Visvesvaraya Technological University, Belagavi
(State University of Government of Karnataka Established as per the VTU Act, 1994)
Centre for Distance and Online Education (VTU-CDOE)

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Scheme and Syllabus

Postgraduate Diploma in Software Testing

Visvesvaraya Technological University, Belagavi
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SEMESTER-I

Sl. No	Code	Course Name	Credit
1	OPGDST101	Programming Using C	5
2	OPGDST102	Database Management System	5
3	OPGDST103	Computer Organization	5
4	OPGDST104	DBMS Lab	2
5	OPGDST105	C Programming Lab	3
TOTAL			20

SEMESTER-II

Sl. No	Code	Course Name	Credit
1	OPGDST201	Data Structures Using C++	5
2	OPGDST202	Python Programming	5
3	OPGDST203	Software Engineering	5
4	OPGDST204	Data Structures Lab	2
5	OPGDST205	Python Lab	3
TOTAL			20

SEMESTER-III

Sl. No	Code	Course Name	Credit
1	OPGDST301	Unix Programming	5
2	OPGDST302	Java Programming	5
3	OPGDST303	Computer Networks	5
4	OPGDST304	Java Programming Lab	2
5	OPGDST305	Mini-Project	3
TOTAL			20

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SEMESTER-IV

Sl. No	Code	Course Name	Credit
1	OPGDST401	Project Work	10
2	OPGDST402	Software Testing	5
3	OPGDST403X	Elective - I	5

Elective -I		
Sl. No	Course Code	Course Name
1	OPGDST403A	Object Oriented Modelling & Design
2	OPGDST403B	Agile Methodology
3	OPGDST403C	Web Programming

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Course	Programming in C	Semester	I
Course Code	OPGDST101	CIE Marks	30
Credits	05	SIE Marks	70

MODULE 1

Introduction to programming – definitions and developing Algorithms and flowcharts for simple programs. Introduction to C Programming: Origin and history of c programming character set, Identifiers and keywords data types, constants, variables, operators, special operators, constants, Expressions, compound statements, structure of C program, Input and output function

MODULE 2

C Statements – selection statements – if nested if's, the if-else –if ladder the conditional expressions, switch statement nested switch statements, iteration statements – the for loop, for loop variations, the while loop, the do-while loop, declaring variable with in selection and iteration statements, jump statement, the return statement, the go to submit, break statement, exit ( ) function, the continue statement, expression statement. Block statements.

MODULE 3

Arrays – Array what is an array? – Array Declaration, Array Initialization – Accessing individual elements of an array – Two Dimensional Arrays – Multi Dimensional Array, Passing an array element to a function – Rules of using an array. What are strings? String I/O, string Manipulation.

MODULE 4

Functions – The General Form of a Function, Math functions, elements of function, function categories, types of functions, Function Arguments Call by value, Call by Reference, return statement. Uses of functions. C pre – processor, storage classes – Automatic – Register, Static and external. Pointers – definition, pointer variables, pointer expressions, arithmetic pointers, pointers and arrays, initializing pointers and functions and problems with pointers.

MODULE 5

Structures – definition, accessing structure members, structure assignments, array of structures, passing structures, structure pointers, uses of structures Unions – definitions, difference between structure and union, type def. Files – introduction to streams and files, basics of files – file pointer, opening and closing files, writing and reading character, file functions.

Recommended Text and Reference Books:

1. Let Us C by Yashwanth Kanethar.

2. "Programming in ANSI C" by E. Balaguruswamy.

3. Complete Reference of C++ by Herbert Schilde.

Course outcomes :

CO1: Describe the C Programming language which includes the structure of a C program, Tokens, Expressions, Operators etc.

CO2: Demonstrate conditional and iterative statements to write C programs.

CO3: Construct the C programs that use pointers to access arrays and strings.

CO4: Illustrate the user defined functions to solve real time problems.

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Course	Database Management System	Semester	I
Course Code	OPGDST102	CIE Marks	30
Credits	05	SIE Marks	70

MODULE 1
Introduction: Characteristics of Database approach, Actors on the Scene, Workers behind the scene, Advantages of using DBMS approach, Data models, schemas and instances, Three -schema architecture and data independence, Database languages and interfaces, the database system environment, Centralized and client -server architectures, Classification of Database Management systems, Entity-Relationship Model: Conceptual Database using high level conceptual data models for Database Design, A Sample Database Application, Entity types, Entity sets Attributes and Keys Relationship types, Relationship Sets, Roles and Structural Constraints Weak Entity Types.

MODULE 2
Relational Model Relational Model and Relational Algebra: Relational Model Concepts, Relational Model Constraints and Relational Database Schema Update Operations, Transactions and Dealing with Constraint violations, Unary Relational operations, Relational Algebra Operations from Set Theory, Binary Relational Operations, JOIN and DIVISION, Additional Relational Operations, Examples of Queries in Relational Algebra Relational Database Design Using ER-to Relational Mapping .

MODULE 3
Introduction to SQL: Overview of the SQL Query Language, SQL Data Definition, Basic structure of SQL Queries, Additional Basic Operations, Null values, Aggregate Functions, nested Sub queries, Modification of the Database, Join Expressions, Views, Transactions, Integrity Constraints, SQL Data Types and Schemas, Authorization.

MODULE 4
Database Design: Informal Design Guidelines for Relation Schemas, Functional Dependencies, Normal Forms based on Primary Keys, General Definitions of 2nd and 3rd Normal Forms, Boyce Codd Normal Forms, Stored Procedures and functions, Triggers.

MODULE 5
Transaction Management: Transaction Concept, A Simple Transaction Model, Transaction Atomicity and Durability, Serializability, Transaction Isolation and Atomicity, Transaction Isolation Levels, Implementation of Isolation Levels. Concurrency Control: Lock Based Protocols, Deadlock Handling. Recovery System: Failure Classification, Storage, Recovery and Atomicity, Recovery Algorithm.

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Recommended Text and Reference Books:
1. RamezElmasri, Shamkant B. Navathe, Fundamentals of Database Systems ,7th Edition, Pearson Education, 2017
2. Silberschatz, Korth and Sudharshan Data base System Concepts,6th Edition, Tata McGraw Hill, 2011.

Course Outcomes:

CO1: Figure out the concepts of database objects, enforce integrity constraints on a database using RDBMS.

CO2: Demonstrate Structured Query Language (SQL) for database manipulation and also the basic of query evaluation.

CO3: Develop application to interact with databases, relational algebra expression,

CO4: Construct an application using tuple and domain relation expression from queries.

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Course	Computer Organization	Semester	I
Course Code	OPGDST103	CIE Marks	30
Credits	05	SIE Marks	70

MODULE 1

Basic Functional units of Computers: Functional units, basic Operational concepts, Bus structures. Software, Performance, Multiprocessors, Multicomputer. Data Representation: Signed number representation, fixed and floating point Representations. Computer Arithmetic: Addition and subtraction, multiplication Algorithms, Division Algorithms. Error detection and correction codes.

MODULE 2

Register Transfer Language and Micro Operations: RTL- Registers, Register transfers, Bus and memory transfers. Micro operations: Arithmetic, Logic, and Shift micro operations, Arithmetic logic shift unit. Basic Computer Organization and Design: Computer Registers, Computer instructions, Instruction cycle. Instruction codes, Timing and Control, Types of Instructions: Memory Reference Instructions, Input – Output and Interrupt.

MODULE 3

Central Processing Unit organization: General Register Organization, Stack organization, Instruction formats, Addressing modes, Data Transfer and Manipulation, Program Control, CISC and RISC processors Control unit design: Design approaches, Control memory, Address sequencing, micro program example, design of CU. Micro Programmed Control.

MODULE 4

Memory Organization: Semiconductor Memory Technologies, Memory hierarchy, Interleaving, MainMemory-RAM and ROM chips, Address map, Associative memory-Hardware organization. Match logic. Cache memory-size vs. block size, Mapping functions-Associate, Direct, Set Associative mapping. Replacement algorithms, write policies. Auxiliary memory Magnetic tapes etc

MODULE 5

Input –Output Organization: Peripheral devices, Input-output subsystems, I/O device interface, I/O Processor, I/O transfers–Program controlled, Interrupt driven, and DMA, interrupts and exceptions. I/O device interfaces – SCII, USB Pipelining and Vector Processing: Basic concepts, Instruction level Parallelism Throughput and Speedup, Pipeline hazards.

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Recommended Text and Reference Books:
1. Computer Organization – Carl Hamacher, Zvonks Vranesic, SafeaZaky, Vth Edition, McGraw Hill.
2. Computer Systems Architecture – M.Moris Mano, IIIrd Edition, Pearson/PHI.

Course Outcome (CO):

CO1: Understand the Basics of Digital System

CO2: Understand the Basics of Computer System Organization

CO3: Apply the concepts of the number system in Designing Digital System.

CO4: Analyze the need of Logic circuits in digital system

CO5: Create logic circuits for real time requirement

Course	DBMS Lab	Semester	I
Course Code	OPGDST104	CIE Marks	70
Credits	02	SIE Marks	30

1. Students should be allowed to choose appropriate DBMS software, install it, configure it and start working on it. Create sample tables, execute some queries, use SQLPLUS features, Use PL/SQL features like cursors on sample database. Students should be permitted to practice appropriate User interface creation tool and Report generation tool.

2. A college consists of number of employees working in different departments. In this context, create two tables' employee and department. Employee consists of columns empno, empname, basic, hra, da, deductions, gross, net, date-of-birth. The calculation of hra,da are as per the rules of the college. 1. Create tables department and employee with required constraints. 2. Initially only the few columns (essential) are to be added. Add the remaining columns separately by using appropriate SQL command 3. Basic column should not be null 4. Add constraint that basic should not be less than 5000. 5. Calculate hra,da,gross and net by using PL/SQL program.

3. Students may be divided into batches and the following experiments may be given to them to better understand the DBMS concepts. Students should gather the required information, draw ER diagrams, map them to tables, normalize, create tables, triggers, procedures, execute queries, create user interfaces, and generate reports.

- Student information system
- KSRTC reservation system
- Hostel management
- Library management
- Indian Railways reservation

Course	C Programming Lab	Semester	I
Course Code	OPGDST105	CIE Marks	30
Credits	03	SIE Marks	70

1. Write a C program to find roots of a Quadratic equation.

2 Write a C program to find the total no. of digits and the sum of individual digits of a positive integer.

3 Write a C program to generate the Fibonacci sequence of first N numbers.

4 Write a C program to compute Sin(x) using Taylor series approximation given by $Sin(x) = x - x3\ 3! + x5\ 5! - x7\ 7! + \ldots$ Compare output of the program with the built-in Library function. Print both the results with appropriate messages.

5 Write a C program to arrange the elements of an integer array using Bubble Sort algorithm.

6 Write a C program to search for an element in an array using Binary Search algorithm and print appropriate message.

7 Write a C program to input two matrices and perform matrix multiplication on them.

8. Write a C program to check whether the given string is palindrome or not without using Library functions.

9 Write a C program to count the number of lines, words and characters in a given text.

10 Write a C program to generate Prime numbers in a given range using user defined function.

11 Write a C program to find factorial of a given number using recursive function.

Course outcome (Course Skill Set)
At the end of the course the student will be able to:
CO1: Make use of IDE for programming, identify and correct the syntax and syntactic errors using various programming constructs.
CO2: Demonstrate use of functions, recursive functions, arrays, strings, structures and pointers in problem solving.
CO3: Design and development of C programs to implement different searching and sorting techniques.

Course outcomes (Course Skill Set):

At the end of the course the student will be able to:

CO1: Design entity-relationship diagrams to solve given database applications.

CO2: Implement a database schema for a given problem.

CO3: Formulate SQL queries in Oracle for the given problem.

CO4: Design and Develop suitable database and verify for its appropriate normalization for any given problem.

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Course	Data Structures Using C++	Semester	II
Course Code	OPGDST201	CIE Marks	30
Credits	05	SIE Marks	70

MODULE 1

Introduction to Data Structure and its Characteristics Array Representation of single and multidimensional arrays; Sparse arrays – lower and upper triangular matrices and Tri-diagonal matrices with Vector Representation.

MODULE 2

Stacks and Queues

Introduction and primitive operations on stack; Stack application; Infix, postfix, prefix expressions; Evaluation of postfix expression; Conversion between prefix, infix and postfix, introduction and primitive operation on queues, D- queues and priority queues.

MODULE 3

Lists

Introduction to linked lists; Sequential and linked lists, operations such as traversal, insertion, deletion searching, two way lists.

MODULE 4

Trees

Introduction and terminology; Traversal of binary trees; Recursive algorithms for tree operations such as traversal, insertion, deletion; Binary Search Tree

MODULE 5

Graphs

Graph terminology, Representation of graphs, path matrix, BFS (breadth first search), DFS (depth first search), topological sorting, Warshall's algorithm (shortest path algorithm.)

Course outcomes:
CO 1 : Identify different types of data structures, operations and algorithms
CO 2: Illustrate searching and sorting operations on files
CO 3:Demonstrate the working of stack, Queue, Lists, Trees and Graphs in problem solving & implement all data structures in a high-level language for problem solving

Suggested Learning Resources: Books
1. Adam Drozdek, "Data Structures and Algorithms in C++", 2013, Fourth Edition, Cengage Learning
2. Bhushan Trivedi, "Programming with ANSI C++", Oxford Press, Second Edition, 2012.
3. Balagurusamy E, Object Oriented Programming with C++, Tata McGraw Hill Education Pvt.Ltd , Fourth Edition 2010.
4. R.S. Salaria, " Data Structures & Algorithms" , Khanna Book Publishing Co. (P)Ltd..,2002

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Course	Python Programming	Semester	II
Course Code	OPGDST202	CIE Marks	30
Credits	05	SIE Marks	70

MODULE 1
Python Basic Concepts and Programming Parts of Python Programming Language, Identifiers, Keywords, Statements and Expressions, Variables, Operators, Precedence and Associativity, Data Types, Indentation, Comments, Reading Input, Print Output, Type Conversions, The type( ) Function and Is Operator, Control Flow Statements, The if Decision Control Flow Statement, The if…else Decision Control Flow Statement, The if…elif…else Decision Control Statement, Nested if Statement, The while Loop, The for Loop, The continue and break Statements, Built-In Functions, Commonly Used Modules, Function Definition and Calling the Function, The return Statement and void Function, Scope and Lifetime of Variables, Default Parameters, Keyword Arguments, *args and **kwargs, Command Line Arguments.

MODULE 2
Python Collection Objects, Strings- Creating and Storing Strings, Basic String Operations, Accessing Characters in String by Index Number, String Slicing and Joining, String Methods, Formatting Strings, Lists-Creating Lists, Basic List Operations, Indexing and Slicing in Lists, Built-In Functions Used on Lists, List Methods. Sets, Tuples and Dictionaries. Files: reading and writing files

MODULE 3
Object-oriented Design :Introducing object-oriented ,Objects and classes, Specifying attributes and behaviours : Data describes objects , Behaviours are actions ,Hiding details and creating the public interface: Composition, Inheritance: Inheritance provides abstraction, Multiple inheritance Objects in Python : Creating Python classes , Adding attributes, Making a function work: passing arguments, Initializing the object, self argument

MODULE 4
Modules and packages: Organizing the modules, Absolute imports, Relative imports, Organizing module contents: Access control, Third-party libraries, Basic inheritance, Extending built-ins, Overriding and super, Multiple inheritance, The diamond problem, Different sets of arguments

MODULE 5
Polymorphism , Abstract base classes, Using an abstract base class , Creating an abstract base class Exceptions: Raising exceptions, The effects of an exception , Handling exceptions, The exception hierarchy, Defining our own exceptions

Course outcome (Course Skill Set)

At the end of the course the student will be able to:

CO1: Demonstrate proficiency in handling loops and creation of functions

CO2: Illustrate the methods to create and manipulate lists, tuples and dictionaries .

CO3: Design and Develop programs for string processing and file organization.

CO4: Interpret the concept of OOP as used in Python

Suggested Learning Resources:

Books

1. Allen B. Downey, "Think Python: How to Think Like a Computer Scientist'', 2nd edition,Updated for Python 3, Shroff/O'Reilly Publishers, 2016

2. Python 3 Object Oriented Programming, 2nd Edition, Unleash the power of Python 3 Objects by Dusty Phillips , PACKT Publishing.

3. Python Object–Oriented Programming :Build robust and maintainable Object-oriented python applications and libraries, Steven F. Lott, Dusty Philips,4th Edition, Packt Publishing Limited; 2021

4. Python the complete reference ,Martin C. Brown,4th Edition, McGraw Hill Education ,2018

Web links and Video Lectures (e-Resources):

http://greenteapress.com/wp/thinkpython/

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Course	Software Engineering	Semester	II
Course Code	OPGDST203	CIE Marks	30
Credits	05	SIE Marks	70

MODULE 1
Introduction: Software Products and Software process, Process models: Waterfall modal, Evolutionary Development, Bohemia's Spiral model, Overview of risk management, Process Visibility, Professional responsibility. Computer based System Engineering: Systems and their environment, System Procurement, System Engineering Process, System architecture modeling. Human Factors, System reliability Engineering.
MODULE 2
Requirements and Specification: The requirement Engineering Process, The Software requirement document, Validation of Evolution of requirements, Viewpoint – oriented & method based analysis, system contexts, Social 7 organizational factors. Data flow, Semantic, Objects, models, Requirement Specification, Non functional requirement.
MODULE 3
Software Prototyping: Prototyping in software process, Prototyping techniques, User interface prototyping. Software Design: Design Process, Design Strategies, Design Quality, System Structuring control models, Modular decomposition, Domain Specific architecture.
MODULE 4
Object Oriented& function oriented design: Objects, object Classes and inheritance Object identification, An object oriented design example, Concurrent Objects, Data flow design Structural decomposition, Detailed Design, A Comparison of design Strategies. User interface design: Design Principles, User System interaction, Information Presentation, User Guidance, Interface Evaluation.
MODULE 5
Software Verification and Validation : The testing Process , Test Planning & Strategies, Black Box , Structural, interface testing , Program inspections , Mathematically based verification, Static analysis tools, Clean room software development. Management Issues: Project management, Quality management, Software cost estimation, Software maintenance.

Course outcomes:

CO 1: Describe a software system, component, or process to meet desired needs within realistic constraints.

CO 2: Compare professional and ethical responsibility'

CO 3: Apply the techniques, skills, and modern engineering tools necessary for engineering practice, design, implement, verify, validate, implement, and maintain software systems or parts of software systems

Suggested Learning Resources: Books

1. Ian Sommerville: Software Engineering, 9th Edition, Pearson Education, 2012.

2. Michael Blaha, James Rumbaugh: Object Oriented Modelling and Design with UML,2nd Edition, Pearson Education,2005.

3. Roger S. Pressman: Software Engineering-A Practitioners approach, 7th Edition, Tata McGraw Hill.

4. Stephan R. Schach, "Object oriented software engineering", Tata McGrawHill,2008

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Course	Data Structure Lab	Semester	II
Course Code	OPGDST204	CIE Marks	30
Credits	02	SIE Marks	70

1. Write a menu driven C++ program to perform the following string operations without using string functions: (i) String Length (ii) String Concatenation (ii) String Reverse

2. Write a C++ program to search for an element in an array using Binary search.

3. Write a C++ program to sort a list of N elements using Merge sort technique.

4. Write a C++ program to sort a list of N elements of integer type using Quick Sort technique.

5. Write a C++ program to find the Binomial Coefficient using recursion.

6. Write a C++ program to simulate the working of Towers of Hanoi problem for N disks, print the moves taken by the problem using recursion.

7. Write a C++ program to demonstrate the working of a stack using an array. The elements of the stack may be integers. Operations to be supported are 1.PUSH, 2.POP 3.DISPLAY. The program should print appropriate messages for STACK overflow, Underflow.

8. Write a C++ program to implement the operations of a Queue using linked list.

Course outcomes:

CO 1 : Illustrate different types of data structures, operations and algorithms, searching and sorting operations on files

CO 2: Design & develop the working of stack, Queue, Lists in problem solving & implement all data structures

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Course	Python Lab	Semester	II
Course Code	OPGDST205	CIE Marks	30
Credits	03	SIE Marks	70

Course Learning Objectives:

CLO1: To be able to introduce core programming basics and program design with functions using Python programming language.

CLO2: To understand a range of Object-Oriented Programming, as well as in-depth data and information processing techniques.

CLO3: To understand the high-performance programs designed to strengthen the practical expertise.

1. Write a program to sum all the elements from n1 to n2 where n1 and n2 are positive integers.
2. Input an array of n numbers and find separately the sum of positive numbers and negative numbers.
3. Write a program to search an element using linear search
4. Write a program to search an element using binary search.
5. Write a program to simulate stack.
6. Using a stack evaluate an arithmetic expression.
7. Write a program to multiply two matrices
8. Write a program to find the roots of a quadratic equation
9. Write a program to Insert a number in a sorted array.
10. Write a Python Program to check whether the given string is palindrome or not using built in string manipulation methods.
11. Write a Python Program to read a word and prints the number of letters, vowels and percentage of vowels in the word using dictionary
12. Write a Python Program to check a given sentence is a pangram or not using Function/Module.

Course Outcomes: At the end of the course the student will be able to:

CO1: Demonstrate proficiency in handling loops and creation of functions.

CO2: Illustrate the methods to create and manipulate lists, tuples and dictionaries in Python Programme.

CO3: Design and Develop programs for string processing and file organization and use the concept of OOP as used in Python.

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Course	Unix Programming	Semester	III
Course Code	OPGDST301	CIE Marks	30
Credits	05	SIE Marks	70

MODULE 1
Introduction of UNIX and Shell: Introduction, History, Architecture, Experience the Unix environment, Basic commands ls, cat, cal, date, calendar, who, printf, tty, sty, uname, passwd, echo, tput, bc, script, spell and ispell, Introduction to Shell Scripting, Shell Scripts, read, Command Line Arguments, Exit Status of a Command, The Logical Operators && and ||, exit, if, and case conditions, expr, sleep and wait, while, until, for, $, @, redirection. The here document, set, trap, Sample Validation and Data Entry Scripts.
MODULE 2
UNIX File System: The file, what's in a filename? The parent-child relationship, pwd, the Home directory, absolute pathnames, using absolute pathnames for a command, cd, mkdir, rmdir, Relative pathnames, The UNIX file system. Basic File Attributes: Is – l, the –d option, File Permissions, chmod, Security and File Permission, users and groups, security level, changing permission, user masks, changing ownership and group, File Attributes, More file attributes: hard link, symbolic link, umask, find.
MODULE 3
Simple Filters: Pr, head, tail, cut, paste, sort, uniq, tr commands, Filters using Regular Expression : grep&sedgrep, Regular Expression, egrep, fgrep, sed instruction, Line Addressing, Inserting and Changing Text, Context addressing, writing selected lines to a file, the – f option, Substitution, Prosperities of Regular Expressions Context addressing, writing selected lines to a file, the –f option, Substitution, Properties of Regular Expressions.
MODULE 4
Awk and Advanced Shell Programming: Awk-Advanced Filters: Simple awk Filtering, Splitting a Line into Fields, printf, the Logical and Relational Operators, Number Processing, Variables, The –f option, BEGIN and END positional Parameters, get line, Built-in variables, Arrays, Functions, Interface with the Shell, Control Flow. The sh command, export, cd, the Command, expr, Conditional Parameter Substitution, Merging Streams, Shell Functions, eval, Exec Statement and Examples

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MODULE 5
Process and System Administration: Process basics, PS, internal and external commands, running jobs in background, nice, at and batch, cron, time commands, Essential System Administration root, administrator's privileges, startup & shutdown, managing disk space, cpio, tar, Customizing the Environment : System Variables, profile, sty, PWD, Aliases, Command History, On-line Command Editing. Advanced System Administration: Case Study: emacs editor and any one distribution of Linux.
Recommended Text and Reference Books: 1. Your UNIX-The Ultimate Guide, Sumitabha Das, Tata McGrawHill,
Course Outcome (CO): At the end of this course,   the students will be able to CO1: Understand and experience the UNIX environment,   File system and hierarchy. CO2: Demonstrate commands to extract,   interpret data for further processing. CO3: Apply commands to perform different tasks on various applications CO4: Analyze the usage of different shell commands, variables and AWK filtering. CO5: Evaluate different commands with sample shell scripts

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Course	Java Programming	Semester	III
Course Code	OPGDST302	CIE Marks	30
Credits	05	SIE Marks	70

Course objectives:

☐ Understand the Java program structure, data types and statements .

☐ Learn the concepts of class, objects and methods using JDK tools.

☐ Explore concepts of inheritance, overloading and multi-threaded programming

☐ Explore the use built-in packages and create user-defined packages Applet programming

MODULE 1

History and features of java, C++ Vs java, how java works, JAVA Program Structure, Java Virtual Machine concepts, java platform overview, Primitive data types, variables and constants, operators, expression statement- branching, looping and jumping, labeled statements.

MODULE 2

Classes, objects and methods: defining a class, creating object, adding variables and methods, Constructor Instances, field and methods initialization by constructors, Types of constructor, memory allocation and garbage collection, access methods Arrays, String and String buffer classes.

MODULE 3

Inheritance, Super class Subclass, basic types, using super keyword, abstract and final classes, method overriding, dynamics method dispatch. Method overloading, Interface, Thread, Thread Life cycle, Multithreading examples, Synchronized threading, Priorities of thread.

MODULE 4

Exception handling: fundamental, exception types, uncaught exception, throws, throw, try-catch, finally, built in exception, creating your own exception, Packages, Built in Packages, Creating your own Package, input/output-basics streams, Byte and character streams.

MODULE 5

Applet programming-Local and Remote Applets, Applet Vs Application, creating and executing java applets, inserting applets in a web page, java security, passing parameter to applets, Aligning the Display, HTML Tags & Applet Tag, Getting Input from User.

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Course Outcomes:

CO 1: Explore the object-oriented concepts and JAVA.

CO 2: Demonstrate programs to solve real world problems in Java.

CO 3: Construct simple GUI interfaces for a computer program to interact with users

Suggested Learning Resources:

Books

1. Programming with Java,6th Edition, E. Balaguruswamy, McGraw-Hill, 2019

2. Internet and Java Programming, 1 st Edition, Prabhu, R. Krishnamurthy, New Age International,2013

3. Java Fundamentals, A comprehensive Introduction by Herbert Schildt, Dale Skrien. Tata McGraw Hill Edition 2013. (Chapters:1,2,3,4,5,6,7,8,9,10,11,12,13,15,22,23,24,25,26)

4. Java6 Programming, Black Book, KoGenT, Dreamtech Press, 2012.

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Course	Computer Networks	Semester	III
Course Code	OPGDST303	CIE Marks	30
Credits	05	SIE Marks	70

Course objectives:

☐ Comprehend the transmission technique of digital data between two or more computers and a computer network that allows computers to exchange data.

☐ Explain with the basics of data communication and various types of computer networks;

☐ Demonstrate Medium Access Control protocols for reliable and noisy channels.

☐ Expose wireless and wired LANs.

MODULE 1
Definition and concept of networking transmission modes. Transmission media, Internet working, Connecting devices, Adapters. Routers, evolution of Network Technology, Standards and protocols, Introduction to Analog signals, Digital signal, Modulation and Demodulation, OSI Reference Model-Layered structure, function of each layer, protocol used

MODULE 2
Switching-Message. Packet, and Circuit Switching, Multiplexing – FDM, TDM WDM, SONNET, Cellular network, satellite network, IEEE 802 STANDARDSCSMA/CD, TOKEN BUS, TOKEN RING, FDDI. Routing algorithms ─ Distance Vector routing, Link state routing, TCP/IP- Overview. Architectures, functions of each layers and protocol, IP addressing, subnet and subnet mask, IP addressing-classes, IPV4 IPV6.

MODULE 3
Bootstrap protocol, DHCP, mobile IP, DNS, Telnet, SMTP HTTP. SNMP, FTP. ATM network, ATM Architecture, BISND reference model. ATM applications, Data link control ─ Line discipline, Flow control, Error control. Encryption ─ Convention Encryption, Conventional Encryption Model, Steganography, Classical Encryption Techniques, Simplified DES. Block Cipher Design Principles. Block Cipher Modes of Operation.

MODULE 4
Cryptography, Public key encryption and hash functions ,public key cryptography, principles of public key cryptosystems, The RSA algorithm, Message Authentication and Hash functions, Authentication Requirements, Authentication Functions, Message Authentication Codes, MAC Algorithm, Hash Function algorithms, Secure Hash Algorithm, IP Security

MODULE 5
Network Security at various layers, Secure-HTTP. SSL, PSP, authentication Header, Key distribution protocols. Digital Signature, Digital Certificate, Security protocols, Levels of security. Virus and Worms related threats. Malicious programs, firewall. Design principles, Wifi, Bluetooth, Infrared.

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Course Outcomes:

CO 1: List the various components of data communication and transmission modes

CO 2: Describe the fundamentals of digital communication and switching.

CO 3: Explain data link layer protocols and network security at various layes.

Suggested Learning Resources: Books

1. Data Communication‖, 4 th Edition, Behrouz A. Forouzen, Tata McGraw Hill Education,2006

2. Computer Networks‖, 5 th Edition, Andrew S. Tanenbaum, Pearson, 2011

3. William Stallings: Data and Computer Communication, 8th Edition, Pearson Education, 2007.

4. Larry L. Peterson and Bruce S. Davie: Computer Networks – A Systems Approach, 4th Edition, Elsevier, 2007.

Course	Java Programming Lab	Semester	III
Course Code	OPGDST304	CIE Marks	30
Credits	02	SIE Marks	70

1. a) Write a JAVA program to demonstrate Constructor Overloading and Method Overloading.

   b) Write a JAVA program to implement Inner class and demonstrate its Access protection

2. Write a program in Java for String handling which performs the following:

   i) Checks the capacity of String Buffer objects.

   ii) Reverses the contents of a string given on console and converts the resultant string in upper case.

   iii) Reads a string from console and appends it to the resultant string of (ii).

3. a). Write a JAVA program to demonstrate Inheritance. b). Simple Program on Java for the implementation of Multiple inheritance using interfaces to calculate the area of a rectangle and triangle.

4. Write a JAVA program which has

   i) A Class called Account that creates account with 500Rs minimum balance, a deposit()method to deposit amount, a withdraw() method to withdraw amount and also throws Less Balance Exception if an account holder tries to withdraw money which makes the balance become less than 500Rs.

   ii) A Class called Less Balance Exception which returns the statement that says withdraw amount (Rs) is not valid.

   iii) A Class which creates 2 accounts, both account deposit money and one account tries to withdraw more money which generates a Less Balance Exception take appropriate action for the same.

5. Write a JAVA program using Synchronized Threads, which demonstrates Producer Consumer concept.

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6. Complete the following:

1. Create a package named shape.

2. Create some classes in the package representing some common shapes like Square, Triangle, and Circle.

3. Import and compile these classes in other program.

7. Write a JAVA program to create an enumeration Day of Week with seven values SUNDAY through SATURDAY. Add a method isWorkday( ) to the DayofWeek class that returns true if the value on which it is called is MONDAY through FRIDAY. For example, the call DayOfWeek.SUNDAY.isWorkDay ( ) returns false.

8. Write a JAVA program to print a chessboard pattern

9. Write a JAVA program which uses FileInputStream / FileOutPutStream Classes

10. Write JAVA programs which demonstrates utilities of LinkedList Class.

11. Write a JAVA program which uses Datagram Socket for Client Server Communication.

12. Write a JAVA applet program, which handles keyboard event.

Course Outcome (CO): At the end of this course, the students will be able to
CO1: UnderstandJava programming language fundamentals and run time
      environment.
CO2: Acquire knowledge and skill necessary to write java programs.
CO3: Learn the object oriented concepts and its implementation in Java
CO4: Implement the multithreading and client side programming.

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Course	Mini Project	Semester	III
Course Code	OPGDST305	CIE Marks	30
Credits	03	SIE Marks	70

Develop a mini-project using the languages and concepts learnt in the theory and exercises.

Note:

1. Student must develop the mini project. However during the examination, student must demonstrate the project individually.
2. Student has to execute the project at the end of examination.

3. The team must submit a brief project report (20-25 pages) that must include the following

a. Introduction
b. Requirement Analysis
c. Software Requirement Specification
d. Analysis and Design
e. Implementation
f. Testing

4. Brief synopsis not more than two pages to be submitted by the Student.

5. It was recommended that students to do prior art search as part of literature survey before submitting the synopsis for the Mini/Major projects.

5. Rubrics may be used to evaluate the Mini-Project.

The goal of this Mini Project course is to help the student apply the theories and important tools they studied in this program to practice and mobilize the students for the next semester Major Project.

Course outcomes: At the end of this course, the students will be able to

• Illustrate effective user interfaces

• Develop applications using the technologies learnt

• Establish various methods to integrate database

• Design and develop open source software based applications

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Course	Project Work	Semester	IV
Course Code	OPGDST401	CIE Marks	30
Credits	10	SIE Marks	70

General Rules

• The candidate should carry out the project individually in any industry or R&D institution or educational institution under a guide/co-guide.

• The candidate has to present the work carried out before the examiners during the University examination.

• The work out carried out should be free from plagiarism as per the guideline provided by the university. • The literature study may be clearly written which may be summary of existing project and highlight of what are the functionalities that are proposed to this project.

• Student shall indicate the different research papers, documents refereed as a part of the literature study. It is recommended to do prior art search as part of literature survey before submitting the synopsis for the projects.

• This is an individual project for a duration of minimum of 4 months or duration of the semester.

• Regular project work weekly diary should be maintained by the students, signed by the external guide and internal guide in order to verify the regularity of the student.

• Project work may be application/testing or research-oriented and accordingly the project report contents may vary.

• The presentation should be given at various levels such as Synopsis, SRS, Design and Project implementation/ completion levels.

• Student has to publish a paper in conference or journal of either National or International level

• Paper publication in an indexed journal/conference is compulsory as part of the project work.

• Publications follow the Thesis. 10% weightage is given in SEE.

• There shall be three project presentations each to be considered for 5 marks (5X3= 15 marks) and a final presentation for 15 marks. Presentation may be given using Power point presentation/demonstrations of the work. Synopsis submitted in a proper format is to be evaluated for 10 marks.

• The students are informed to strictly follow the report format as prescribed by the University. However as per the title/domain of the project with a suitable justification guide/department can make the minor changes.

• If the project report is not as per the format, internal guide / external examiner will have every right to reject the project.

• The Students are encouraged and appreciated to show their project demo along with their power pointduring their viva-voce exams as an added advantage. • In case of the paper publication could not be completed before the submission of the report, or acceptance received from the organiser of the conference / journal authorities should be included while uploading/submitting the report to the university.

Course outcomes: At the end of the course the student will be able to:

☐ Present the project and be able to defend it.

☐ Make links across different areas of knowledge and to generate, develop and evaluate ideas and information so as to apply these skills to the project task.

☐ Habituated to critical thinking and use problem solving skills

☐ Communicate effectively and to present ideas clearly and coherently in both the written and oral forms.

☐ Work in a team to achieve common goal.

☐ Learn on their own, reflect on their learning and take appropriate actions to improve it.

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Course	Software Testing	Semester	IV
Course Code	OPGDST402	CIE Marks	30
Credits	05	SIE Marks	70

MODULE 1

Basics of Software Testing, Basic Principles, Test case selection and Adequacy Humans, Errors and Testing, Software Quality; Requirements, Behavior and Correctness, Correctness Vs Reliability; Testing and Debugging; Test Metrics; Software and Hardware Testing; Testing and Verification; Defect Management; Execution History; Test Generation Strategies; Static Testing; Test Generation from Predicates. Sensitivity, Redundancy, Restriction, Partition, Visibility and Feedback, Test Specification and cases, Adequacy Criteria, Comparing Criteria

MODULE 2

A perspective on Testing Basic definitions, Test cases, Insights from a Venn diagram, Identifying test cases, Error and fault taxonomies, Level of testing, Examples: Generalized pseudo code, The triangle problem, the Next Date function, The commission problem, The SATM (Simple Automation Teller Machine) problem, The currency converter, Saturn windshield wiper

MODULE 3

Boundary value testing, Equivalence class testing, Decision table based testing Boundary value analysis, Robustness testing, Worst-case testing, special value testing, Examples, Random testing, Equivalence classes, Equivalence test cases for triangle problem, Next Date function and commission problem, Guidelines and observations, Decision tables, Test cases for triangle problem

MODULE 4

Path Testing, Data flow testing, Levels of Testing, Integration Testing DD Paths, Test coverage metrics, Basis path testing, guidelines and observations, Definition Use testing, Slice based testing, Guidelines and observations. Traditional view of testing levels, Alternative life cycle models, the SATM systems, separating integration and system testing, Guidelines and observations

MODULE 5

Fault Based Testing, Planning and Monitoring the Process, Documenting Analysis and Test Assumptions in fault-based testing, Mutation Analysis, Fault-based Adequacy Criteria; Variations on mutation Analysis; From Test case specification to Test Cases, Scaffolding, Generic vs. specific Scaffolding, Test Oracles, Self checks as oracles, Capture and Replay. Quality and Process, Test and Analysis strategies and plans, Risk Planning, Monitoring the Process, Improving the process, The quality team, Organizing documents, Test strategy document, Analysis and test plan, Test design specifications documents, Test and analysis reports.

Recommended Text and Reference Books:

1. Adithya P.Mathur " Foundations of Software Testing – Fundamental Algorithms and Techniques", Pearson Education India, 2011

2. Mauro Pezze, Michael Young, Software testing and Analysis- Process, Principles and Techniques, Wiley India, 2012

3. Paul C Jorgensen, "Software Testing A Craftsman's Approach", Auerbach publications, 3rd edition, 2011.

4. KshirasagaraNaik, PriyadarshiTripathy: Software Testing and Quality Assurance, Wiley India 2012

5. M.G.Limaye: Software Testing-Principles, Techniques and Tools – McGraw Hill, 2009

Course Outcomes:

CO1: Acquire knowledge of basic principles and knowledge of software testing and Debugging and test cases.

CO2: Understand the perceptions on testing like levels of testing, generalized pseudo code and with related examples

CO3: Analyze the difference between functional testing and structural testing.

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Course	**Object Oriented Modeling and Design**	Semester	IV
Course Code	OPGDST403A	**CIE Marks**	30
Credits	05	**SIE Marks**	70

MODULE 1
Modeling Concepts & Class Modeling What is Object Orientation? What is OO development? OO themes; Evidence for usefulness of OO development; OO modeling history. Modeling as Design Technique: Modeling; abstraction; The three models. Object and class concepts; Link and associations concepts; Generalization and inheritance; A sample class model; Navigation of class models; Practical tips. Advanced object and class concepts; Association ends; N-array associations; Aggregation; Abstract classes; Multiple inheritance; Metadata; Reification; Constraints; Derived data; Packages;
MODULE 2
State Modeling and Interaction Modeling State Modeling: Events, States, Transitions and Conditions; State diagrams; State diagram behavior; Practical tips. Advanced State Modeling: Nested state diagrams; Nested states; Signal generalization; Concurrency; A sample state model; Relation of class and state models; Interaction Modeling: Use case models; Sequence models; Activity models. Use case relationships; Procedural sequence models; Special constructs for activity models
MODULE 3
System Conception and Analysis System Conception: Devising a system concept; elaborating a concept; preparing a problem statement. Overview of analysis; Domain class model; Domain state model; Domain interaction model; Iterating the analysis. Application Analysis: Application interaction model; Application class model; Application state model; adding operations.
MODULE 4
System Design and Class Design Overview of system design; Estimating performance; Making a reuse plan; Breaking a system in to sub-systems; Identifying concurrency; Allocation of sub-systems; Management of data storage; Handling global resources; Choosing a software control strategy; Handling boundary conditions Class Design: Overview of class design; Bridging the gap; Realizing use cases; Designing algorithms; Recording downwards, Refactoring; Design optimization; Reification of behavior.

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MODULE 5
Patterns and Design Patterns What is a pattern and what makes a pattern? Pattern categories; Relationships between patterns; Pattern description. Introduction, Model View Controller, Structural decomposition: Whole-Part, Access Control: Proxy; Management Patterns: Command processor; Communication Patterns: Forwarder-Receiver; Client-Dispatcher-Server; Publisher-Subscriber.
Recommended Text and Reference Books: 1. Michael Blaha, James Rumbaugh, "Object-Oriented Modeling and Design with UML", 2nd Edition, Pearson Education / PHI, 2005. (Chapters 1 to 9, 11 to 14.10,15.1 to 15.8)   2. Frank Buschmann, RegineMeunier, Hans Rohnert, Peter Sommerlad, Michael Stal, "Pattern-Oriented Software Architecture, A System of Patterns", Volume 1, John Wiley and Sons, 2006. (Chapters 1, 2.4, 3)
Course outcome (Course Skill Set) :   **CO1** Explain the concepts of object-oriented and basic class modelling.   **CO2** Create class diagrams, sequence diagrams and interaction diagrams to solve problems.   **CO3** Choose and apply a befitting design pattern for the given problem.

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Course	Agile Methodology	Semester	IV
Course Code	OPGDST403B	**CIE Marks**	30
Credits	05	**SIE Marks**	70

MODULE 1
Why Agile?: Understanding Success, Beyond Deadlines, The Importance of Organizational Success, Enter Agility, How to Be Agile?: Agile Methods, Don't Make Your Own Method, The Road to Mastery, Find a Mentor
MODULE 2
Understanding XP: The XP Lifecycle, The XP Team, XP Concepts, Adopting XP: Is XP Right for Us?, Go!, Assess Your Agility
MODULE 3
Practicing XP: Thinking: Pair Programming, Energized Work, Informative Workspace, Root-Cause Analysis, Retrospectives, Collaborating: Trust, Sit Together, Real Customer Involvement, Ubiquitous Language, Stand-Up Meetings, Coding Standards, Iteration Demo, Reporting, Releasing:"Done Done", No Bugs, Version Control, TenMinute Build, Continuous Integration, Collective Code Ownership, Documentation. Planning: Vision, Release Planning, The Planning Game, Risk Management, Iteration Planning, Slack, Stories, Estimating. Developing: Incremental requirements, Customer Tests, Test Driven Development, Refactoring, Simple Design ,Incremental Design and Architecture, Spike Solutions, Performance Optimization, Exploratory Testing
MODULE 4
Mastering Agility: Values and Principles: Commonalities, About Values, Principles, and Practices, Further Reading, Improve the Process: Understand Your Project, Tune and Adapt, Break the Rules, Rely on People :Build Effective Relationships, Let the Right People Do the Right Things, Build the Process for the People, Eliminate Waste :Work in Small, Reversible Steps, Fail Fast, Maximize Work Not Done, Pursue Throughput
MODULE 5
Deliver Value: Exploit Your Agility, Only Releasable Code Has Value, Deliver Business Results, Deliver Frequently, Seek Technical Excellence :Software Doesn't Exist, Design Is for Understanding, Design Trade-offs, Quality with a Name, Great Design, Universal Design Principles, Principles in Practice, Pursue Mastery

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Text Books:

1. David J. Anderson and Eli Schragenheim, ―Agile Management for Software Engineering: Applying the Theory of Constraints for Business Results‖, Prentice Hall, 2003.

2. Hazza and Dubinsky, ―Agile Software Engineering, Series: Undergraduate Topics in Computer Science‖, Springer, 2009.

REFERENCES:

1. Craig Larman, ―Agile and Iterative Development: A Manager‗s Guide‖, Addison-Wesley, 2004.

2. Kevin C. Desouza, ―Agile Information Systems: Conceptualization, Construction, and Management‖, Butterworth-Heinemann, 2007.

Course outcome (Course Skill Set) :

CO1 Define XP Lifecycle, XP Concepts, Adopting XP

CO2 Examine on Pair Programming, Root-Cause Analysis, Retrospectives, Planning, Incremental Requirements, Customer Tests

CO3 Demonstrate concepts to Eliminate Waste

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Course	Web Programming	Semester	IV
Course Code	OPGDST403C	CIE Marks	30
Credits	05	SIE Marks	70

Course objectives:

☐ Explain advanced features of the web programming.

☐ Define the characteristics of HTML, XHTML, Java script, XML.

☐ Explore the basic principles of Web programming

☐ Enhance problem solving and programming skills in web programming with extensive programming projects.

MODULE 1

Fundamentals of Web: Internet, WWW, Web Browsers, and Web Servers, URLs, MIME, HTTP, Security, The Web Programmers Toolbox. XHTML: Origins and evolution of HTML and XHTML, Basic syntax, Standard XHTML document structure, Basic text markup, Images, Hypertext Links, Lists, Tables.

MODULE 2

HTML and XHTML: Forms, Frames in HTML and XHTML, Syntactic differences between HTML and XHTML. CSS: Introduction, Levels of style sheets, Style specification formats, Selector forms, Property value forms, Font properties, List properties, Color, Alignment of text, The Box model, Background images, The and tags, Conflict resolution.

MODULE 3

Java Script: Overview of JavaScript; Object orientation and JavaScript; General syntactic characteristics; Primitives, Operations, and expressions; Screen output and keyboard input; Control statements; Object creation and Modification; Arrays; Functions; Constructor; Pattern matching using expressions; Errors in scripts; Examples

MODULE 4

Java Script and HTML Documents: The JavaScript execution environment; The Document Object Model; Element access in JavaScript; Events and event handling; Handling events from the Body elements, Button elements, Text box and Password elements; The DOM 2 event model; The navigator object; DOM tree traversal and modification.

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MODULE 5
Dynamic Documents with JavaScript: Introduction to dynamic documents; Positioning elements; Moving elements; Element visibility; Changing colors and fonts; Dynamic content; Stacking elements; Locating the mouse cursor; Reacting to a mouse click; Slow movement of elements; Dragging and dropping elements. XML: Introduction; Syntax; Document structure; Document Type definitions; Namespaces; XML schemas; Displaying raw XML documents; Displaying XML documents with CSS; XSLT style sheets; XML Processors; Web services.
Course Outcomes: CO 1: Discover HTML and CSS syntax and semantics to build web pages. CO 2: Demonstrate format tables and forms using HTML and CSS CO 3: Construct Client-Side Scripts using JavaScript and Server-Side Scripts using PHP to generate and display the contents dynamically. **Suggested Learning Resources:** **Books** 1. Robert W Sebesta, "Programming the World Wide Web", 4th Edition, Pearson Education, 2008. 2. Web Programming By Chris Bates , Wiley Publications 3. HTML5 Black Book by Dreamtech 4. 4. Angular JS By Krishna Rungta
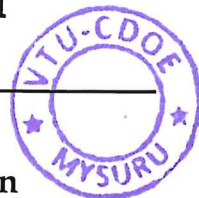
Postgraduate Diploma in Software Testing / Postgraduate Diploma in Postgraduate Diploma in Cyber Security and Cloud Computing / Postgraduate Diploma in Big Data Analytics / Postgraduate Diploma in Artificial Intelligence and Data Science

ASSESSMENT GUIDELINES (BOTH CIE AND SEE)

The weightage of Continuous Internal Evaluation (CIE) is 30% and for Semester End Exam (SEE) is 70%. The minimum passing marks for the CIE is 50% of the maximum marks. Minimum passing marks in SEE is 50% of the maximum marks of SEE. A student shall be deemed to have satisfied the academic requirements (passed) and earned the credits allotted to each course if the student secures not less than 50% in the sum total of the CIE and SEE taken together.

Continuous Internal Evaluation:

The CIE will be for 30 Marks. A candidate shall obtain not less than 50% of the maximum marks prescribed for the CIE. CIE Marks will be based on 30 objective type questions **(MCQ's, Fill in the blanks, one word answer, etc.) from all the Modules. Equal weightage should be given to all the modules.**

Semester End Examination:

The SEE question paper will be set for 70 marks & will have three sections

- **Section-A** consists of 20 objective type questions carrying 1 mark each. All questions are compulsory

- **Section-B** consists of 8 questions carrying 10 marks each. The students will have to answer 5 complete questions
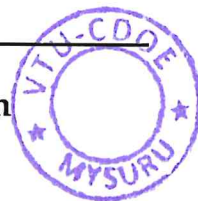
Postgraduate Diploma in Software Testing / Postgraduate Diploma in Postgraduate Diploma in Cyber Security and Cloud Computing / Postgraduate Diploma in Big Data Analytics / Postgraduate Diploma in Artificial Intelligence and Data Science

PROJECT WORK GUIDELINES

Project Work	Semester	IV	
Course Code	OPGDAD401/ OPGDBA401/ OPGDST401/ OPGDCC401	CIE Marks	30
Teaching Hours/Week (L: P: SDA)	0:4:0	SEE Marks	70
Credits	10	Exam Hours	03

Objective

To expose the students to understand the working of the organization/company/ industry and take up an in-depth study of an issue/problem in the area of specialization.

General guidelines

- Each candidate shall carry out the project work independently as per Scheme of Teaching and Evaluations under the guidance of one of the faculty members of the Department.

- If the project is of inter-disciplinary nature, a co-guide shall be allotted by the University from the other concerned department.

- The topic and title of the dissertation shall be chosen by the candidate in consultation with the guide and co-guide, if any, before the commencement of fourth semester.

- The subject and topic of the dissertation shall be from the major field of studies of the candidate. Modification of only the title but not the field of work may be permitted at the time of final submission of dissertation report during fourth semester.

- The Project Work and Dissertation preparation could be carried out by the students either in their work place/ institution/ any industry/ R&D labs/ business organizations.

- The candidate shall submit a soft copy of the dissertation work to the University.
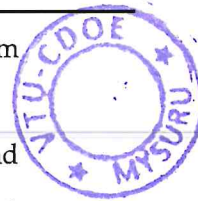
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- The soft copy shall contain the entire Dissertation on the project work in monolithic form as a PDF file (not separate chapters).

- The Guide, after satisfying himself/herself on the suitability of the dissertation and checking the report for completeness and shall upload the Dissertation along with the name, University Seat Number, address, mobile number of the candidate etc., as prescribed in the form available on online Dissertation evaluation portal.

- Once the Guide uploads the dissertation, the same shall be linked for plagiarism check. The allowable plagiarism index shall be less than or equal to 25%. If the check indicates a plagiarism index greater than 25%, he/she shall, resubmit the dissertation to the Registrar (Evaluation)/Regional Centre/ Head Office, VTU along with the penal fees.

- By keeping the business trend in the present scenario, university has given an option to the students to select the research problem either from business organization or they can carry out the project on freelance basis subject to the approval of department committee. It is the total responsibility of the internal guide to monitor the freelance project.

- In case, business problem selected from a Company, no two students of an institute shall work on the same problem in the same organization.

- The student shall seek the guidance of the internal guide on a continuous basis, and the guide shall give a certificate to the effect that the candidate has worked satisfactorily under his/her guidance.

- On completion of the project work, student shall prepare a report with the following format.

    i. The Project report shall be prepared using word processor viz. MS Word with New Times Roman, 12 font size and shall be in the A4 size 1" margin on all the sides (1.5 inch on left side) and 1.5 line spacing. The Project report shall not exceed 100 pages.

    ii. The report shall have a title sheet with the title of the project, guide details and month & year of admission.

    iii. A certificate by the guide, Programme Coordinator and the Director indicating the bonafide performance of the project by the student to be enclosed.

    iv. An undertaking by the student to the effect that the work is independently carried out by him/her.
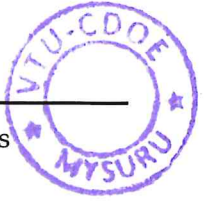
v. The certificate from the organization if applicable (if its Freelance project, certificate is not required and internal guide can issue a certificate for successful completion).

Project Report Evaluation:

- Internal evaluation will be done by the internal guide.

- External valuation shall be done by faculty members of PG centers of VTU and VTU affiliated institutes with minimum of 10 years experience.

- **Viva-Voce / Presentation:** A viva-voce examination shall be conducted online where a student is expected to give a presentation of his/ her work.

- Minimum passing marks of the Project work is 50% in each of the components such as Internal Marks, report evaluation and viva-voce examination.

PROJECT STRUCTURE

Abstract

Acknowledgement

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    1.2   Objectives

    1.3   Purpose, Scope, and Applicability

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        1.3.2 Scope

        1.3.3 Applicability

    1.4   Achievements

    1.5   Organisation of Report

CHAPTER 2: Literature Survey

CHAPTER 3: System Requirements & Specifications

    3.1   Functional and Non functional Requirements

    3.2   Software and Hardware Tools

    3.3   Software Requirements Specification

GLOSSARY APPENDIX A APPENDIX B

Abstract

This should be one/two short paragraphs (400 words), summarising the project work. It is important that this is not just a re-statement of the original project outline. A suggested flow is background, project aims and main achievements.

NOTE: From the abstract, a reader should be able to ascertain if the project is of interest to them and, it should present results of which they may wish to know more details.

Chapter 1: Introduction

The introduction has several parts as given below:

Background:

A description of the background and context of the project and its relation to work already done in the area. Summarise existing work in the area concerned with your project work.

Objectives:

Concise statement of the aims and objectives of the project. Define exactly what you are going to do in the project; the objectives should be about 30 /40 words.

Purpose, Scope and Applicability:

The description of Purpose, Scope, and Applicability are given below:

- **Purpose:**

Description of the topic of your project that answers questions on why you are doing this project. How your project could improve the system its significance and theoretical framework
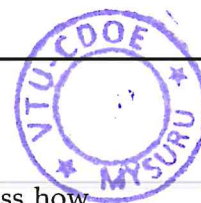
- **Scope:**

A brief overview of the methodology, assumptions and limitations.

You should answer the question: What are the main issues you are covering in your project? What are the main functions of your project?

- **Applicability:**

You should explain the direct and indirect applications of your work. Briefly discuss how this project will serve the computer world and people.

Achievements:

Explain what knowledge you achieved after the completion of your work. What contributions has your project made to the chosen area?

Goals achieved - describes the degree to which the findings support the original objectives laid out by the project. The goals may be partially or fully achieved, or exceeded.

Organisation of Report:

Summarising the remaining chapters of the project report, in effect, giving the reader an overview of what is to come in the project report.

Chapter 2: SURVEY OF TECHNOLOGIES

In this chapter

- You should demonstrate your awareness and understanding of Available Technologies related to the topic of your project.

- You should give the detail of all the related technologies that are necessary to complete your project.

- You should describe the technologies available in your chosen area and present a comparative study of all those Available Technologies.

- Explain why you selected the one technology for the completion of the objectives of your project.
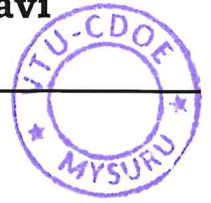
Chapter 3: REQUIREMENTS AND ANALYSIS

3.1   Problem Definition:

Formulate/define the problem on which you are working in the project.

Provide details of the overall problem and then divide the problem in to sub- problems. Define each sub-problem clearly.

3.2   Proposed Solution:

Define briefly the methodology/technology you are proposing to solve the problem on which you are working in the project.

3.3   Planning and Scheduling:

Planning and scheduling is a complicated part of software development. Planning, for our purposes, can be thought of as determining all the small tasks that must be carried out in order to accomplish the goal. Planning also takes into account, rules, and known as constraints, which, control when certain tasks can or cannot happen. Scheduling can be thought of as determining whether adequate resources are available to carry out the plan. You should show the Gantt chart and Program Evaluation Review Technique (PERT).

3.4   Software and Hardware Tools used:

Define the details of all the software and hardware needed for the development and implementation of your project.

- Hardware Requirement: In this section, the equipment, graphics card, numeric co-processor, mouse, disk capacity, RAM capacity etc. necessary to run the software must be noted.

- Software Tools used: In this section, the operating system, the compiler, testing tools, linker, and the libraries etc. necessary to compile, link and install the software must be listed.

3.5   Preliminary Product Description:

Identify the requirements and objectives of the new system. Define the functions and operation of the application/system you are developing as your project.

3.6   Conceptual Models:

You should understand the problem domain and produce a model of the system, which describes operations that can be performed on the system, and the allowable sequences of those operations. Conceptual Models could consist of complete Data Flow Diagrams, ER diagrams, Object-oriented diagrams, System Flowcharts etc.
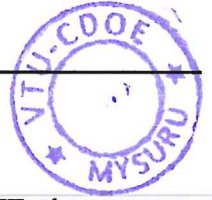
3.7   Software Requirements Specification:

- In this phase you should define the requirements of the system, INDEPENDENT of how these requirements will be accomplished.
- The Requirements Specification describes the things in the system and the actions that can be done on these things.
- Identify the operation and problems of the existing system.

i.   USER REQUIREMENTS

ii.   SYSTEM REQUIREMENTS

- FUNCTIONAL REQUIREMENTS
- NON-FUNCTIONAL REQUIREMENTS
- DOMAIN REQUIREMENTS

Chapter 4: SYSTEM DESIGN

Describes desired features and operations in detail, including screen layouts, business rules, process diagrams, pseudo code and other documentation.

Basic Modules:

You should follow the divide and conquer theory, so divide the overall problem into more manageable parts and develop each part or module separately. When all modules are ready, you should integrate all the modules into one system. In this phase, you should briefly describe all the modules and the functionality of these modules.


Data Design:

Data design will consist of how you organise, managing and manipulate the data.

- Schema Design: Define the structure and explanation of schemas used in your project.
- Data Integrity and Constraints: Define and explain all the validity checks and constraints you are providing to maintain data integrity.

Procedural Design:

Procedural design is a systematic way for developing algorithms or procedurals.
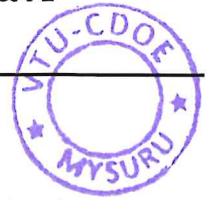
- **Logic Diagrams:**

Define the systematically flow of procedure that improves its comprehension and helps the programmer during implementation. e.g., Control Flow Chart, Process Diagrams etc.

- **Data Structures:**

Create and define the data structure used in your procedures.

- **Algorithms Design:**

With proper explanations of input data, output data, logic of processes, design and explain the working of algorithms.

User Interface Design:

- Define user, task, environment analysis and how you intend to map those requirements in order to develop a "User Interface".
- Describe the EXTERNAL and INTERNAL components and the architecture of your user interface.
- Show some rough pictorial views of the user interface and its components.

Security Issues:

Discuss Real-time considerations and Security issues related to your project and explain how you intend avoiding those security problems. What are your security policy plans and architecture?

Test Cases Design:

Define test cases, which will provide easy detection of errors and mistakes within a minimum period of time and with the least effort. Explain the different conditions in which you wish to ensure the correct working of your software.

Chapter 5: IMPLEMENTATION AND TESTING

Implementation Approaches:

Define the plan of implementation, and the standards you have used in the implementation.

Coding Details and Code Efficiency:

Students not need include full source code, instead, include only the important codes (algorithms, applets code, forms code etc). The program code should contain comments needed for explaining the work a piece of code does. Comments may be needed to explain why it does it, or, why it does a particular way.

You can explain the function of the code with a shot of the output screen of that program code.

- **Code Efficiency:** You should explain how your code is efficient and how you have handled code optimisation.

Testing Approach: Testing should be according to the scheme presented in the system design chapter and should follow some suitable model – e.g., category partition, state machine-based. Both functional testing and user-acceptance testing are appropriate. Explain your approach of testing.

- **Unit Testing:**

Unit testing deals with testing a unit or module as a whole. This would test the interaction of many functions but, do confine the test within one module.

- **Integrated Testing:**

Brings all the modules together into a special testing environment, then checks for errors, bugs and interoperability. It deals with tests for the entire application. Application limits and features are tested here.

Modifications and Improvements:

Once you finish the testing you are bound to be faced with bugs, errors and you will need to modify your source code to improve the system. Define what modification you implemented in the system and how it improved your system.
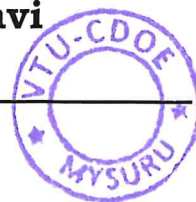
Chapter 6: RESULTS AND DISCUSSION

Test Reports:

Explain the test results and reports based on your test cases, which should show that your software is capable of facing any problematic situation and that it works fine in different conditions. Take the different sample inputs and show the outputs.

User Documentation:

Define the working of the software; explain its different functions, components with screen shots. The user document should provide all the details of your product in such a way that any user reading the manual, is able to understand the working and functionality of the document.

Chapter 7: CONCLUSION:

The conclusions can be summarised in a fairly short chapter (2 or 3 pages). This chapter brings together many of the points that you would have made in the other chapters.

Limitations of the System:

Explain the limitations you encounterd during the testing of your software that you were not able to modify. List the criticisms you accepted during the demonstrations of your software.

Future Scope of the Project:

It describes two things: firstly, new areas of investigation prompted by developments in this project, and secondly, parts of the current work that were not completed due to time constraints and/or problems encountered.

REFERENCES

It is very important that you acknowledge the work of others that you have used or adapted in your own work, or that provides the essential background or context to your project. The use of references is the standard way to do this. Please follow the given standard for the references for books, journals, and online material.
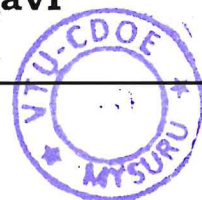
GLOSSARY

If you use any acronyms, abbreviations, symbols, or uncommon terms in the project report then their meaning should be explained where they first occur. If you go on to use any of them extensively then it is helpful to list them in this section and define the meaning.

APPENDICES

These may be provided to include further details of results, mathematical derivations, certain illustrative parts of the program code (e.g., class interfaces), user documentation etc.

Rubrics for Project Work

Sl. No.	Evaluation Type	Particulars	Marks
1	CIE	Internal Assessment by the Guide- Based on the Presentations by Students	30
2	SEE	Report Evaluation by the Guide & External Examiner. Average of the marks awarded by the two Examiners shall be the final evaluation marks for the Dissertation	35
3	SEE	Viva-Voce Examination to be conducted by the Guide and an External examiner from the Industry/ Institute (Joint Evaluation)	35
		Total	100

Rubrics for Project Evaluation and Viva voce Examination

A. Internal Assessment by the Guide- Based on three Presentations by Students

Sl. No.	Aspects	Marks
1	Three Presentations	5
2	Introduction and Methodology	5
3	Industry and Company Profile	5
4	Theoretical background of study	5
5	Data analysis and interpretation	5
6	Summary of findings, suggestions and conclusion	5
	Total	30

B. Report Evaluation by the Guide & External Examiner

Sl. No.	Aspects	Marks
1	Introduction & Relevance of the project	5
2	Conceptual background and literature review	5
3	Research design	5
4	Analysis and interpretation	10
5	Summary of findings, suggestions and conclusion	10
	Total	**35**

C. Viva-Voce Examination to be conducted by the Guide and an External examiner from the Industry/ Institute (Joint Evaluation)

Sl. No.	Aspects	Marks
1	Presentation and Communication Skills	5
2	Subject knowledge	5
3	Objectives of the study and Methodology	5
4	Analysis using statistical tools and statistical packages	10
5	Findings and appropriate suggestions	10
	Total	**35**

Activity Chart to be followed during Project Work

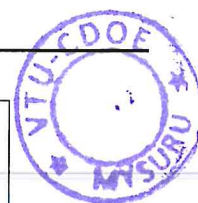| Activity	Remarks
Identifying the organization and Problem identification	Student individually identifies an organization or identifies problem for his/her study, according to his/her interest.
Problem statement & Research Design	His/ Her interests are discussed with project guides. Discussion with Internal Guide to decide on suitable design for the research
Synopsis Preparation	Preparation of Synopsis* & formulating the objectives
Presentation of Synopsis	The student will present the synopsis with the detailed execution plan to the Internal Guide and Programme Coordinator who will review and may: a. Approve b. Approve with modification or c. Reject for fresh synopsis

Approval Status	The approval status is submitted to Programme Coordinator who will officially give concurrence for the execution of the Project
Understanding Structure, Culture and functions of the organization / Identifying of business problem from the Industry through the literature study	Student should understand products / services and the problems of the organization
Preparation of Research design and Research instrument for data collection	Discussion with the guide for finalization of research design and instrument in his/her domain and present the same to the guide. **(First Presentation)**
Data collection	Date collected to be edited, coded, tabulated and presented to the guide for suggestions for analysis. **(Second Presentation)**
Analysis and finalization of report	Students must use appropriate and latest statistical tools and techniques for analyzing the data. **(Third Presentation)**
Submission of Report	Final Report should be submitted to the University before one week of the commencement of theory examination.

***Synopsis of 3-4 pages to be submitted to the Programme Coordinator through the Guide**

Page 1	Title, Contact Address of student- with details of Internal and External Guide (if applicable)
Pages 2-4	Short introduction with objectives and summary (300 words), Review of Articles / Literature about the topic with source of information.

Formats for Project Report

- Format of Cover Page
- Format of certificate by Company/Institution or from both
- Format of Declaration Page
- Format of Contents
- Format of List of Tables and Charts
- Format of Bibliography

Visvesvaraya Technological University, Belagavi

Centre for Distance and Online Education (CDOE), Mysuru
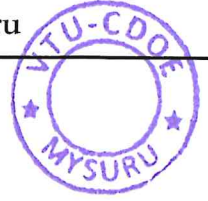
(Title of the Project Work)

Submitted by

(Student Name)

(USN)

Submitted to

VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELGAVI

In partial fulfillment of the requirements for the award of the degree of

[Postgraduate Diploma in Software Testing / Postgraduate Diploma in Postgraduate

Diploma in Cyber Security and Cloud Computing

/ Postgraduate Diploma in Big Data Analytics

/ Postgraduate Diploma in Artificial Intelligence and Data Science]

Under the guidance of

INTERNAL GUIDE   **EXTERNAL GUIDE**

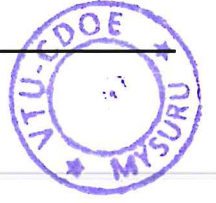(Name & Designation)   (Name & Designation)

(Institute Logo)

Department of Computer Applications

VTU's Centre for Distance and Online Education

Mysuru

(Month & Year of submission)

CERTIFICATE

This is to certify that (Name of the Student) bearing USN (xxxx), is a bonafide student of [Postgraduate Diploma in Software Testing / Postgraduate Diploma in Postgraduate Diploma in Cyber Security and Cloud Computing / Postgraduate Diploma in Big Data Analytics / Postgraduate Diploma in Artificial Intelligence and Data Science] course of the Institute (Batch), affiliated to Visvesvaraya Technological University, Belgavi. Project Report on "(Title of Report)"is prepared by him/her under the guidance of (Name of the Guide), in partial fulfilment of the requirements for the award of the degree of [Postgraduate Diploma in Software Testing / Postgraduate Diploma in Postgraduate Diploma in Cyber Security and Cloud Computing / Postgraduate Diploma in Big Data Analytics / Postgraduate Diploma in Artificial Intelligence and Data Science] of Visvesvaraya Technological University, Belagavi, Karnataka.
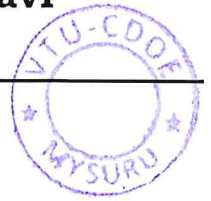
Signature of Internal Guide   Signature of PC   Signature of Director

DECLARATION

I, (Student Name), hereby declare that the Project report entitled "(Title)" with reference to (Organization with place) prepared by me under the guidance of (Guide Name), faculty of Computer Application Department, (Institute name) and external assistance by (External Guide Name, Designation and Organization). I also declare that this Project work is towards the partial fulfilment of the university Regulations for the award of degree of [Postgraduate Diploma in Software Testing / Postgraduate Diploma in Postgraduate Diploma in Cyber Security and Cloud Computing / Postgraduate Diploma in Big Data Analytics / Postgraduate Diploma in Artificial Intelligence and Data Science] by Visvesvaraya Technological University, Belagavi. I have undergone a summer project for a period of Twelve weeks. I further declare that this Project is based on the original study undertaken by me and has not been submitted for the award of any degree/diploma from any other University / Institution.

Place: **Signature of the Student**

Date:

PROGRAMME CO-ORDINATOR
COMPUTER APPLICATIONS
Visvesvaraya Technological University
Centre for Distance and Online Education
MYSURU-570 029