SCHEME AND SYLLABI
of
TWO YEAR POST GRADUATE PROGRAMME
M.SC.
in
COMPUTER SCIENCE

WITH EFFECT FROM THE
SESSION 2025-26

Chaudhary Bansi Lal University,
Prem Nagar-127031
Bhiwani
HARYANA, INDIA

Structure for Two Year Post Graduate Programme

	Scheme	Semester	Courses				Total Credits
			Core Courses	Elective Courses	Dissertation/ Project work/ Apprenticeship /internship etc.	Value Added Course/ Employability & Entrepreneurship Skills Course	
First Year (Semester I and II) of 2 years PG program (NHEQF level6)							
	PG	I	CC- 1 4 Credits CC- 2 4 Credits CC- 3 4 Credits CC- 4 4 Credits	DEC-1 4 credits		--	20
	PG	II	CC- 5 4 Credits CC- 6 4 Credits CC- 7 4 Credits CC- 8 4 Credits	DEC-2 4 credits		IKS/OEC 2 credits	22
Second Year (Semester III and IV) of 2 year PG program (NHEQF level 6.5) (For UTD and affiliated colleges)							
Option I	PG-I	III	CC-9 4 Credits CC-10 4 Credits CC-11 4 Credits	DEC-3 4 Credits DEC-4 4 Credits		EEC 2 Credits	22
	PG-I	IV	CC-12 4 Credits CC-13 4 Credits	DEC-5 4 Credits DEC-6 4 Credits DEC-7 4 Credits			20
Option II: When a student opts for Dissertation / Project Work / Internship/ Research Work/ Apprenticeship/ Field work etc.							
Option II	PG-II	III	CC-9 4 Credits CC-10 4 Credits CC-11 4 Credits	DEC-3 4 Credits DEC-4 4 Credits		EEC 2 Credits	22
	PG-II	IV		DEC-5 4 Credits DEC-6 4 Credits	12 Credits		20

Scheme and Syllabus of Two Year Post Graduate Programme M.Sc. in Computer Science w.e.f. 2025-26

Courses	Nomenclature of Course	Course Code	Credits Distribution			Total Credits	Total Contact Hours			Marks				Total Marks
			L	T	P		L	T	P	Theory		Practical		
										Internal	External	Internal	External	
SEMESTER-I														
CC-1 @ 4 credits	Mathematical Foundation of Computing	25MCS101	4	0	0	4	4	0	0	30	70	-	-	100
CC-2 @ 4 credits	Data Structure using C	25MCS102	3	0	1	4	3	0	2	20	50	10	20	100
CC-3 @ 4 credits	Database Management System	25MCS103	3	0	1	4	3	0	2	20	50	10	20	100
CC-4@ 4 credits	Fundamental of Web Designing	25MCS104	3	0	1	4	3	0	2	20	50	10	20	100
PC-1@ 3 credits	Office Automation Tools	25MCS105	0	0	3	3	0	0	6	-	-	20	50	70
Any one of the following														
DEC-1 @ 4 credits	Computer Architecture and Organization	25MCS106	4	0	0	4	4	0	0	30	70	-	-	100
	Design and Analysis of Algorithms	25MCS107	4	0	0	4	4	0	0	30	70	-	-	100
SEMESTER-II														
CC-5 @ 4 credits	Operating Systems	25MCS201	3	0	1	4	3	0	2	20	50	10	20	100
CC-6 @ 4 credits	Object Oriented Programming using C++	25MCS202	3	0	1	4	3	0	2	20	50	10	20	100
CC-7 @ 4 credits	Computer Networking	25MCS203	4	0	0	4	4	0	0	30	70	-	-	100
CC-8 @ 4 credits	Artificial Intelligence	25MCS204	4	0	0	4	4	0	0	30	70	-	-	100
PC-2@ 3 credits	Programming in MATLAB	25MCS205	0	0	3	3	0	0	6	-	-	20	50	70
Any one of the following														
DEC-2 @ 4 credits	Data Mining	25MCS206	4	0	0	4	4	0	0	30	70	-	-	100
	Linux Administration	25MCS207	4	0	0	4	4	0	0	30	70	-	-	100
IKS/OEC @2 credits	Indian Knowledge System in Computer Science	25MCS208	2	0	0	2	2	0	0	15	35	-	-	50
SEMESTER-III (for option I and II)														
CC-9 @ 4 credits	Python Programming	25MCS301	3	0	1	4	3	0	2	20	50	10	20	100
CC-10 @ 4 credits	Software Engineering	25MCS302	4	0	0	4	4	0	0	30	70	-	-	100
CC-11 @ 4 credits	Computer Graphics	25MCS303	3	0	1	4	3	0	2	20	50	10	20	100

Semester-2

Name of the Course (CC5) (3 credits)	OPERATING SYSTEM AND UNIX	Course Code	25MCS201
Maximum Marks	Theory: 20(Internal)+50(External)=70	Time of Examination	3 Hours

Note: Examiner will set seven questions and the candidates will be required to attempt four questions in all. Question number one will be compulsory containing four short answer type questions from all sections. Further, examiner will set two questions from each section and the candidates will be required to attempt one question from each Section. All questions will carry equal marks.

Course Outcomes

- Be able to understanding basic operating system fundamentals
- Know how an operating system can be used as a service
- Familiarity with Linux programming concepts
- Have a foundation stone to understand working of operating systems

Section – I

Operating systems overview: Operating systems as an extended machine & resource manager, operating systems classification; Operating systems and system calls; Operating systems architecture. **Process Management functions:** Process model, hierarchies, and implementation; process states and transitions; multi-programming, multi-tasking, multi-threading; level of schedulers and scheduling algorithms, inter-process communication.

Section-II

Memory Management and Virtual Memory: Logical versus Physical Address Space, Swapping, Contiguous Allocation, Paging, Segmentation, Segmentation with Paging, Demand Paging, Performance of Demanding Paging, Page Replacement, Page Replacement Algorithm, Allocation of Frames, Thrashing. Interrupt handlers, disk scheduling.

Section-III

File management functions: file naming, structure, types, access mechanisms, attributes and operations; directory structures and directory operations; file space allocations; file sharing, file locking symbolic links; file protection and security: distributed file systems.

Concurrent programming: sequential and concurrent process; critical code section, mutual exclusion problem; classical process coordination problems; deadlock handling.

References:

1. M.J. Bach "Design of UNIX O.S. ", Prentice Hall of India.
2. Y.Kanetkar "Unix shell programming", BPB Pub.Tenenbaum: Modern Operating Systems, Prentice-Hall.
3. Silberschatz, Galvin, Gagne, "Operating System Concepts", 8th Edition, John Wiley & Sons Inc.
4. Peterson, James L: Operating System Concepts, Addison Wesley Publ. &Silberschatz Comp.
5. Deitel, H.M.: An Introduction to Operating System, Addison Wesley Publ. Comp.

Semester-2

Name of the Course (CC6) (3 credits)	OBJECT ORIENTED PROGRAMMING USING C++	Course Code	25MCS202
Maximum Marks	Theory: 20(Internal)+50(External)=70	Time of Examination	3 Hours

Note: Examiner will set seven questions and the candidates will be required to attempt four questions in all. Question number one will be compulsory containing four short answer type questions from all sections. Further, examiner will set two questions from each section and the candidates will be required to attempt one question from each Section. All questions will carry equal marks.

Course Learning Outcomes (CLO):

- Write C++ programs using classes and objects,
- Develop C++ programs using constructors.
- Implement Inheritance in C++.
- Implement Polymorphism in C++.
- Develop C++ programs to perform file operations.

Section – I

Object Oriented Programming Concepts: Procedural Language and Object Oriented approach. Characteristics of OOP: Objects, classes, Encapsulation, Data Abstraction, Inheritance, Polymorphism, Dynamic Binding, Message Passing. Structure of C++ program: Data-types, Variables, Static Variables, Operators in C++, Arrays, Strings, Structure, Functions, Recursion, Control Statements, Classes: Class, object, Memory Allocation for Objects, memory layout of objects, private, public, protected member functions, static members.

Section-II

Constructors: Features, types, dynamic constructor, Parameterized constructors; destructors. Memory management: Dynamic Memory allocation: new, delete, Object Creation at Run Time; This Pointer, Inheritance: Derived Class and Base Class, Different types of Inheritance, Overriding member function, Public and Private Inheritance, Ambiguity in Multiple inheritance, Virtual Inheritance, Abstract Class.

Section-III

Polymorphism: Definition, operator overloading, Overloading Unary and Binary Operators, Function overloading, Virtual function, Friend function, Static function. Exception handling: Throwing, Catching, Re-throwing an exception, specifying exceptions; processing unexpected exceptions; Exceptions when handling exceptions, resource capture and release. Templates: Introduction; Class templates; Function templates; Overloading of template function, namespaces.

References:

1. Herbert Schildts : C++ - The Complete Reference, Tata McGraw Hill Publications.
2. Balaguru Swamy : C++, Tata McGraw Hill Publications.
3. Balaguruswamy : Object Oriented Programming and C++, TMH.
4. Shah & Thakker : Programming in C++, ISTE/EXCEL.
5. Johnston : C++ Programming Today, PHI.
6. Olshevsky : Revolutionary Guide to Object Oriented Programming Using C++, SPD/WROX.

Semester-2

Name of the Course (CC7) (4 credits)	DATA COMMUNICATION AND COMPUTER NETWORKS	Course Code	25MCS203
Maximum Marks	Theory: 30(Internal)+70(External)=100	Time of Examination	3 Hours

Note:
Examiner will set nine questions and the candidates will be required to attempt five questions in all. Question number one will be compulsory containing seven short answer type questions from all sections. Further, examiner will set two questions from each section and the candidates will be required to attempt one question from each Section. All questions will carry equal marks.

Course Learning Outcomes (CLO):

- Familiar with the basic Networking Protocols
- Be able to understand some of the Communication Techniques
- Detailed understanding of Various Layers in OSI and TCP/IP reference models

Section – I

Introduction to Computer Network: Types of Networks, Network Topologies, OSI and TCP/IP Reference Models; Comparison of Models. Data Communications Concepts: Digital Vs. Analog communication; Parallel and Serial Communication; Synchronous, Asynchronous and Isochronous Communication; Communication modes: simplex, half duplex, full duplex; Multiplexing; Transmission media: Wired-Twisted pair, Coaxial cable, Optical Fibre, Wireless transmission: Terrestrial, Microwave, Satellite, Infra red.

Section-II

Communication Switching Techniques: Circuit Switching, Message Switching, Packet Switching. Data Link Layer Fundamentals: Framing, Basics of Error Detection, Forward Error Correction, Cyclic Redundancy Check codes for Error Detection, Flow Control. Media Access Protocols: ALOHA, Carrier Sense Multiple Access (CSMA), CSMA with Collision Detection (CSMA/CD), Token Ring, Token Bus.

Section-III

High-Speed LAN: Standard Ethernet, Fast Ethernet, Gigabit Ethernet, 10G; Wireless LANs: IEEE 802.11, Bluetooth. Network Layer: IP Addressing and Routing, Network Layer Protocols: IPv4 (Header Format and Services), ARP, ICMP (Error Reporting and Query message); IPv6 (Header Format and Addressing).

Section-IV

Transport Layer: Process-to-Process Delivery: UDP, TCP; Connection Management by TCP; Basics of Congestion Control. Application Layer: Domain Name System (DNS); SMTP; HTTP; WWW. Network Security: Security Requirements and attacks; Cryptography: Symmetric Key (DES, AES), Public Key Cryptography (RSA); Firewall

References:

1. B. Muthukumaran, "Introduction to High Performance Networks", Vijay Nicole Imprints.
2. Wayne Tomasi, "Introduction to Data Communications and Networking", Pearson Education.
3. James F. Kurose, Keith W. Ross, "Computer Networking, A Top-Down Approach Featuring the Internet", Pearson Education.
4. Andrew S. Tanenbaum, "Computer Networks", Pearson Education.
5. Mahbub Hassan, Raj Jain, "High Performance TCP/IP Networking, Concepts, Issues, and Solutions", Pearson Education.
6. Andrew S. Tanenbaum, Marten Van Steen, "Distributed Systems-Principles & Paradigms", Pearson Education.

Semester- 2

Name of the Course (CC 8) (4 credits)	ARTIFICIAL INTELLIGENCE	Course Code	25MCS204
Maximum Marks	Theory: 30(Internal)+70(External)=100	Time of Examination	03 Hours

Note:
Examiner will set nine questions and the candidates will be required to attempt five questions in all. Question number one will be compulsory containing four short answer type questions from all sections. Further, examiner will set two questions from each section and the candidates will be required to attempt one question from each Section. All questions will carry equal marks.

Course Learning Outcomes (CLO):

- Ability to develop a basic understanding of AI building blocks presented in intelligent agents.
- Ability to choose an appropriate problem solving method and knowledge representation technique.
- Ability to analyze the strength and weaknesses of AI approaches to knowledge– intensive problem solving.
- Ability to design models for reasoning with uncertainty as well as the use of unreliable information.

Section-I

Introduction: Introduction to Artificial Intelligence, various definitions of AI, AI Applications and Techniques, Turing Test and Reasoning - forward & backward chaining. Introduction to Intelligent Agents, Rational Agent, their structure, reflex, model-based, goal-based, and utility-based agents, behaviour and environment in which a particular agent operates.

Section-II

Problem Solving and Search Techniques: State space search, Problem Characteristics, Production Systems, Control Strategies, Breadth First Search, Depth First Search, iterative deepening, uniform cost search, Hill climbing and its Variations, simulated annealing, genetic algorithm search; Heuristics Search Techniques: Best First Search, A* algorithm, AO* algorithm, Minmax & game trees, refining minmax, Alpha – Beta pruning, Constraint Satisfaction Problem, Means-End Analysis.

Section-III

Reasoning with Uncertain Knowledge: Different types of uncertainty - degree of belief and degree of truth, various probability constructs - prior probability, conditional probability, probability axioms, probability distributions, Bayes' rule, other approaches to modelling uncertainty such as Dempster-Shafer theory.

Fuzzy logic: Definition, Difference between Boolean and Fuzzy logic, fuzzy subset, fuzzy membership function, fuzzy expert system, Inference process for fuzzy expert system, fuzzy controller

Section-IV

Expert system development life cycle: Problem selection, Prototype construction, Formalization, Implementation, Evaluation, Knowledge acquisition: Knowledge engineer, Cognitive behavior, Acquisition techniques. Knowledge representation: Level of representation, Knowledge representation schemes, Formal logic, Inference Engine, Semantic net, Frame, Scripts.

References:

1. Rich Elaine and Knight Kevin: Artificial Intelligence, Tata McGraw Hill.
2. TaniMoto: Introduction to AI using LISP.
3. Patterson: Artificial Intelligence and Expert Systems.
4. SangalRajeev: LISP Programming, Tata McGraw Hill.
5. Balagurusamy: Artificial Intelligence & Technology.
6. Mishkoff, Henry C: Understanding Artificial Intelligence, BPB Publ.

Semester-2

Name of the Course (PC2) (3 credits)	PROGRAMMING IN MATLAB	Course Code	25MCS205
Maximum Marks	Practical: 20(Internal)+50(External)=70		

Course Learning Outcomes (CLO):

- Ability to find importance of this software for Lab Experimentation.
- In-depth knowledge of providing virtual instruments on MATLAB Environment.
- Articulate importance of software's in research by simulation work.

Section-I

Introduction to MATLAB programming, Basic of MATLAB programming, Variables and assignments, data types, operators, working with numbers, mathematical operations, functions, good programming style, commands, M-files, Introduction to Vectors in MATLAB: Vector types, referencing the elements of vector, Matrix generations, Array operations and Linear Equations

Section-II

; Introduction to programming in Matlab: M-File scripts, M-File functions, Colon notations; Introduction to Matrices in Matlab:defining Matrix, Matrix functions, Vector operations, Matrix operations; Looping and Decision Making: for loops, while loop, branching and nesting, if statement, if-else statement, else-if statement.

Section-III

Subroutine, built in function and user defined functions, handling functions in m-files; Data Files: Data import and data output, read/write, Plotting and Graphics in MATLAB: Polar plot, 2D and 3D plots, mesh, contour, Algebra, Optimization, Numerical Integration, Numerical Differentiation, solving polynomial equations, Introduction to SIMULINK.

References:

1. Amos Gilat, MATLAB: An Introduction With Applications 5ed, Wiley, ISBM13: 978-1118629864
2. Krister Ahlersten, An Introduction to Matlab, Bookboon.com, ISBN:978-87-403-0283-7
3. Stephen J. Chapman,MATLAB Programming for Engineers, Cengage Learning, 2015

Semester- 2

Name of the Course (DEC-2) (4 credits)	DATA MINING	Course Code	25MCS206
Maximum Marks	Theory: 30(Internal)+70(External)=100	Time of Examination	3 Hours

Note:
Examiner will set nine questions and the candidates will be required to attempt five questions in all. Question number one will be compulsory containing seven short answer type questions from all sections. Further, examiner will set two questions from each section and the candidates will be required to attempt one question from each Section. All questions will carry equal marks.

Course Learning Outcomes (CLO):

- Implement different data mining techniques on the pre-processed data set for extracting hidden patterns from data.
- Identify appropriate data mining algorithms to solve real world problems
- Compare and evaluate different data mining techniques like classification, prediction, clustering and association rule mining

Section-I

Introduction to Data Mining: Scope of Data Mining, working of data mining, Predictive Modelling on Data Mining, and Architecture for Data Mining, Profitable Applications of Data Mining, Data Mining Tools

Business Intelligence: Introduction, Business Intelligence, Business Intelligence tools, Business Intelligence Infrastructure, Business Intelligence Applications, BI versus Data Warehouse, BI versus Data Mining, Future of BI.

Section-II

Data Pre-processing: Data Pre-processing Overview, Data Cleaning, Data Integration and Transformation, Data Reduction, Discretization and Concept Hierarchy Generation.

Data Mining Techniques- An Overview: Introduction of Data Mining, Techniques, Data Mining Versus Database Management System, Data Mining Techniques- Association rules, Classification, Regression, Clustering, Neural networks.

Section -III

Clustering: Introduction of Clustering, Cluster Analysis, Clustering Methods- K means, Hierarchical clustering, Agglomerative clustering, Divisive clustering, clustering and segmentation software, evaluating clusters.

Web Mining: Terminologies, Categories of Web Mining – Web Content Mining, Web Structure Mining, Web Usage Mining, Applications of Web Mining, and Agent based and Data base approaches, Web mining Software

Section-IV

Applications of Data mining: Business Applications Using Data Mining- Risk management and targeted marketing, Customer profiles and feature construction, Medical applications (diabetic screening), Scientific Applications using Data Mining, Other Applications

References:

1. Jiawei Han & MichelineKamber: Data Mining - Concepts & Techniques, Harcourt India PVT Ltd. (Morgan Kaufmann Publishers)..
2. I.H. Whiffen: Data Mining, Practical Machine Cearing tools & techniques with Java (Morgan Kanffmen)
3. A.K. Pujari: Data Mining Techniques, University Press.
4. Pieter Adriaans Dolf Zantinge: Data Mining, Addition Wesley.
5. David Hand, HeikkiMannila, and Padhraic Smyth: Principles of Data Mining, PHI Publication.

Semester- 2

Name of the Course (DEC-2) (4 credits)	LINUX ADMINISTRATION	Course Code	25MCS207
Maximum Marks	Theory: 30(Internal)+70(External)=100	Time of Examination	3 Hours

Note:
Examiner will set nine questions and the candidates will be required to attempt five questions in all. Question number one will be compulsory containing seven short answer type questions from all sections. Further, examiner will set two questions from each section and the candidates will be required to attempt one question from each Section. All questions will carry equal marks.

Course Learning Outcomes (CLO):

- Learner will be able to develop Linux based systems and maintain. Learner will be able to install appropriate service on Linux server as per requirement. Learner will have proficiency in Linux server administration.

Section-I

Linux Utilities - File handling utilities, Security by file permissions, Process utilities, Disk utilities, Networking commands, Filters, Text processing utilities and Backup utilities, Operation, Addresses, Commands, Applications, awk- Execution, Fields and Records, Scripts, Operation, Patterns, Actions, Associative Arrays, String and Mathematical functions, System commands in awk, Applications. Shell programming with Bourne again shell(bash) - Introduction, shell responsibilities, pipes and Redirection, here documents, running a shell script, the shell as a programming language, shell meta characters, file name substitution, shell variables, command substitution, shell commands, the environment, quoting, test command, control structures, arithmetic in shell, shell script examples, interrupt processing, functions, debugging shell scripts.

Section-II

Files and Directories- File Concept, File types, File System Structure, file metadata-Inodes, kernel support for files, system calls for file I/O operations- open, create, read, write, close, lseek, dup2, file status information-stat family, file and record locking-lockf and fcntl functions, file permissions - chmod, fchmod, file ownership-chown, lchown, fchown, links soft links and hard links – symlink, link, unlink.

Directories - Creating, removing and changing Directories-mkdir, rmdir, chdir, obtaining current working directory-getcwd, Directory contents, Scanning Directories- opendir, readdir, closedir, rewinddir, seekdir, telldir functions.

Section -III

Process – Process concept, Kernel support for process, process identification, process hierarchy, process states, process control - process creation, waiting for a process, process termination, zombie process, orphan process, system call interface for process management-fork, vfork, exit, wait, waitpid, exec family, system, I/O redirection Signals – Introduction to signals, Signal generation and handling, Kernel support for signals, Signal function, unreliable signals, reliable signals, kill, raise , alarm, pause, abort, sleep functions.

Section-IV

Shared Memory- Kernel support for shared memory, APIs for shared memory, shared memory example. Sockets- Introduction to Berkeley Sockets, IPC over a network, Client-Server model, Socket address structures (Unix domain and Internet domain), Socket system calls for connection oriented protocol and connectionless protocol, example-client/server programs-Single Server-Client connection, Multiple simultaneous clients, Comparison of IPC mechanisms.

References:

1. UNIX: Concepts and techniques, S. Das, Tata McGraw-Hill,
2. Linux Administration: A Beginner's Guide, Fifth Edition, Wale Soyinka, Tata McGraw-Hill
3. Linux: Complete Reference, 6th Edition, Richard Petersen, Tata McGraw-Hill
4. Linux System Programming, Robert Love, O'Reilly, SPD, rp-2007

Semester- 2

Name of the Course (IKS/OEC) (2 credits)	INDIAN KNOWLEDGE SYSTEM IN COMPUTER SCIENCE	Course Code	25MCS207
Maximum Marks	Theory: 15 (Internal)+ 35 (External)=50	Time of Examination	2 Hours

Note:
Examiner will set five questions and the candidates will be required to attempt three questions in all. Question number one will be compulsory containing seven short answer type questions from all sections. Further, examiner will set two questions from each section and the candidates will be required to attempt one question from each Section. All questions will carry equal marks.

Course Learning Outcomes (CLO):
After the course the students

- Would become familiar with the contribution of India in the domain.
- would know about Indians who have contributed significantly to the domain.
- would become familiar with the research and development ecosystem that exists in India in computer science.

Section-I

Contribution of Indians to Computation : Invention of Zero, Decimal and Binary Number System, Fibonacci Series and Golden Ratio and their history, biography of Indians and their contribution to Computer Science

Section-II

Ecosystem for Computer Science in India: Indian IT industry and its contribution to Computer Science, Introduction to R&D entities in India and their contribution to computer science.

References:

1. The Aryabhatiya of Aryabhata: An Ancient Indian Work on Mathematics and Astronomy, Walter Eugene Clark, Kessinger Pub Co, ISBN-10: 1425485995
2. Number Words and Number Symbols: A Cultural History of Numbers, Karl Menninger, Dover Publications, 1992
3. Carl B. Boyer, Uta C. Merzbach Boyer, C. B. History of Mathematics. Wiley; 2nd edition
4. D. Knuth. The Art of Computer Programming. Volume 2, 3rd Ed. Addison–Wesley. pp. 194–213, "Positional Number Systems"

Semester-2

Name of the Course (1 credits)	PRACTICAL (BASED ON 25MCS201)	Course Code	25MCS201P
Maximum Marks	Practical: 10 (Internal)+20(External)=30		

Course Learning Outcomes (CLO):

CO1: Knowledge of Basic fundamentals of operating system and UNIX Commands
CO2: Able to write scripts and working with shell programming in UNIX Type Operating system.

List of Practical:

1. Getting started with UNIX / Linux: a) Basic Commands for login and logout, b) Change password, c) Shutdown or rebooting system
2. Commands for Basic Utilities: a) Calendar, Help, command manual, b) date & time, current user status, knowing present working directory
3. Commands for Directories & File listing
4. Commands for identifying UNIX shell - Listing the shell variables - Changing the shell - Path setting - Setting Prompt variable Contents Tasks List Description
5. Commands for File Management
6. Commands for Directory Management
7. Commands to change file and directory access permissions
8. Using Pipes & filters & meta characters
9. Command to deal with processes - Listing of processes - Running foreground & background processes - Stopping processes
10. Commands for communication - Pinging another computer in the network
11. Commands for vi editor - Open and closing, Operation modes, editing, navigation, copying text, searching

Semester-2

Name of the Course (1 credits)	PRACTICAL (BASED ON 25MCS202)	Course Code	25MCS202P
Maximum Marks	Practical: 10(Internal)+20(External)=30		

List of Practical:

1. Write programs to evaluate any expression using Input / Output functions
2. Write programs to demonstrate use of Implicit type casting and Explicit type casting
3. Write programs to show use of classes and objects to define the function inside the class
4. Write programs to implement inline function
5. Write programs to implement friend function using Two different classes and External function.
6. Write programs to create array of object.
7. Write programs to implement Static data member and Static member function.
8. Write programs for Default constructor, Parameterized constructor, Copy constructor, Multiple constructor in one class
9. Write programs to implement multiple inheritance
10. Write programs to implement hierarchical inheritance
11. Write programs which show the use of constructors in derived class
12. Write programs to implement virtual base class.
13. Write programs to overload unary operator using Member function and Friend function.
14. Write programs to copy the content of one file into another file using formatted input/output functions
15. Write file programs to implement sequential input and output operations on file