Radio transmitter and receiver: Different type of AM and FM transmitters and receivers, AM and FM standard broadcast calculation of noise for signal and cascaded stages. Noise-performance of analog communication systems: SNR, Noise figure. Line Codes.

Data Transmission: Generation and Detection of ASK, FSK, PSK, DPSK, QPSK.

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UNIT V:

Information Theory: Unit of Information, Entropy, Rate of Information, Joint & Conditional Entropy, Mutual Information, Channel Capacity, Shawn's Theorem, Shannon Harder Theorem, Coding Efficiency, Shannon Fano Coding, Hoffman Coding, Blocks Codes.

Reference Books:

1. Taub and Schilling: Principles of Communication System, TMH.
2. Simon Haykin: Digital Communication, John Wiley.
3. J. G. Proakis: Digital Communications, MGH.
4. G. Kennedy: Electronic Communication System, TMH.

Course Outcomes: The students would be able to

CO-1: Explain the fundamentals of analog and digital Signals and Communication System

CO-2: Apply Fourier Transform to communication signals and derive the power spectral density of signals.

CO-3: Define, formulate and analyse various techniques for amplitude and angle modulation.

CO-4: Analyse different techniques for digital data transmission and analyse the performance of spread spectrum communication systems.

CO-5: Understand the fundamentals of Information Theory.

COs and POs,PSOs Mapping:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1	PO11	PO12	PSO1	PSO2
CO-1	2	1			2								2	
CO-2	3	2	2		1									
CO-3	2	3	1		1								1	2
CO-4	3	3	2	1	2								2	
CO-5	3	2	2	2	1								1	

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	CS-1854	Computer Graphics and Multimedia	70	20	10	-	-	100	3	1	-	4

Prerequisites: Basic Knowledge of Matrix, 2-dimensional & 3-dimensional concepts**.**

Course Objectives:

Throughout the course, students will be expected to demonstrate their understanding in Computer Graphics by being able to:

A) Understand the basic concepts of computer graphics and its applications.
B) Apply and analyze the algorithms to draw graphics output primitives.
C) Apply and create 2-D & 3-D transformation on various objects.

COURSE CONTENTS

UNIT I:

Basic of Computer Graphics, Applications of computer graphics, Display devices, Cathode Ray Tube, quality of phosphors, CRTs for color display, beam penetration CRT, The Shadow - Mask CRT, Direct View Storage Tube,LED and LCD. Graphics input devices, Graphics software and standards, Output primitives, attributes of output primitives, point and line style, color and intensity, Area filling algorithms, Scan line algorithm, boundary fill & flood fill algorithm, Antialiasing techniques.

UNIT II :

Line drawing- various algorithms and their comparison, circle generation - Bresenham's midpoint circle drawing algorithm, 2D transformation- Basic Transformations, Matrix Representation and Homogeneous Coordinates, translation, scaling, rotation, reflection, sheering, composite transformation, Window to view port transformation, line clipping algorithm; Cohen Sutherland, polygon clipping; Sutherland hodgman algorithm.

UNIT III:

Need for 3-Dimensional imaging, techniques for 3-Dimesional displaying, 3D transformation, projection and its types, Curve- parametric and non parametric functions, Bezier (Bernstein Polynomials) Curves, Cubic-Splines, B-Splines, Need for hidden surface removal, Back face detection, Z-buffer method, Painter's algorithm.

UNIT IV:

Shading Algorithms-Phong's shading model, Gouraud shading, Shadows and background, illumination, light sources, illumination methods (ambient, diffuse reflection, specular reflection), Color models: properties of light, XYZ, RGB, YIQ and CMY color models

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UNIT V: Multimedia systems-An introduction, multimedia hardware and architecture, Data and file format standard i.e. RTF, TIFF, MIDI, JPEG, MPEG, Video- AVI, 3GP, MOV, MPEG, Compression standards, Multimedia Authoring.

Reference Books:-

1. Computer Graphics C Version, Donald Hearn & M. Pauline Baker , Pearson Education, New Delhi, 2004 (Chapters 1 to 12 except 10-9 to 10-22)
2. James D. Foley, Andries Van Dam, Steven K. Feiner, John F. Hughes, Computer Graphics- Principles and practice, Second Edition in C, Pearson Education, 2007.
3. OpenGL ES 3.0 Programming Guide 2nd Edition (English, Paperback, Budi Rijanto Purnomo, Dan Ginsburg), PEARSON.
4. Rogers, "Procedural elements of Computer Graphics", Tata McGraw Hill.
5. Parekh, "Principles if multimedia", Tata McGraw Hill.

Course Outcomes: The students would be able to:

CO-1: To understand the Graphics systems, its applications, hardware & software requirement.
CO-2: To apply scan conversion algorithms of various graphics output primitives.
CO-3: To understand the basic principles of homogeneous coordinate systems, 2-dimensional & 3-dimensional computer graphics systems.
CO-4: To create geometrical transformation on 2-dimensional & 3-dimensional objects.
CO-5: To apply window into viewport, clipping algorithms of graphics objects against a window.

COs and POs,PSOs Mapping:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1	PO11	PO12	PSO1	PSO2
CO1	2					2	2	1				3	1	
CO2	3		2	2	1	2	1	1				1	3	
CO3	3	3		2	2	2	2	2				2	2	1
CO4	3	3	2	3	3		3	1				1	2	1
CO5	2	3	2	2	3		2	3				2	3	

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	CS-1855(A)	Principle of Programming Language	70	20	10	-	-	100	3	-	-	3

Prerequisites: Knowledge of computer programming with any programming language like C/C++, Java.

Course Objectives:

To enable the students to understand the evolution of programming languages, different types of programming practices and programming languages and their distinctive features and applications, compilation basics, working and design principles of programming language constructs like data types, subprograms, blocks, control structures etc.

COURSE CONTENTS

UNIT I:

Language Evaluation Criteria, influences on Language design, Language categories, Programming Paradigms — Imperative, Object Oriented, functional Programming, Logic Programming. Programming Language Implementation — Compilation and Virtual Machines, programming environments. Issues in Language Translation: Syntax, Semantics, Stages, analysis and synthesis, Parse Tree, CFG and BNF grammar.

UNIT II:

Data types, Primitive, Character, user defined, array, associative, record, union, pointer and reference data types, design and implementation issues related to these data types. Names, Variable, concept of binding, type checking, strong typing, type compatibility, named constants, variable initialization. Sequence control with Expressions, Conditional Statements, Loops, Exception handling.

UNIT III:

Subprograms and Blocks: Fundamentals of sub-programs, Scope and lifetime of variable, static and dynamic scope, Design issues of subprograms and operations, local referencing environments, parameter passing methods, overloaded sub-programs, generic subprograms, design issues for functions overloaded operators, co routines.

UNIT IV:

Abstract Data types: Abstractions and encapsulation, introductions to data abstraction, Static and Stack-Based Storage management, heap based storage management. Garbage Collection, Concurrency: Subprogram level concurrency, semaphores, monitors, massage passing, Java threads, C++ threads.

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UNIT V:

Exception handling: Exceptions, exception Propagation, Exception handler in C++ and Java. Logic Programming Language: Introduction and overview of logic programming, basic elements of prolog, application of logic programming. Functional Programming Languages: Introduction, fundamentals. Introduction to 4GL.

Reference Books:

1. Sebesta,"Concept of programming Language", Pearson Edu.
2. Louden, "Programming Languages: Principles and Practices", Cengage Learning
3. Tucker, "Programming Languages: Principles and paradigms", Tata McGraw —Hill
4. Terrance W Pratt, "Programming Languages: Design and Implementation", Pearson Edu.
5. Cavlo Ghezziand Mehdi Jazayeri, "Programming Languages Concepts", Willey India
6. E Horowitz, "Programming Languages", 2nd Edition, Addison Wesley

Course Outcomes: The students would be able to:

CO1: Appreciate the difference between different types of programming practices and languages.
CO2: Apply appropriate programming technique and language for different types of problem solving.
CO3: Analyse, design and use different programming language constructs rightly.
CO4: Understand the implementation of programming languages.
CO5: Understand the Exception handling, Exceptions, exception Propagation

COs and POs,PSOs Mapping:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1	PO11	PO12	PSO1	PSO2
CO1	3	1					3		2		2		1	2
CO2	3	3	2		1			1		3		1	3	3
CO3	3	3		3		2					2		1	
CO4	3	1			2		2	1		1		2		1
CO5	2	3							1		1			1

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	CS-1855(B)	Information Storage and Management	70	20	10	-	-	100	3	-	-	3

Prerequisite: Knowledge of CSO and Operating system .

Course Objective:

A) Define backup, recovery, disaster recovery, business continuity, and replication.

B) Examine emerging technologies including IP-SAN.

C) Understand logical and physical components of a storage infrastructure.

D) Identify components of managing and monitoring the data center.

E) Define information security and identify different storage virtualization technologies.

COURSE CONTENTS

UNIT I:

Introduction to storage technology: Data proliferation, evolution of various storage technologies, Overview of storage infrastructure components, Information Lifecycle management, Data categorization, Data Centers, Storage Systems Architecture: Intelligent disk subsystems overview, Contrast of integrated vs modular array.

UNIT II:

Component architecture of intelligent disk subsystems, Disk physical structure component, properties, performance, and specifications, RAID implementations, techniques, and levels along with the impact of RAID on application performance . Parity algorithms, hot sparing, Front end to host storage provisioning, mapping and operation.

UNIT III:

Introduction to networked storage: JBOD, DAS, NAS, SAN, & CAS evolution and comparison. Applications', Elements, connectivity, standards, management, security and limitations of DAS, NAS, SAN, & CAS. Hybrid Storage solutions, Virtualization: memory, network, server, storage and appliances.

UNIT IV:

Data center concepts and requirements, Backup and disaster recovery, principles managing and monitoring, Industry management standards (SNMP, SMI-S, and CIM), standard framework applications, Key management metrics.

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UNIT V:

Information storage on cloud: Concept of cloud, Cloud computing storage on cloud, Cloud vocabulary, Architectural framework, cloud benefits, cloud computing evolution, Application and services on cloud, cloud service provides and models,Essential characteristics of cloud computing, cloud security and integration.

Reference Books:

1. G. Somasundaram & Alok Shrivastava (EMC Education Services) editors, Information Storage and management: Storing, managing, and protecting digital information, Wiley India.
2. Ulf Troppens, Wolfgang Mueller Friedt, Rainer Erkens, Rainer Wolafka, Nils Haustein,Storage network explained : Basic and application of fiber channels, SAN, NAS, iSESI, INFINIBAND and FCOE, wiley India.
3. John W. Rittinghouse and James F. Ransome, Cloud Computing: Implementation, management and security, CRC press, Taylor Frances Pub.
4. Nick Antonopoulos, Lee Gillam, cloud computing: Principles, System & Application, and Springer.

Course Outcomes: The students would be able to-

CO-1: Ability to identify key challenges in managing information and analyze different storage networking technologies and virtualization.

CO-2: Ability to understand components and the implementation of NAS.

CO-3: To understand CAS architecture and types of archives and forms of virtualization.

CO-4: To monitor the storage infrastructure and management activities.

CO-5: Explain and apply concept of cloud in information storage.

COs and POs,PSOs Mapping:

COs	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO_{12}	PSO1	PSO2
CO-1	2	1	2			2		1					2	1
CO-2	3	3		2			3				1		1	
CO-3		2	2		1							3		3
CO-4	2		1				2				2			1
CO-5	2	3				2							2	

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	CS-1855(C)	Numerical Methodology	70	20	10	-	-	100	3	-	-	3

Prerequisite: Engineering Mathematics.

Course Objectives:

A) To provide suitable and effective methods called Numerical Methods, for obtaining approximate representative numerical results of the problems.

B) To solve problems in the field of Applied Mathematics, Theoretical Physics and Engineering which requires computing of numerical results using certain raw data.

C) To solve complex mathematical problems using only simple arithmetic operations.

D) To deal with various topics like finding roots of equations, solving systems of linear algebraic equations, solution of matrix problems.

E) To facilitate numerical computing.

COURSE CONTENTS

UNIT I:

Approximation in numerical computation: Truncation and rounding errors, Fixed and floatingpoint arithmetic, Propagation of errors and corresponding programming.Interpolation: Newton forward/backward interpolation.

UNIT II:

Lagrange's and Newton's divided difference Interpolation and corresponding programming.Numerical integration: Trapezoidal rule, Simpson's 1/3 rule, Expression for corresponding error terms and corresponding programming.

UNIT III :

Numerical solution of a system of linear equations: Gauss elimination method, Matrix inversion, LU Factorization method. Gauss-Seidel iterative method and corresponding programming.

UNIT IV:

Numerical solution of Algebraic equation: Bisection method, Regula-Falsi method, NewtonRaphson method and corresponding programming.

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UNIT V:
Numerical solution of ordinary differential equation: Euler's method, Runge-Kutta methods, Predictor-Corrector Methods and Finite Difference method and corresponding programming.

Reference Books

1. C.Xavier: C Language and Numerical Methods.
2. Dutta & Jana: Introductory Numerical Analysis.
3. J.B.Scarborough: Numerical Mathematical Analysis.
4. Jain, Iyengar , & Jain: Numerical Methods (Problems and Solution).
5. Balagurusamy: Numerical Methods, Scitech

Course Outcomes:

CO-1: Apply Numerical analysis which has enormous application in the field of Science andsome fields of Engineering.
CO-2: Familiar with finite precision computation.
CO-3: Familiar with numerical solutions of nonlinear equations in a single variable.
CO-4: Familiar with numerical integration and differentiation, numerical solution of ordinary differential equations.
CO-5: Familiar with calculation and interpretation of errors in numerical method

COs and POs,PSOs Mapping:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1	PO11	PO12	PSO 1	PSO 2
CO-1	3	2											3	
CO-2	3	3			1		1			2			2	
CO-3	3	3	1		1		1			1		3		3
CO-4	3	3	2	1		1		1		1		1		3
CO-5	3	3							1		1	1	2	

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	CS-1856	Linux and Shell Programming	-	-	-	30	20	50	-	-	4	1

Prerequisites: Fundamentals of computer operations and programming

Course Objectives:

To provide in-depth knowledge to work with Linux Operating System so that students become capable to use Linux as open source software development platform.

COURSE CONTENTS

UNIT I:

Overview of Linux: What is Linux, Linux's Root in UNIX, Common Linux Features, Advantages of Linux, Overview of UNIX and LINUX Architectures, Linux File System, Hardware requirements for Linux.

UNIT II:

Linux File system: Logging in, getting familiar with Linux desktop, shell interface. Understanding Linux shell, using shell, types of Text editors, using vi editor, prompt character, correcting typing errors, simple shell commands-date, cal, who, tty, uname, passwd, be, echo, logging out, Environment variables, wildcard characters, absolute and relative path, listing. Files and directories commands, navigating file system-pwd, cd, mkdir, rmdir, ls, Handling or binary files, Basic file attributes- file, permissions, changing permissions.

UNIT III:

Processes and filters: Simple filters, head and tail, cut, paste, sort. uniq, tr, Regular expression, Grep utility, Shell command line, redirection, pipeline, split output, tree, and Process system, processes: internal and external commands, back ground process, premature termination of process, process priorities, process scheduling.

UNIT IV:

Shell programming: Interactive scripts, shell variables, assigning values to variables, positional parameters, command line arguments, arithmetic in shell script, exit, status of a command, sleep and wait, script termination.

UNIT V:

Decision taking,- if else, nested if, file tests, string tests, case control structure, Loop control, break, continue, logical operators and executing Script, Debugging a script, executing multiple scripts, System Administration: Configuration of Linux, Installation of Linux, Connecting to remote machines-ftp, telnet, Adding and removing users.

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Course Outcomes:

CO-1: Define the architecture of Linux operating system.
CO-2: Understanding and use of Linux system commands, tools and utilities.
CO-3: Implement Knowledge of shell programming.
CO-4: Ability to use different open source software in Linux environment.

Reference Books :

1. Venkatesh Murthy, "Introduction to Unix andShell", Pearson Edu.
2. Forouzan, "Unix and Shell Programming", Cengage Learning.
3. Sumitab Das, "Unix Concept and Application", TMH.
4. Gopalan, Shivaselvan, "Beginners Guide to Unix", PHI Learning
5. Venkatesh wavle, "Linux Programming Tools Unveiled", B S Publication.
6. Richard Peterson, "Linux Complete Reference", TMH.
7. Richard Peterson, "Unix Complete Reference", TMH.

COs and POs,PSOs Mapping:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1	PO11	PO12	PSO1	PSO2
CO1	1	1	2		2								1	2
CO2	3	2	2		2								1	2
CO3	2	1	2		2								1	2
CO4	2	1	2		2									2

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