PEA305:ANALYTICAL SKILLS-I

L:2 T:1 P:0 Credits:3

Course Outcomes: Through this course students should be able to

CO1 :: demonstrate procedural fluency with number system and mathematical operations to solve the stated problems.

CO2 :: select an appropriate approach to solve problems related to percentage, profit and loss.

CO3 :: observe the data given and interpret given number and alphanumeric series

CO4 :: apply the analytical concepts learnt to solve the questions of ratio and proportion

CO5 :: use the concepts of permutation, combination and probability to handle various problems.

CO6 :: analyze the reasoning aptitude problems such as blood relation and direction sense to solve related problems.

Unit I

Number system : HCF & LCM, divisibility rules, classification of numbers, factors, factorials, unit digit calculation, remainder properties

Simplification and approximation : BODMAS rule, calculation and approximation based on percentage, problem based on digit sum

Average : basic average calculations, average increase and decrease, weighted average

Unit II

Percentage : basic percentage calculations, percentage to fraction, percentage comparison, percentage increase and decrease, population change in percentage

Profit loss discount : basic concepts of cost price selling price and marked price, calculations of profit and loss percentage, types of discount and discount percentages, comparison of profit or loss with discount percentage

Simple and compound interest : basic concepts of interest calculations, comparison of simple and compound interest

Unit III

Logical reasoning : number series with introduction of AP and GP, alphabet series, alphabet test, coding and decoding, language coding

Unit IV

Ratio and proportions : basic concepts of ratio and proportions and ages, problems based on ratio and proportions and ages, problems based on partnerships and profit sharing

Alligation and mixtures : conceptual knowledge of alligation and mixtures, problems based on alligation and mixtures

Unit V

Permutation : basic principle of counting, numerical permutation(formation of numbers and sum of numbers), alpha permutation(rearrangement of words and rank of a word), linear and circular permutation, logical permutation

Combination : basic formulas of combination, formation of committee, combination of identical objects

Probability : concept of probability, classification of events, conditional probability, problems based on coins dices and cards

Unit VI

Analytical reasoning : blood relations, direction sense test

Text Books:

1. QUANTITATIVE APTITUDE FOR COMPETITIVE EXAMINATIONS by DR.R.S. AGGARWAL, S Chand Publishing

2. A MODERN APPROACH TO VERBAL AND NON-VERBAL REASONING by DR. R.S. AGGARWAL, S Chand Publishing

References:

1. MAGICAL BOOK ON QUICKER MATHS by M.TYRA, BANKING SERVICE CHRONICLE

2. MAGICAL BOOK SERIES ANALYTICAL REASONING by M.K. PANDEY, BANKING SERVICE CHRONICLE

INT249:SYSTEM ADMINISTRATION

L:2 T:0 P:2 Credits:3

Course Outcomes: Through this course students should be able to

CO1 :: discuss the installation process of windows server and virtual environment

CO2 :: administer the basic server configurations and perform implementation of storage solutions

CO3 :: apply server hardening techniques

CO4 :: enumerate the process of managing, permissions and storage in linux

CO5 :: examine different files, directories, kernel modules and boot process

CO6 :: analyze devices, networks and packages in linux operating system

Unit I

Installing Windows Server : prepare an installation plan, prepare the server hardware, set up the server hardware, install an operating system

Configuring Network : manage network cabling, configure network interface cards, implement IP addressing and network infrastructure services

Creating a Virtual Environment : create virtual servers, create virtual switches

Unit II

Performing Basic Server Configuration : configure local server properties, configure server roles, set up IP addressing service roles

Administering the Server : update the server, server administration access and control methods, create service level agreements, monitor server performance

Implementing Storage Solutions : perform capacity planning, deploy primary storage devices, storage technologies, configure RAID

Unit III

Securing The Server : configure firewalls, configure security protocols, implement intrusion detection systems, implement logical access control methods, implement data security models, apply server hardening techniques, implement physical security, create virtual networks

Unit IV

Performing Basic Linux Tasks : identify linux design philosophy, enter shell commands, get help with linux

Managing Users and Groups : assume superuser privileges, create, modify and delete users, create, modify and delete groups, query users and groups, configure account profiles

Managing Permissions and Ownership : modify file and directory permissions, modify file and directory ownership, configure special permissions and attributes, troubleshoot permissions issues

Managing Storage : create partitions, manage logical volumes, mount file systems, manage file systems, navigate the linux directory structure

Unit V

Managing Files and Directories : create and edit text files, search for files, perform operations on files and directories, process text files, manipulate file output, explore the linux kernel, install and configure kernel modules, monitor kernel modules

Managing the Linux Boot Process : configure linux boot components, configure GRUB2

Managing Kernel Modules : explore the linux kernel, install and configure kernel modules, monitor kernel modules

Unit VI

Managing Devices : identify the types of linux devices, configure devices, monitor devices, troubleshoot hardware issues

Managing Networking : identify TCP/IP fundamentals, identify linux server roles, connect to a network, configure DHCP and DNS client services, configure cloud and virtualization technologies, troubleshoot networking issues

List of Practicals / Experiments:

Setup virtual environment
- installation of virtual workstation

Installation of windows server
- install operating system, setup server hardware, configure network

Server configuration
- configure server roles,setup IP addressing service roles,adminstering the server, manage storage solutions

Server hardening
- configure firewall,server hardening techniques,physical security,create virtual network

Working with linux
- shell commands,manage users, groups,permissions,storage

Linux file and directories
- Linux file and directories

Manage components
- install and configure kernel modules, monitor modules, boot components, configuring GRUB2

Manage devices, networks in linux
- monitor and troubleshoot hardware issues, configure DHCP and DNS client services

Text Books:

1. COMPTIA SERVER+ STUDY GUIDE by T MCMILLAN, SYBEX

2. COMPTIA LINUX+ STUDY GUIDE by CHRISTINE BRESNAHAN, SYBEX

References:

1. COMPTIA LINUX+ CERTIFICATION ALL-IN-ONE EXAM GUIDE: EXAM XK0-004 by TED JORDAN, MC GRAW HILL

INT242:CYBER SECURITY ESSENTIALS

L:2 T:0 P:2   Credits:3

Course Outcomes: Through this course students should be able to

CO1 :: illustrate the concept of information security, threats and vulnerabilities

CO2 :: define the basic concept of cryptography and authentication control

CO3 :: discuss the security appliances and protocols to secure the networks

CO4 :: analyze how to secure the mobile system and application concept

CO5 :: examine the procedures for incident response, cyber security and physical security

CO6 :: apply the port scanning, socket creation and web crawling using python programming

Unit I

Security roles and security controls : information security roles, security control and framework types, threat actor types and attack Vectors, Threat Intelligence Sources.

Performing security assessments : assess organizational security with network reconnaissance tools, security concerns with general vulnerability types, vulnerability scanning techniques, penetration testing concepts

Social engineering and malware : social engineering techniques, indicators of malware-based attacks

Unit II

Basic cryptographic concepts : cryptographic ciphers, cryptographic modes of operation, summarize cryptographic use cases and weaknesses, cryptographic technologies, digital certificates and certificate authorities, PKI management

Authentication controls : authentication design concepts, knowledge-based authentication, authentication technologies, biometrics authentication concepts

Unit III

Secure network designs and protocols : secure network designs, secure switching and routing, secure wireless infrastructure, load balancers, network operations protocols, application protocols, remote access protocols

Network security appliances : firewalls and proxy servers, network security monitoring, use of SIEM

Unit IV

Secure mobile solutions : mobile device management, secure mobile device connections

Secure application concepts : indicators of application attacks, indicators of web application attacks, secure coding practices, secure script environments, deployment and automation concepts

Data privacy and protection concepts : privacy and data sensitivity concepts, privacy and data protection controls

Unit V

Incident response : incident response procedures, utilize appropriate data sources for incident response, apply mitigation controls

Cyber security Resilience : redundancy strategies, implement backup strategies, cyber security resiliency strategies, physical site security controls, physical host security controls

Unit VI

Network security programming with python : introduction to python and working on linux, windows, raw socket basics, socket libraries and functionality, programming server and clients, port scanner program in python, identifying live host over a network using python, creating backdoor using python, web crawler program in python, wireless packet sniffer in python

List of Practicals / Experiments:

Setup virtual environment

- Installation of Virtual Workstation (VMware/VirtualBox), Installing a guest OS

Performing basic network commands

- ping, ifconfig,ipconfig, route, netstat,nslookup,tracert/traceroute/pathping,arp, mtr

Performing Reconnaissance and Discovery Tools

- Open Source Intelligence (OSINT) information gathering, theHarvester,shodan

Identifying Port Scanning Threats

- port scanning, service discovery, version detection using nmap and Advanced IP scanner

Conducting Security Analysis

- Use of Netcat for establish connection with remote machines, backdoor, port scanning and fingerprinting

Capturing Network Traffic

- Capturing and monitoring network data with Wireshark

Evaluating security threats

- Social Engineering attacks using SEToolkit, password attacks using hashcat, identifying threats toDNS using nslookup

Cryptographic Ciphers

- Demonstration: RSA ciphertext generation.

Network Security

- Configuring firewall parameters in windows , iptables in linux.Configuration of ACL using Cisco Packet Tracer on routers.Divide large network into subnets by using subnetting and implement in Cisco Packet tracer.

Web Application Attack

- Sqlmap tool of linux to show the real execution of SQL injection on vulnerable website: www.testphp.vulnweb.com

Text Books: 1. INTRODUCTION TO COMPUTER NETWORKS AND CYBERSECURITY by CHWAN-HWA (JOHN) WU, J. DAVID IRWIN, CRC PRESS

References: 1. COMPTIA SECURITY+ STUDY GUIDE: EXAM SY0-601, 8TH EDITION by MIKE CHAPPLE, DAVID SEIDL, WILEY

CSE408:DESIGN AND ANALYSIS OF ALGORITHMS

L:3 T:0 P:0   Credits:3

Course Outcomes: Through this course students should be able to

CO1 :: Understand the basic techniques of analyzing the algorithms using space and time complexity, asymptotic notations

CO2 :: apply the various string matching algorithms

CO3 :: Analyze the divide and conquer algorithm design technique using various problems

CO4 :: Evaluate the various dynamic programming and greedy algorithm design technique to solve various problems

CO5 :: Apply the Approximation Algorithm to solve some classic problems and design technique.

CO6 :: Define intractability (NP-completeness) and understand to solve the optimization problems

Unit I

Foundations of Algorithm : Analysis of algorithm: History and Motivation, A Scientific Approach, Example: Quicksort, Introductions to "big-oh" notation and asymptotic analysis, Recurrence relations : Computing Values, Telescoping, Types of Recurrences, Mergesort , Master Theorem, Overview of generating functions: Ordinary Generating Functions, Counting with Generating Functions, Catalan Numbers, Solving Recurrences, Exponential Generating Functions. Asymptotics: Standard Scale, Manipulating Expansions, Asymptotic of Finite Sums, Asymptotic of Finite Sums., Trees: Trees and Forests, Binary Search Trees, Path Length, Other Types of Trees.

Unit II

String and its Matching Algorithms : Strings and Tries: Bit strings with Restrictions , Languages, Tries, Trie Parameters Key pattern matching concepts: Suffix Tree , Suffix Array, Knuth-Morris-Pratt algorithm

Unit III

Divide and Conquer Technique : What Are Divide and Conquer Algorithms? Max Subarray Problem Using Divide and Conquer, Karatsuba's Multiplication Algorithm , FFT Part 1: Introduction and Complex Numbers,FFT Definition and Interpretation of Discrete Fourier Transforms, FFT: Divide and Conquer Algorithm for FFT, Application # 1 : Fast Polynomial Multiplication using FFT ,Application # 2: Data Analysis using FFT

Unit IV

Dynamic Programming and Greedy Techniques : Introduction to Dynamic Programming + Rod Cutting Problem, Coin Changing Problem, Knapsack Problem, When Optimal Substructure Fails, Dynamic Programming: Longest Common Subsequence, Memorization, Coin Changing Problem. Introduction to Greedy Algorithms ,Greedy Interval Scheduling, Prefix Codes, Huffman Codes, Huffman Codes: Proof of Optimality

Unit V

Approximation Algorithms : Introduction to Approximation Algorithms,: Introduction to Job shop Scheduling and Algorithm Design, Analysis of Job shop Scheduling, Approximation Algorithms for Vertex Cover and their Analysis, Approximation Algorithms for the Maximum Satisfiability Problem, Travelling Salesman Problem and Approximation Schemes: Introduction to TSP and its applications, NP-Hardness of TSPs, Hardness of Approximating General TSPs

Unit VI

Introduction to intractability (NP-completeness) and solving optimization problems. : Decision Problems and Languages, Polynomial Time Problems, NP Definition, NP Completeness and Reductions ,NP Complete Problems: Examples, Computation and Physics ,Qubits and Operations, Bell's Inequality, Grover's Search Algorithm

Text Books:

1. INTRODUCTION TO THE DESIGN AND ANALYSIS OF ALGORITHM by ANANY LEVITIN, PEARSON

2. INTRODUCTION TO THE DESIGN AND ANALYSIS OF ALGORITHM by ANANY LEVITIN, PEARSON

References:

1. INTRODUCTION TO ALGORITHMS by C.E. LEISERSON, R.L. RIVEST AND C. STEIN, THOMAS TELFORD LTD.

References:

2. THE DESIGN AND ANALYSIS OF COMPUTER ALGORITHMS by A.V.AHO, J.E. HOPCROFT AND J.D.ULLMAN, PEARSON

3. COMPUTER ALGORITHMS - INTRODUCTION TO DESIGN AND ANALYSIS by SARA BAASE AND ALLEN VAN GELDER, PEARSON

4. FUNDAMENTALS OF COMPUTER ALGORITHMS by HOROWITZ, S. SAHNI, GALGOTIA PUBLICATIONS

CSE325:OPERATING SYSTEMS LABORATORY

L:0   T:0   P:2   Credits:1

Course Outcomes: Through this course students should be able to

CO1 :: gain a comprehensive introduction to the Linux operating system, including basic commands, system calls, and file management operations, enabling them to work effectively in a Linux environment.

CO2 :: develop skills in shell programming, including handling variables, standard input/output redirection, shell arithmetic, and flow control, enhancing their ability to write efficient shell scripts.

CO3 :: perform file and directory management using system calls, allowing them to manipulate files, directories, and their attributes programmatically.

CO4 :: gain hands-on experience in implementing and managing threads and concurrency mechanisms.

CO5 :: demonstrate the ability to implement and use synchronization mechanisms such as semaphores and mutexes.

CO6 :: use inter-process communication techniques such as pipes, popen, pclose, shared memory and message passing to facilitate data exchange and synchronization between processes.

List of Practicals / Experiments:

Process creation and threading

- Creating processes
- Creating Threads
- Process duplication using fork()
- Creating threads using pthread
- Environment variables
- Replacing process image using execlp

Inter-process communication

- Pipes, popen and pclose functions
- Stream pipes, passing file descriptors
- Shared memory
- Message passing
- Remote Procedure calls

Introduction to Linux

- Basic Linux Commands: ls, cat, man, cd, touch, cp, mv, rmdir, mkdir, rm, chmod, pwd
- System Calls: Read, Write, Open
- Lseek

Synchronization

- Synchronization with Mutexes
- Synchronization with semaphores
- Race Condition

shell programming

- variables

- standard input/output redirection
- shell arithmetic
- flow control and decision making

File and directory management using system calls
- File related system calls (open, read, write, lseek, close)
- Directory related system calls (opendir, readdir, closedir etc)

Text Books:

1. BEGINING LINUX PROGRAMMING by NEIL MATHEW & RICHARD STONES, WILEY

References:

1. OPERATING SYSTEM CONCEPTS by ABRAHAM SILBERSCHATZ, GALVIN, WILEY

2. UNIX CONCEPTS AND APPLICATIONS by SUMITABHA DAS, Tata McGraw Hill, India

CSE316:OPERATING SYSTEMS

L:3 T:0 P:0   Credits:3

Course Outcomes: Through this course students should be able to

CO1 :: understand the role, functionality and layering of the system software components

CO2 :: use system calls for managing processes, memory and the file system

CO3 :: Analyze important algorithms eg. process scheduling and memory management algorithms

CO4 :: use and outline the various security measures that ensure threat free operation of a system

CO5 :: apply various operations on processes, threads and analyze methods to synchronize their execution to avoid deadlock

CO6 :: simulate inter-process communication techniques like message passing and shared memory

Unit I

Introduction to Operating System : Operating System Meaning, Supervisor & User Mode, Multiprogramming and Multiprocessing System, OS structure, system calls, functions of OS, evolution of OSs

Process Management : Process Concept , Life Cycle, PCB, Operations on Processes, Co-operating and Independent Processes, Process states, Operations on processes, Process management in UNIX, Process control box

Unit II

CPU Scheduling : Types of Scheduling, Scheduling Algorithms, Scheduling criteria, CPU scheduler - preemptive and non preemptive, Dispatcher, First come first serve, Shortest job first, Round robin, Priority, Multi level feedback queue, multiprocessor scheduling, real time scheduling, thread scheduling

Unit III

Process Synchronization : Critical Section Problem, Semaphores, Concurrent processes, Co-operating processes, Precedence graph, Hierarchy of processes, Monitors, Dining Philosopher Problem, Reader-writer Problem, Producer consumer problem, classical two process and n-process solutions, hardware primitives for synchronization

Threads : Overview, Multithreading Models, scheduler activations, examples of threaded programs

Unit IV

Deadlock : Deadlock Characterization, Handling of deadlocks- Deadlock Prevention, Deadlock Avoidance & Detection, Deadlock Recovery, Starvation

Protection and Security : Need for Security, Security Vulnerability like Buffer overflow, Trapdoors, Backdoors, cache poisoning etc, Authentication-Password based Authentication, Password Maintenance & Secure Communication, Application Security - Virus, Program Threats, Goals of protection, Principles of protection, Domain of protection, Access matrix, Implementation of access matrix, System and network threats, Examples of attacks

Unit V

Memory Management : Logical & Physical Address Space, Swapping, Contiguous Memory allocation, Paging, Segmentation, Page replacement algorithms, Segmentation - simple, multi-level and with paging, Page interrupt fault, Fragmentation - internal and external, Schemes - Paging - simple and multi level, Overlays - swapping, Virtual memory concept, Demand paging

Unit VI

File Management : File Concepts, Access methods, Directory Structure, File System Mounting and Sharing, Protection, Allocation methods, Free-Space Management, Directory Implementation

Device management : Dedicated, shared and virtual devices, Serial access and direct access devices, Disk scheduling methods, Direct Access Storage Devices – Channels and Control Units

Inter process communication : Introduction to IPC (Inter process communication) Methods, Pipes - popen and pclose functions, Shared memory, FIFOs, Message queues

Text Books:

1. OPERATING SYSTEM CONCEPTS by ABRAHAM SILBERSCHATZ, PETER B. GALVIN, GERG GAGNE, WILEY

References:

References: 1. DESIGN OF THE UNIX OPERATING SYSTEM by MAURICE J. BACH, Pearson Education India

2. REAL-TIME SYSTEMS by JANE W. S. LIU, Pearson Education India

CSE310:PROGRAMMING IN JAVA

L:3 T:0 P:2 Credits:4

Course Outcomes: Through this course students should be able to

CO1 :: explain basic constructs of Java programming and apply them to solve the real-world problems

CO2 :: Illustrate the Object-oriented programming principles to write efficient and reusable codes.

CO3 :: demonstrate the concept of inheritance to reuse and extend the features of existing class with access control

CO4 :: contrast the uses of abstract classes, interfaces and Lambda expressions

CO5 :: use of exception handling and input/output techniques to improve the robustness and reliability of Java applications

CO6 :: integrate collections and generics to ensure clean, robust, and maintainable Java code

Unit I

Introduction to Java : History and Features of Java, Java program structure, Writing simple Java class and main() method, Command-line arguments, Understanding JDK, JRE and JVM

Data In the Cart : Using primitive data types, Type conversion, Keywords, Identifiers, Variables, Access modifiers, static keyword, Wrapper class

Operators : Working with Bit-wise, arithmetic, logical, and relational operators, Unary, assignment and Ternary operator, Operator precedence

Conditional Statements : Using if/else constructs and switch-case statements

Unit II

Loops : Working with for loop, while loop, do-while loop and for-each loop

Arrays and Enums : Fundamentals about Arrays, Multi-dimensional arrays, Array Access and Iterations, Using varargs, Enumerations

OOP Concepts : Basics of class and objects, Writing constructors and methods, Overloading methods and constructors, this keyword, initializer blocks

String Class : Constructors and methods of String and String Builder class

Unit III

Inheritance and Polymorphism : Inheritance, Method overriding, super keyword, Object class and overriding toString() and equals() method, Using super and final keywords, instanceof operator

Abstract Class and Interface : Abstract method and abstract class, Interfaces, static and default methods, Using Swing Components to demonstrate inheritance

Unit IV

Functional Interface and Lambda Expressions : Using Lambda expressions, Implementing Threads using Lambda expressions, Implementing Listener using Lambda expressions

Nested Class : Understanding the importance of static and non-static nested classes, Local and Anonymous class

Utility Classes : Working with Dates

Unit V

Exceptions and Assertions : Exception overview, Exception class hierarchy and exception types, Propagation of exceptions, Using try, catch and finally for exception handling, Usage of throw and throws, handling multiple exceptions using multi-catch, Autoclose resources with try-with resources statement, Creating custom exceptions, Testing invariants by using assertions

I/O Fundamentals : Describing the basics of input and output in Java, Read and write data from the console, Using streams to read and write files, Writing and read objects using serialization

Unit VI

Collections and Generics : Creating a custom generic class, Using the type inference diamond to create an object, Using bounded types and Wild Cards, Creating a collection by using generics, Implementing an ArrayList, Implementing TreeSet using Comparable and Comparator interfaces, Implementing a HashMap, Implementing a Deque

List of Practicals / Experiments:

Exception Handling
- Program to demonstrate the use of all the keywords used for exception handling and need of assertion

Multithreading
- Program to implement multithreading using Lambda Expressions.

Creating a Java Main Class
- Program to implement a java class.

Managing Multiple Items
- Program to demonstrate the use of list of items.

Describing Objects and Classes
- Program to demonstrate the instantiation of class and accessing the attributes using object of class.

Manipulating and Formatting the Data in Your Program
- Program to demonstrate the uses of String and StringBuilder

Using Inheritance
- Program to demonstrate the inheritance and its importance using Swing Components.

Overriding Methods, Polymorphism, and Static Classes
- Program to implement polymorphism and using proper access control.

Abstract and Nested Classes
- Program to demonstrate the use of abstract class and nested class.

Java IO
- Program to implement read and write operation using console and File.

Text Books:
    1. PROGRAMMING WITH JAVA: A PRIMER, 4E by E. BALAGURUSAMY, MCGRAW HILL EDUCATION

References:
    1. INTRODUCTION TO JAVA PROGRAMMING by Y. DANIEL LIANG, PEARSON

    2. JAVA THE COMPLETE REFERENCE by HERBERT SCHILDT, MCGRAW HILL EDUCATION