

**The Kelkar Education Trust's  
V. G. Vaze College of Arts, Science, and Commerce (Autonomous)**



**The Kelkar Education Trust's  
V G Vaze College of Arts, Science and Commerce  
(Autonomous)**

**Syllabus for S.Y.B.Sc. - I.T.**

**(June 2024 Onwards)**

**Programme: B.Sc. Semester III & IV**

**Subject : Information Technology**

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<b>Semester III</b>			
<b>Code</b>	<b>Course Type</b>	<b>Course Title</b>	<b>Credits</b>
VGVUSTMCN301	Major Subject	Computer Network	2
VGVUSTMCNP301	Major Subject Practical	Computer Network Practical	2
VGVUSTMOS301	Major Subject	Operating System	2
VGVUSTMOSP301	Major Subject Practical	Operating System Practical	2
VGVUSTNPP301	Minor Subject	Python Programming	2
VGVUSTNPPP301	Minor Subject Practical	Python Programming Practical	2
VGVUOE	Open Elective Subject	Law and Cyberspace -I	2
VGVUSTVSE301	Vocational Skill Enhancement Course Pr	Introduction to Java Programming Practical	2
VGVUAE3	Ability Enhancement Course	Marathi-I	2
VGVUAE3		Hindi-I	
VGVUFP301	Field Project	Field Project	2
VGVUCC301	Cocurricular Activities	Community Engagement Activities	2
VGVUCC302	Cocurricular Activities	Cultural	2
VGVUCC303	Cocurricular Activities	National Service Scheme (NSS)	2
VGVUCC304	Cocurricular Activities	Sports Activities	2
VGVUCC305	Cocurricular Activities	Yoga	2
<b>Total Credits</b>			<b>22</b>

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<b>Semester IV</b>			
<b>Code</b>	<b>Course Type</b>	<b>Course Title</b>	<b>Credits</b>
VGVUSTMDS401	Major Subject	Data Structure	2
VGVUSTMDSP401	Major Subject Practical	Data Structure Practical	2
VGVUSTMSE401	Major Subject	Software Engineering	2
VGVUSTMSEP401	Major Subject Practical	Software Engineering Practical	2
VGVUSTNCT401	Minor Subject	Computer Oriented Statistical Techniques	2
VGVUSTNCTP401	Minor Subject Practical	Computer Oriented Statistical Techniques Practical	2
VGVUOE4	Open Elective Subject	Law and Cyberspace -II	2
VGVUSTVSE401	Vocational Skill Enhancement Course Pr	Advanced Web Programming	2
VGVUAE4	Ability Enhancement Course	Marathi-II	2
VGVUAE4		Hindi-II	
VGVUCEP401	Community Engagement Program	Community Engagement Program	2
VGVUCC401	Cocurricular Activities	Community Engagement Activities	2
VGVUCC402	Cocurricular Activities	Cultural Activities	2
VGVUCC403	Cocurricular Activities	National Service Scheme (NSS)	2
VGVUCC404	Cocurricular Activities	Sports Activities	2
VGVUCC405	Cocurricular Activities	Yoga	2
<b>Total Credits</b>			<b>22</b>

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## **SEMESTER-III**

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<b>B. Sc. (Information Technology)</b>		<b>Semester – III</b>	
<b>Course Name: Computer Networks</b>		<b>Course Code: VGVUSTMCN301</b>	
<b>Periods per week (1 Period is 60 minutes)</b>		<b>2</b>	
<b>Credits</b>		<b>2</b>	
		<b>Hours</b>	<b>Marks</b>
<b>Evaluation System</b>	<b>Theory Examination</b>	<b>2</b>	<b>60</b>
	<b>Internal</b>	<b>--</b>	<b>40</b>

### Course Objective

#### To make the learner

1. Aware of Understanding of the fundamental concepts of computer networking as well as will understand functionalities and various concepts of physical layer.
2. Aware of Bandwidth utilization, transmission media and switching concept as well as will understand functionalities and various concepts of Data link layer.
3. Familiarize with basic taxonomy and terminology of computer networking area.
4. Will understand functionalities and various concepts of Network Layer also become ware of advanced networking concepts and implement the same using CISCO packet tracer.
5. Will understand functionalities and various concepts of Transport Layer.

Unit	Details	Lectures
<b>I</b>	<p><b>Introduction:</b> Data communications, networks, network types, Internet history, standards and administration.</p> <p><b>Network Models:</b> Protocol layering, TCP/IP protocol suite, The OSI model.</p> <p><b>Introduction to Physical layer:</b> Data and signals, periodic analog signals, digital signals, transmission impairment, data rate limits, performance.</p> <p><b>Digital and Analog transmission:</b> Digital-to-digital conversion, analog-to-digital conversion, transmission modes, digital-to-analog conversion, analog-to-analog conversion.</p>	<b>10</b>
<b>II</b>	<p><b>Bandwidth Utilization: Multiplexing and Spectrum Spreading:</b> Multiplexing, Spread Spectrum</p> <p><b>Transmission media:</b> Guided Media, Unguided Media</p> <p><b>Switching:</b> Introduction, circuit switched networks, packet switching, structure of a switch.</p> <p><b>Introduction to the Data Link Layer:</b> Link layer addressing, Data Link Layer Design Issues, Error detection and correction, block coding, cyclic codes, checksum, forward error correction, error correcting codes, error detecting codes.</p>	<b>10</b>

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<b>III</b>	<p><b>Introduction to the Network Layer:</b> Network layer services, packet switching, network layer performance, IPv4 addressing, forwarding of IP packets, Internet Protocol, ICMPv4, Mobile IP</p> <p><b>Unicast Routing:</b> Introduction, routing algorithms, unicast routing protocols.</p> <p><b>Introduction to the Transport Layer:</b> Introduction, Transport layer protocols (Simple protocol, Stop-and-wait protocol, Go-Back-n protocol, Selective repeat protocol, Bidirectional protocols), Transport layer services, User datagram protocol, Transmission control protocol,</p>	<b>10</b>
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<b>Course Outcome</b>	
<b>Learner will be able to</b>	
<b>CO1</b>	Understand and explain Data Communications System and its components.
<b>CO2</b>	Identify the different types of network topologies and protocols.
<b>CO3</b>	Identify the different types of network devices and their functions within a network.
<b>CO4</b>	Understand and building the skills of sub netting and routing mechanisms.
<b>CO5</b>	Motivate the student to become network administrator.

<b>Books and References:</b>					
<b>Sr. No.</b>	<b>Title</b>	<b>Author/s</b>	<b>Publisher</b>	<b>Edition</b>	<b>Year</b>
1.	Data Communication and Networking	Behrouz A. Forouzan	Tata McGraw Hill	Fifth Edition	2013
2.	TCP/IP Protocol Suite	Behrouz A. Forouzan	Tata McGraw Hill	Fourth Edition	2010
3.	Computer Networks	Andrew Tanenbaum	Pearson	Fifth	2013

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<b>B. Sc. (Information Technology)</b>		<b>Semester – III</b>	
<b>Course Name: Computer Networks Practical</b>		<b>Course Code: VGVUSTMCNP301</b>	
<b>Periods per week (1 Period is 120 minutes)</b>		<b>2</b>	
<b>Credits</b>		<b>2</b>	
		<b>Hours</b>	<b>Marks</b>
<b>Evaluation System</b>	<b>Practical Examination</b>	<b>2</b>	<b>100</b>
	<b>Internal</b>	<b>--</b>	<b>--</b>

<b>List of Practical</b>	
<b>1.</b>	<p><b>IPv4 Addressing and Subnetting</b></p> <p>a) Given an IP address and network mask, determine other information about the IP address such as:</p> <ul style="list-style-type: none"> <li>● Network address</li> <li>● Network broadcast address</li> <li>● Total number of host bits</li> <li>● Number of hosts</li> </ul> <p>b) Given an IP address and network mask, determine other information about the IP address such as:</p> <ul style="list-style-type: none"> <li>● The subnet address of this subnet</li> <li>● The broadcast address of this subnet</li> <li>● The range of host addresses for this subnet</li> <li>● The maximum number of subnets for this subnet mask</li> <li>● The number of hosts for each subnet</li> <li>● The number of subnet bits</li> <li>● The number of this subnet</li> </ul>
<b>2.</b>	Use of ping and tracert / traceroute, ipconfig / ifconfig, route and arp utilities.
<b>3.</b>	Configure IP static routing.
<b>4.</b>	Configure IP routing using RIP.
<b>5.</b>	Configuring Simple OSPF.
<b>6.</b>	Configuring DHCP server and client.
<b>7.</b>	Create virtual PC based network using virtualization software and virtual NIC.
<b>8.</b>	Configuring DNS Server and client.
<b>9.</b>	Configuring OSPF with multiple areas.
<b>10.</b>	<p>Use of Wireshark to scan and check the packet information of following protocols</p> <ul style="list-style-type: none"> <li>● HTTP</li> <li>● ICMP</li> <li>● TCP</li> <li>● SMTP</li> <li>● POP3</li> </ul>

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<b>B. Sc (Information Technology)</b>		<b>Semester – III</b>	
<b>Course Name: Operating Systems</b>		<b>Course Code: VGVUSTMOS301</b>	
<b>Periods per week 1 Period is 60 minutes</b>		<b>2</b>	
<b>Credits</b>		<b>2</b>	
		<b>Hours</b>	<b>Marks</b>
<b>Evaluation System</b>	<b>Theory Examination</b>	<b>2</b>	<b>60</b>
	<b>Internal</b>	<b>--</b>	<b>40</b>

**Course Objective**

Learner should be able

1. To learn the fundamentals of Operating Systems and the mechanisms of OS to handle processes and threads and their communication
2. To learn the mechanisms involved in memory management and file management in contemporary OS.
3. To learn handling of input and output as well as deadlock concept in operation system.
4. To gain introductory knowledge on distributed operating system concepts that includes architecture.
5. To gain introductory knowledge on Multiprocessor Systems.

<b>Unit</b>	<b>Details</b>	<b>Lectures</b>
<b>I</b>	<p><b>Introduction:</b>            What is an operating system? History of operating system, computer hardware, different operating systems, operating system concepts, system calls, operating system structure.</p> <p><b>Processes and Threads:</b>            Processes, threads, inter process communication, scheduling, IPC problems.</p>	<b>10</b>
<b>II</b>	<p><b>Memory Management:</b>            No memory abstraction, memory abstraction: address spaces, virtual memory, page replacement algorithms, design issues for paging systems, implementation issues, segmentation.</p> <p><b>File Systems:</b>            Files, directories, file system implementation, file-system management and optimization.</p>	<b>10</b>
<b>III</b>	<p><b>Input-Output:</b>            Principles of I/O hardware, Principles of I/O software, I/O software layers, disks, clocks, user interfaces: keyboard, mouse, monitor, thin clients, power management,</p> <p><b>Deadlocks:</b>            Resources, introduction to deadlocks, the ostrich algorithm, deadlock detection and recovery, deadlock avoidance, deadlock prevention, issues.</p> <p><b>Multiple Processor Systems</b>            Multiprocessors, multi-computers, distributed systems.</p>	<b>10</b>



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<b>Course Outcome</b>	
<b>Learners should be able to</b>	
<b>CO1</b>	Analyze the structure of OS and basic architectural components involved in OS design.
<b>CO2</b>	Understand the various modules in Operating system like process, memory, files, device and resource management techniques or different types of OS.
<b>CO3</b>	Understand the Mutual exclusion, Deadlock handling methods like Deadlock detection, avoidance.
<b>CO4</b>	Create virtual machine and install Linux / Windows OS.
<b>CO5</b>	Know the basic commands in Linux and Windows OS as well as install and use Windows / Linux Desktop and utilities.

<b>Books and References:</b>					
<b>Sr. No.</b>	<b>Title</b>	<b>Author/s</b>	<b>Publisher</b>	<b>Edition</b>	<b>Year</b>
1.	Modern Operating Systems	Andrew S. Tanenbaum, Herbert Bos	Pearson	4 <sup>th</sup>	2014
2.	Operating Systems – Internals and Design Principles	William Stallings	Pearson	8 <sup>th</sup>	2009
3.	Operating System Concepts	Abraham Silberschatz, Peter B. Galvineg Gagne	Wiley	8 <sup>th</sup>	
4.	Operating Systems	Godbole and Kahate	McGraw Hill	3 <sup>rd</sup>	

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<b>B. Sc (Information Technology)</b>		<b>Semester – III</b>	
<b>Course Name: Operating Systems Practical</b>		<b>Course Code: VGVUSTMOSP301</b>	
<b>Periods per week (1 Period is 120 minutes)</b>		<b>2</b>	
<b>Credits</b>		<b>2</b>	
		<b>Hours</b>	<b>Marks</b>
<b>Evaluation System</b>	<b>Practical Examination</b>	<b>2</b>	<b>100</b>
	<b>Internal</b>	<b>--</b>	<b>--</b>

<b>List of Practical</b>	
<b>1.</b>	<b>Installation of virtual machine software.</b>
<b>2.</b>	<b>Installation of Linux operating system (RedHat / Ubuntu) on virtual machine.</b>
<b>3.</b>	<b>Installation of Windows operating system on virtual machine.</b>
<b>4.</b>	<b>Linux commands: Working with Directories:</b>
a.	pwd, cd, absolute and relative paths, ls, mkdir, rmdir,
b.	file, touch, rm, cp, mv, rename, head, tail, cat, tac, more, less, strings, chmod
<b>5.</b>	<b>Linux commands: Working with files:</b>
a.	ps, top, kill, pkill, bg, fg,
b.	grep, locate, find, locate.
c.	date, cal, uptime, w, whoami, finger, uname, man, df, du, free, whereis, which.
d.	Compression: tar, gzip.
<b>6.</b>	<b>Windows (DOS) Commands – 1</b>
a.	Date, time, prompt, md, cd, rd, path.
b.	chkdsk, copy, xcopy, cls, defrag, del, move.
<b>7.</b>	<b>Windows (DOS) Commands – 2</b>
a.	diskcomp, diskcopy, diskpart, doskey, echo
b.	edit, fc, find, rename, set, type, ver
<b>8.</b>	<b>Working with Windows Desktop and utilities</b> Notepad, Wordpad, Paint, Taskbar, Adjusting display resolution, Using the browsers, Configuring simple networking, Creating users and shares
<b>9.</b>	<b>Working with Linux Desktop and utilities</b>
a.	The vi editor.
b.	Graphics
c.	Terminal
d.	Adjusting display resolution
e.	Using the browsers
f.	Configuring simple networking
g.	Creating users and shares
<b>10.</b>	<b>Installing utility software on Linux and Windows</b>

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<b>B. Sc. (Information Technology)</b>		<b>Semester – III</b>	
<b>Course Name: Python Programming</b>		<b>Course Code: VGVUSTNPP301</b>	
<b>Periods per week (1 Period is 60 minutes)</b>		<b>2</b>	
<b>Credits</b>		<b>2</b>	
		<b>Hours</b>	<b>Marks</b>
<b>Evaluation System</b>	<b>Theory Examination</b>	<b>2</b>	<b>60</b>
	<b>Internal</b>	<b>--</b>	<b>40</b>

**Course Objective**

**To make learner aware of**

1. Acquire programming skills in core Python.
2. Understand and implement the concept of functions and strings in Python.
3. Understand and implement the concept of Lists, Tuples and Dictionaries.
4. Understand and implement the concepts of Classes and Objects, Multithreading Programming and modules in python
5. Understand and implement the concepts of Graphical User Interface design and Database(MySQL) programming in Python..

<b>Unit</b>	<b>Details</b>	<b>Lecture s</b>
<b>I</b>	<p><b>Introduction:</b> The Python Programming Language, History, features, Installing Python, Running Python program, Debugging: Syntax Errors, Runtime Errors, Semantic Errors, Experimental Debugging, Formal and Natural Languages.</p> <p><b>Variables and Expressions:</b> Values and Types, Variables, Variable Names and Keywords, Type conversion, Operators and Operands, Expressions, Interactive Mode and Script Mode, Order of Operations.</p> <p><b>Conditional Statements, Looping, Control statements</b></p> <p><b>Functions:</b> Function Calls, Type Conversion Functions, Math Functions, Composition, Adding New Functions, Definitions and Uses, Flow of Execution, Parameters and Arguments, Variables and Parameters Are Local, Stack Diagrams, Fruitful Functions and Void Functions, Why Functions? Importing with from, Return Values, Incremental Development, Composition, Boolean Functions, More Recursion, Leap of Faith, Checking Types</p> <p><b>Strings:</b> A String Is a Sequence, Traversal with a for Loop, String Slices, Strings Are Immutable, Searching, Looping and Counting, String Methods, The in Operator, String Comparison, String Operations.</p>	<b>10</b>

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<b>II</b>	<p><b>Lists, Tuples and Dictionaries:</b> Creating List, Tuple and Dictionary, Accessing element, Built-in List, Tuple and Dictionary functions and methods Tuples, Tuple Assignment, Tuples as return values, Variable-length argument tuples, Concatenation, Repetition, in Operator, Iteration, Updating Dictionary, Deleting Elements from Dictionary, Properties of Dictionary keys, Operations in Dictionary,</p> <p><b>Classes and Objects:</b> Overview of OOP (Object Oriented Programming), Class Definition, Creating Objects, Instances as Arguments, Instances as return values, Built-in Class Attributes, Inheritance, Method Overriding, Data Encapsulation, Data Hiding</p> <p><b>Multithreaded Programming:</b> Thread Module, creating a thread, synchronizing threads, multithreaded priority queue.</p> <p><b>Modules:</b> Importing module, Creating and exploring modules, Math module, Random module, Time module.</p>	<b>10</b>
<b>III</b>	<p><b>Creating the GUI Form and Adding Widgets:</b></p> <p><b>Widgets:</b> Button, Canvas, Checkbutton, Entry, Frame, Label, Listbox, Menubutton, Menu, Message, Radiobutton, Scale, Scrollbar, text, Toplevel, Spinbox, PanedWindow, LabelFrame, Messagebox. Handling Standard attributes and Properties of Widgets.</p> <p><b>Layout Management:</b> Designing GUI applications with proper Layout Management features.</p> <p><b>Storing Data in Our MySQL Database via Our GUI :</b> Connecting to a MySQL database from Python, Configuring the MySQL connection, Designing the Python GUI database, Using the INSERT command, Using the UPDATE command, Using the DELETE command, Storing and retrieving data from MySQL database.</p>	<b>10</b>

<b>Course Outcome</b>	
<b>Learner will be able to</b>	
<b>CO1</b>	Install and use Python for simple programming tasks.
<b>CO2</b>	Extend the functionality of Python by using add-on packages.
<b>CO3</b>	Develop database (MySQL) application in Python.
<b>CO4</b>	Create GUI based application using python.
<b>CO5</b>	Develop a project / application using python.

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<b>Books and References:</b>					
<b>Sr. No.</b>	<b>Title</b>	<b>Author/s</b>	<b>Publisher</b>	<b>Edition</b>	<b>Year</b>
1.	Think Python	Allen Downey	O'Reilly	1 <sup>st</sup>	2012
2.	An Introduction to Computer Science using Python 3	Jason Montojo, Jennifer Campbell, Paul Gries	SPD	1 <sup>st</sup>	2014
3.	Python GUI Programming Cookbook	Burkhard A. Meier	Packt		2015
4.	Introduction to Problem Solving with Python	E. Balagurusamy	TMH	1 <sup>st</sup>	2016
5.	Murach's Python programming	Joel Murach, Michael Urban	SPD	1 <sup>st</sup>	2017
6.	Object-oriented Programming in Python	Michael H. Goldwasser, David Letscher	Pearson Prentice Hall	1 <sup>st</sup>	2008
7.	Exploring Python	Budd	TMH	1 <sup>st</sup>	2016

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<b>B. Sc. (Information Technology)</b>		<b>Semester – III</b>	
<b>Course Name: Python Programming Practical</b>		<b>Course Code: VGVUSTNPPP301</b>	
<b>Periods per week (1 Period is 120 minutes)</b>		<b>2</b>	
<b>Credits</b>		<b>2</b>	
		<b>Hours</b>	<b>Marks</b>
<b>Evaluation System</b>	<b>Practical Examination</b>	<b>2</b>	<b>100</b>
	<b>Internal</b>	<b>--</b>	<b>--</b>

<b>List of Practical</b>	
<b>1.</b>	<b>Write the program for the following:</b>
a.	Create a program that asks the user to enter their name and their age. Print out a message addressed to them that tells them the year that they will turn 100 years old.
b.	Enter the number from the user and depending on whether the number is even or odd, print out an appropriate message to the user.
c.	Write a program to generate the Fibonacci series.
d.	Write a function that reverses the user defined value.
e.	Write a function to check the input value is Armstrong and also write the function for Palindrome.
f.	Write a recursive function to print the factorial for a given number.
<b>2.</b>	<b>Write the program for the following:</b>
a.	Write a function that takes a character (i.e. a string of length 1) and returns True if it is a vowel, False otherwise.
b.	Define a function that computes the <i>length</i> of a given list or string.
c.	Define a <i>procedure</i> histogram() that takes a list of integers and prints a histogram to the screen. For example, histogram([4, 9, 7]) should print the following: <pre>**** ***** ****</pre>
<b>3.</b>	<b>Write the program for the following:</b>
a.	A <i>pangram</i> is a sentence that contains all the letters of the English alphabet at least once, for example: <i>The quick brown fox jumps over the lazy dog</i> . Your task here is to write a function to check a sentence to see if it is a pangram or not.
b.	Take a list, say for example this one: a=[1,1,2,3,5,8,13,21,34,55,89] and write a program that prints out all the elements of the list that are less than 5.
<b>4.</b>	<b>Write the program for the following:</b>
a.	Write a program that takes two lists and returns True if they have at least one common member.
b.	Write a Python program to print a specified list after removing the 0th, 2nd, 4th and 5th elements.

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c.	Write a Python program to clone or copy a list
<b>5.</b>	<b>Write the program for the following:</b>
a.	Write a Python script to sort (ascending and descending) a dictionary by value.
b.	Write a Python script to concatenate the following dictionaries to create a new one. Sample Dictionary : dic1={1:10,2:20} dic2={3:30,4:40} dic3={5:50,6:60} Expected Result : {1: 10, 2: 20, 3: 30, 4: 40, 5: 50, 6: 60}
c.	Write a Python program to sum all the items in a dictionary.
<b>6.</b>	<b>Write the program for the following:</b>
a.	Write a Python program which shows how to create a thread using thread module.
b.	Write a Python program which shows how to create a thread using threading module.
c.	Write a Python program which shows the implementation of thread class methods.
d.	Write a Python program which creates a priority queue and retrieve its priority.
a.	Write a Python program which shows how to create a thread using thread module.
<b>7.</b>	<b>Write the program for the following:</b>
a.	Design a class that store the information of student and display the same
b.	Implement the concept of inheritance using python
c.	Create a class called Numbers, which has a single class attribute called MULTIPLIER, and a constructor which takes the parameters x and y (these should all be numbers). Write a method called add which returns the sum of the attributes x and y. Write a class method called multiply, which takes a single number parameter a and returns the product of a and MULTIPLIER. Write a static method called subtract, which takes two number parameters, b and c, and returns b -c. Write a method called value which returns a tuple containing the values of x and y. Make this method into a property, and write a setter and getter methods for manipulating the values of x and y.
<b>8.</b>	<b>Write the program for the following:</b>
a.	Open a new file in IDLE (“New Window” in the “File” menu) and save it as geometry.py in the directory where you keep the files you create for this course. Then copy the functions you wrote for calculating volumes and areas in the “Control Flow and Functions” exercise into this file and save it. Now open a new file and save it in the same directory. You should now be able to import your own module like this:import geometry Try and add print dir(geometry) to the file and run it. Now write a function pointyShapeVolume(x, y, squareBase) that calculates the volume of a square pyramid if squareBase is True and of a right circular cone if squareBase is False. x is the length of an edge on a square if squareBase is True and the radius of a circle when squareBase is False. y is the height of the object. First use squareBase to distinguish the cases. Use the circleArea and squareAreafrom the geometry module to calculate the base areas.
b.	Write a program to implement exception handling.

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<b>9.</b>	<b>Write the program for the following:</b>
a.	Try to configure the widget with various options like: bg="red", family="times", size=18
b.	Try to change the widget type and configuration options to experiment with other widget types like Message, Button, Entry, Checkbutton, Radiobutton, Scale etc.
<b>10</b>	<b>Design the database applications for the following:</b>
a.	Design a simple database application that stores the records and retrieves the same.
b.	Design a database application to search the specified record from the database.
c.	Design a database application that allows the user to add, delete and modify the records.



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<b>B. Sc (Information Technology)</b>		<b>Semester – III</b>	
<b>Course Name: Law and Cyberspace - I</b>		<b>Course Code: VGVCUOE</b>	
<b>Periods per week 1 Period is 60 minutes</b>		<b>2</b>	
<b>Credits</b>		<b>2</b>	
		<b>Hours</b>	<b>Marks</b>
<b>Evaluation System</b>	<b>Theory Examination</b>	<b>2</b>	<b>60</b>
	<b>Internal</b>	<b>--</b>	<b>40</b>

**Course Objective**

**To make learner understand and use**

1. IT Act 2000 and its subsequent amendments.
2. Contracts in the digital World.
3. Concept of copyright, infringement of copyright, license of copyright
4. Concept of Jurisdiction in cyberspace.
5. Legal rights on cyberspace by recognizing the issues on it.

<b>Unit</b>	<b>Details</b>	<b>Lecture s</b>
<b>I</b>	<p><b>Introduction:</b>            What is Cyber law ? Need for cyber law, Power of Arrest Without Warrant Under the IT Act, 2000: A Critique, Crimes of this Millennium, Section 80 of the IT Act, 2000 – A Weapon or a Farce? Forgetting the Line Between Cognizable and Non-Cognizable Offences, Necessity of Arrest without Warrant from Any Place, Public or Otherwise, Check and Balances Against Arbitrary Arrests,</p> <p><b>Cyber Crime and Criminal Justice: Penalties, Adjudication and Appeals Under the IT Act, 2000:</b> Concept of “Cyber Crime “ and the IT Act , 2000, Hacking, Teenage Web Vandals, Cyber Fraud and Cyber Cheating, Virus on the Internet, Defamation, Harassment and E- mail Abuse, Cyber Pornography, Other IT Act Offences, Monetary Penalties, Adjudication and Appeals Under IT Act , 2000, Network Service Providers, Jurisdiction and Cyber Crime, Nature of Cyber Criminality, Strategies to Tackle Cyber Crime and Trends, Criminal Justice in India and Implications on Cyber Crime.</p>	<b>10</b>
<b>II</b>	<p><b>Contract's and Jurisdiction's in Cyber World</b>            Contracts in the Infotech World: What are Contracts in the Infotech World? , Click-Wrap and Shrink-Wrap Contract: Status under the Indian Contract Act, 1872, Contract Formation Under the Indian Contract Act, 1872, Contract Formation on the Internet, Terms and Conditions of Contracts.            Jurisdiction in the Cyber World: Questioning the Jurisdiction and Validity of the Present Law of Jurisdiction, Civil Law of Jurisdiction in India, Cause of Action, Jurisdiction and the Information Technology</p>	<b>10</b>

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<b>III</b>	<p><b>IPR's in cyber space:</b>            Battling Cyber Squatters and Copyright Protection in the Cyber World: Concept of Domain Name and Reply to Cyber Squatters, legal issues related to Meta-Tagging, Legislative and Other Innovative Moves Against Cybersquatting, The Battle Between Freedom and Control on the Internet, Works in Which Copyright Subsists and meaning of Copyright, Copyright Ownership and Assignment, License of Copyright, Copyright Terms and Respect for Foreign Works, Copyright Infringement, Remedies and Offences, Copyright Protection of Content on the Internet; Copyright Notice, Disclaimer and Acknowledgement, Downloading for Viewing Content on the Internet, Legal issues related to Hyper-Linking and Framing, Computer Software Piracy.</p>	<b>10</b>
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<b>Course Outcome</b>	
<b>Learner will achieve competency in</b>	
<b>CO1</b>	Knowledge of Cyberspace, Jurisdiction and basic concepts of Cyber Law
<b>CO2</b>	Jurisdiction in cyberspace, cybercrimes and their legal provisions in India.
<b>CO3</b>	Knowledge of legal provisions in Information Technology Act, 2000
<b>CO4</b>	Identify the issues on the Internet.
<b>CO5</b>	Contracts in the Digital world like Click-Wrap and Shrink-Wrap Contract.

<b>Books and References:</b>					
Sr. No.	Title	Author/s	Publisher	Edition	Year
1.	Cyber Law Simplified	Vivek Sood	TMH Education	First edition	2001
2.	Cyber Laws	Pavan Duggal	Universal's	3 <sup>rd</sup> edition	2023
3.	The Information technology Act, 2000 -Bare act 2024	Professional's	Professional's Book Publisher	Latest 2024	2024

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<b>B. Sc. (Information Technology)</b>		<b>Semester – III</b>	
<b>Course Name: Java Programming Practical</b>		<b>Course Code: VGVUSTVSE301</b>	
<b>Periods per week (1 Period is 120 minutes)</b>		<b>2</b>	
<b>Credits</b>		<b>2</b>	
		<b>Hours</b>	<b>Marks</b>
<b>Evaluation System</b>	<b>Practical Examination</b>	<b>3</b>	<b>100</b>

### Course Objective

#### To make learner understand and use

1. Basics of JAVA
2. Control flow, looping statements and Classes in JAVA.
3. Concept of inheritance and packages.
4. Concept of Arrays, Multithreading.
5. Concept of event handling, abstract window toolkit and layouts.

### List of Practical

<b>1.</b>	<b>Java Basics-I:</b> Data types: primitive data types, Object Reference Types, Strings, Auto boxing, Operators: Arithmetic operators, assignment operators, increment and decrement operator, relational operator, logical operator, bitwise operator, conditional operator.
a.	Write a Java program that takes a number as input and prints its multiplication table.
b.	Write a Java program to display the following pattern. * ** **** *****
c.	Write a Java program to display the following pattern. * * * * * * * * *
<b>2.</b>	<b>Java Basics-II:</b> Control Flow Statements, Iteration Statements (Loopings), Jump statements, Arrays.
a.	Write a Java program which shows that the given number is a Prime or not.
b.	Write a Java program to count the letters, spaces, numbers and other characters of an input string
c.	Write a Java program to find largest and smallest number from the array.
d.	Write a Java program to reverse a string or number
e.	Write a Java program which shows that the given number is a Palindrome or not.
f.	Write a Java program which shows the implementation of Armstrong number.
<b>3.</b>	<b>Java Classes and Objects:</b>

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	Definition of class, syntax to write classes, Object, syntax to write object, Instantiating Objects From A Class, Initializing The Class Object And Its Attributes, Class Methods, Accessing A Method, Method Returning A Value, Method's Arguments, Method Overloading, Constructors, this Instance, super Instance, this instance, static fields of a class, static methods of a class.
a.	Write a simple program in Java to demonstrate class and object.
b.	Write a simple program in Java to demonstrate class and object with its instance variables and instance methods.
c.	Write a Java program which shows the implementation of method overloading.
d.	Write a Java program which shows the implementation of static fields and static methods of a class.
<b>4.</b>	<b>Constructor and Destructor:</b> Purpose of constructor, types of constructor, use of super keyword in constructor, destructor.
a.	a) Write a Java program which shows the use of constructor and destructor. b) Write a Java program which shows the implementation of all types of constructors.
b.	Write a Java program which shows the implementation of constructor overloading.
c.	Write a simple Java program which shows the use of super keyword.
d.	Write a Java program which demonstrates the use of destructor.
<b>5.</b>	<b>Inheritance:</b> Inheritance basics, Types of Inheritance, Derived Class Objects, Inheritance and Access Control, Default Base Class Constructors, this and super keywords, Method overriding, Dynamic method dispatch. Abstract Classes, Abstract Methods, Using final with inheritance Defining An Interface, Implementing Interfaces, Classes V/s Interfaces, Interface can be extended.
a.	Write a java program to implement all types of inheritance.
b.	Write a java program to implement method overriding.
c.	Write a java program to implement method overriding using dynamic method dispatch.
d.	Write a java program which how to implement interface.
e.	Write a java program to implement multiple inheritance using interface.
f.	Write a Java program which shows the implementation of interface extending other interface.
<b>6.</b>	<b>Packages:</b> Creating Packages, Default Package, Importing Packages, Using A Package.
a.	Create a package, Add the necessary classes and import the package in java class.
b.	Write a java program to add two matrices and print the resultant matrix.
c.	Write a java program for multiplying two matrices and print the product for the same.
<b>7.</b>	<b>Multithreading:</b> Multithreading: the thread control methods, thread life cycle, the main thread, creating a thread, extending the thread class.
a.	Write a java program to implement thread life cycle.
b.	Write a java program to implement multithreading.
<b>8.</b>	<b>GUI programming(Part A):</b>

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	<b>Abstract Window Toolkit:</b> Introduction to Window Fundamentals, Component, Container, Panel, Window, Frame, Canvas. Components – Labels, Buttons, Check Boxes, Radio Buttons, Choice Menus, Text Fields, Text, Scrolling List, Scrollbars, Panels, Frames
a.	Design a AWT program which shows the following components TextBox, Button, Label using Frame.
b.	Design a AWT program which shows the following components CheckBox, Radio Buttons using Frame.
d.	Design a AWT program which shows the following components Choice Menus, Scrolling List, ScrollBars using Frame.
<b>9.</b>	<b>GUI programming(Part B):</b> <b>Event Handling:</b> Delegation Event Model, Events, Event classes, Event listener interfaces, Using delegation event model. <b>Layouts:</b> Flow Layout, Grid Layout, Border Layout, Card Layout.
a.	Design a AWT program to print the factorial for an input value.
b.	Design an AWT program to perform various string operations like reverse string, string concatenation etc.
d.	Design an AWT application that contains the interface to add student information and display the same.
	Design an AWT application that contains Choice Menu on selecting an option from menu change the value of a Label to a selected option.
e.	Design an AWT application to generate result marks sheet.
<b>10.</b>	<b>Introduction to NetBeans and Eclipse:</b> <b>Swing:</b> Introduction to Swing, Difference between AWT and Swing, Swing Components: JButton, JLabel, JTextFiled, JTextArea, JCheckBox, JRadioButton, JMenuBar, JMenu, JMenuItem.
a.	Design a Swing application which shows the implementation of swing components using NetBeans/Eclipse.
b.	Design an AWT application which shows the implementation of AWT components using NetBeans/Eclipse.

Course Outcome	
Learner will be able to	
<b>CO1</b>	Implement object oriented programming concepts in Java.
<b>CO2</b>	Create and use package and interfaces in a Java.
<b>CO3</b>	Develop Java application using graphical user interface.
<b>CO4</b>	Develop windows application using AWT.
<b>CO5</b>	Handling of events with controls.

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<b>Books and References:</b>					
<b>Sr. No.</b>	<b>Title</b>	<b>Author/s</b>	<b>Publisher</b>	<b>Edition</b>	<b>Year</b>
1.	Core Java 8 forBeginners	Vaishali Shah, Sharnam Shah	SPD	1 <sup>st</sup>	2015
2.	Java: The Complete Reference	Herbert Schildt	McGrawHill	9 <sup>th</sup>	2014
3.	Murach's beginningJava with Net Beans	Joel Murach , Michael Urban	SPD	1 <sup>st</sup>	2016
4.	Core Java, Volume I: Fundamentals	Hortsman	Pearson	9 <sup>th</sup>	2013
5.	Core Java, Volume II: Advanced Features	Gary Cornell and Hortsman	Pearson	8 <sup>th</sup>	2008
6.	Core Java: An Integrated Approach	R. Nageswara Rao	DreamTech	1 <sup>st</sup>	2008

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**SEMESTER-IV**

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<b>B. Sc. (Information Technology)</b>		<b>Semester – IV</b>	
<b>Course Name: Data Structures</b>		<b>Course Code: VGVUSTMDS401</b>	
<b>Periods per week (1 Period is 60 minutes)</b>		<b>2</b>	
<b>Credits</b>		<b>2</b>	
		<b>Hours</b>	<b>Marks</b>
<b>Evaluation System</b>	<b>Theory Examination</b>	<b>2</b>	<b>60</b>
	<b>Internal</b>	<b>--</b>	<b>40</b>

**Course Objective**

**To make learner understand and use**

1. Basics concepts of algorithms and data structure and compute the complexity of different algorithm.
2. Concept of linked list and different types of linked lists as well as implementation.
3. Concept of stack and queue as well as its implementation in different ways.
4. Concept of Various sorting and searching techniques as well as trees and its implementation.
5. Concept of hashing techniques and graphs as well as its implementation.

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<b>Unit</b>	<b>Details</b>	<b>Lectures</b>
<b>I</b>	<p><b>Introduction:</b> Data and Information, Data Structure, Classification of Data Structures, Primitive Data Types, Abstract Data Types, Data structure vs. File Organization, Operations on Data Structure, Algorithm, Importance of Algorithm Analysis, Complexity of an Algorithm, Asymptotic Analysis and Notations, Big O Notation, Big Omega Notation, Big Theta Notation, Rate of Growth and Big O Notation.</p> <p><b>Array:</b> Introduction, One Dimensional Array, Memory Representation of One Dimensional Array, Traversing, Insertion, Deletion, Searching, Sorting, Merging of Arrays, Multidimensional Arrays, Memory Representation of Two Dimensional Arrays, General Multi- Dimensional Arrays, Advantages and Limitations of Arrays.</p> <p><b>Linked List:</b> Linked List, One-way Linked List, Traversal of Linked List, Searching, Memory Allocation and De-allocation, Insertion in Linked List, Deletion from Linked List, Copying a List into Other List, Merging Two Linked Lists, Splitting a List into Two Lists, Reversing One way linked List, Circular Linked List, Applications of Circular Linked List, Two way Linked List, Traversing a Two way Linked List, Searching in a Two way linked List, Insertion of an element in Two way Linked List, Deleting a node from Two way Linked List.</p>	<b>10</b>
<b>II</b>	<p><b>Stack:</b> Introduction, Operations on the Stack Memory Representation of Stack, Array Representation of Stack, Applications of Stack, Evaluation of Arithmetic Expression, Matching Parenthesis, infix and postfix operations, Recursion.</p> <p><b>Queue:</b> Introduction, Queue, Operations on the Queue, Memory</p>	



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	<p>Representation of Queue, Array representation of queue, Linked List Representation of Queue, Circular Queue, Some special kinds of queues, Deque, Priority Queue, Application of Priority Queue, Applications of Queues.</p> <p><b>Sorting and Searching Techniques :</b>  Bubble, Selection, Insertion, Merge Sort. Searching: Sequential, Binary, Indexed Sequential Searches, Binary Search.</p>	<b>10</b>
<b>III</b>	<p><b>Tree:</b>  Tree, Binary Tree, Properties of Binary Tree, Memory Representation of Binary Tree, Operations Performed on Binary Tree, Reconstruction of Binary Tree from its Traversals, Huffman Algorithm, Binary Search Tree, Operations on Binary Search Tree, Heap, Memory Representation of Heap, Operation on Heap, Heap Sort.</p> <p><b>Hashing Techniques</b>  Hash function, Address calculation techniques, Common hashing functions Collision resolution, Linear probing, Quadratic, Double hashing, Bucket hashing, Deletion and rehashing</p> <p><b>Graph:</b> Introduction, Graph, Graph Terminology, Memory Representation of Graph, Adjacency Matrix Representation of Graph, Adjacency List or Linked Representation of Graph, Operations Performed on Graph, Graph Traversal, Applications of the Graph, Reachability, Shortest Path Problems, Spanning Trees.</p>	<b>10</b>

**Course Outcome**

**Learner will be able to**

- |            |  |
|------------|--|
| <b>CO1</b> | Select appropriate data structure for a specific problem.              |
| <b>CO2</b> | Implement linear and Non-linear data structure.                        |
| <b>CO3</b> | Implement appropriate searching / sorting technique for given problem. |
| <b>CO4</b> | Determine the complexity of given algorithm.                           |
| <b>CO5</b> | Implement different operations on various data structures.             |

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<b>Books and References:</b>					
<b>Sr. No.</b>	<b>Title</b>	<b>Author/s</b>	<b>Publisher</b>	<b>Edition</b>	<b>Year</b>
1.	A Simplified Approach to Data Structures	Lalit Goyal, Vishal Goyal, Pawan Kumar	SPD	1 <sup>st</sup>	2014
2.	An Introduction to Data Structure with Applications	Jean – Paul Tremblay and Paul Sorenson	Tata MacGraw Hill	2 <sup>nd</sup>	2007
3.	Data Structure and Algorithm	Maria Rukadikar	SPD	1 <sup>st</sup>	2017
4.	Schaum's Outlines Data structure	Seymour Lipschutz	Tata McGraw Hill	2 <sup>nd</sup>	2005
5.	Data structure – A Pseudocode Approach with C	AM Tanenbaum, Y Langsam and MJ Augstein	Prentice Hall India	2 <sup>nd</sup>	2006
6.	Data structure and Algorithm Analysis in C	Weiss, Mark Allen	Addison Wesley	1 <sup>st</sup>	2006

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<b>B. Sc. (Information Technology)</b>		<b>Semester – IV</b>	
<b>Course Name: Data Structures Practical</b>		<b>Course Code: VGVUSTMDSP401</b>	
<b>Periods per week (1 Period is 120 minutes)</b>		<b>2</b>	
<b>Credits</b>		<b>2</b>	
		<b>Hours</b>	<b>Marks</b>
<b>Evaluation System</b>	<b>Practical Examination</b>	<b>2</b>	<b>100</b>
	<b>Internal</b>	<b>--</b>	<b>--</b>

<b>List of Practical</b>	
<b>1.</b>	<b>Implement the following:</b>
a.	Write a program to store the elements in 1-D array and perform the operations like searching, sorting and reversing the elements. [Menu Driven]
b.	Read the two arrays from the user and merge them and display the elements in sorted order.[Menu Driven]
c.	Write a program to perform the Matrix addition, Multiplication and Transpose Operation. [Menu Driven]
<b>2.</b>	<b>Implement the following for Linked List:</b>
a.	Write a program to create a single linked list and display the node elements in reverse order.
b.	Write a program to search the elements in the linked list and display the same
c.	Write a program to create a double linked list and sort the elements in the linked list.
<b>3.</b>	<b>Implement the following for Stack:</b>
a.	Write a program to implement the concept of Stack with Push, Pop, Display and Exit operations.
b.	Write a program to convert an infix expression to postfix and prefix conversion.
<b>4.</b>	<b>Implement the following for Queue:</b>
a.	Write a program to implement the concept of Queue with Insert, Delete, Display and Exit operations.
b.	Write a program to implement the concept of Circular Queue
<b>5.</b>	<b>Implement the following sorting techniques:</b>
a.	Write a program to implement bubble sort.
b.	Write a program to implement selection sort.
c.	Write a program to implement insertion sort.
<b>6.</b>	<b>Implement the following data structure techniques:</b>
a.	Write a program to implement merge sort.
b.	Write a program to search the element using sequential search.
c.	Write a program to search the element using binary search.

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7.	<b>Implement the following data structure techniques:</b>
a.	Write a program to create the tree and display the elements.
b.	Write a program to construct the binary tree.
c.	Write a program for inorder, postorder and preorder traversal of tree
8.	<b>Implement the following data structure techniques:</b>
a.	Write a program to insert the element into the maximum heap.
b.	Write a program to insert the element into the minimum heap.
9.	<b>Implement the following data structure techniques:</b>
a.	Write a program to implement the collision technique.
b.	Write a program to implement the concept of linear probing.
10.	<b>Implement the following data structure techniques:</b>
a.	Write a program to generate the adjacency matrix.
b.	Write a program for the shortest path diagram.

<b>Books and References:</b>					
<b>Sr. No.</b>	<b>Title</b>	<b>Author/s</b>	<b>Publisher</b>	<b>Edition</b>	<b>Year</b>
1.	Data Structures and Algorithms Using Python	Rance Ncaise	Wiley	First	2016
2.	Data Structures Using C and C++	Langsam, Augenstein, Tanenbaum	Pearson	First	2015

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<b>B.Sc.(Information Technology)</b>		<b>Semester–IV</b>	
<b>Course Name: Software Engineering</b>		<b>Course Code: VGVUSTMSE401</b>	
<b>Periods per week (1 Period is 60 minutes)</b>		<b>2</b>	
<b>Credits</b>		<b>2</b>	
		<b>Hours</b>	<b>Marks</b>
<b>Evaluation System</b>	<b>Theory Examination</b>	<b>2</b>	<b>60</b>
	<b>Internal</b>	<b>--</b>	<b>40</b>

**Course Objective**

**To make learner understand and use**

1. Concept of Software engineering, types of software requirements, software development process models.
2. SocioTechnical and critical system along with requirement engineering process and different system models used for documentation.
3. Architectural and user interface design for system, project management and quality Management
4. Concept to software testing, cost estimation.
5. Concept of service oriented software engineering.

<b>Unit</b>	<b>Details</b>	<b>Lectures</b>
<b>I</b>	<p><b>Introduction:</b> Professional software development, Software engineering ethics</p> <p><b>Software Processes:</b> Software process models, Process activities, Coping with change, Process improvement</p> <p><b>Agile software development:</b> Agile methods, Agile development techniques, Agile project management, Scaling agile methods</p> <p><b>Project planning :</b> Software pricing, Plan-driven development, Project scheduling, Agile planning, Estimation techniques, COCOMO cost modeling</p>	<b>10</b>
<b>II</b>	<p><b>Requirements Engineering:</b> Functional and non-functional requirements, Requirements engineering processes, Requirements elicitation, Requirements specification, Requirements validation Requirements change Plan-driven and agile development, Extreme programming, Agile project management, Scaling agile methods.</p> <p><b>Socio-technical system:</b> Essential characteristics of socio technical systems, Emergent System Properties, Systems Engineering, Components of system such as organization, people and computers, Dealing Legacy Systems.</p> <p><b>Critical system:</b> Types of critical system, A simple safety critical system, Dependability of a system, Availability and Reliability, Safety and Security of Software systems.</p> <p><b>System Modeling:</b> Context models, Interaction models, Structural models,</p>	<b>10</b>

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	Behavioral models, Model-driven engineering	
<b>III</b>	<p><b>Architectural Design :</b> Architectural design decisions, Architectural views, Architectural patterns, Application architectures</p> <p><b>Design and Implementation :</b> Object-oriented design using the UML, Design Patterns, Implementation Issues, Open Source Development</p> <p><b>Software Testing :</b> Development Testing, Test-driven development, Release testing, User testing</p> <p><b>Software Evolution :</b> Evolution processes, Legacy systems, Software maintenance</p> <p><b>Project management:</b> Risk management, Managing people, Teamwork</p>	<b>10</b>

**Course Outcomes**

**Learner will be able to**

<b>CO1</b>	Apply the software engineering life cycle by demonstrating competence in communication, planning, analysis, design, construction, and deployment.
<b>CO2</b>	Work in one or more significant application domains
<b>CO3</b>	Describe the role of SDLC in project development
<b>CO4</b>	Generate project schedule.
<b>CO5</b>	Use the techniques and tools necessary for engineering practice.

**Books and References:**

Sr. No.	Title	Author/s	Publisher	Edition	Year
1.	Software Engineering, edition,	Ian Somerville	Pearson Education.	Ninth	
2.	Software Engineering	Pankaj Jalote	Narosa Publication		
3.	Software engineering, a practitioner's Approach	Roger Pressman	TataMcgraw-hill	Seventh	
4.	Software Engineering principles and practice	WS Jawadekar	Tata Mcgraw-hill		
5.	Software Engineering-A Concise Study	S.AKelkar	PHIIndia.		
6.	Software Engineering Concept and Applications	Subhajit Datta	Oxford Higher Education		
7.	Software Design	D.Budgen	Pearson Education	2nd	
8.	Software Engineering	K L James	PHI	EEE	2009

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<b>B.Sc.(Information Technology)</b>		<b>Semester-IV</b>	
<b>Course Name: Software Engineering Practical</b>		<b>Course Code: VGVUSTMSEP401</b>	
<b>Periods per week 1 Period is 120 minutes</b>		<b>2</b>	
<b>Credits</b>		<b>2</b>	
		<b>Hours</b>	<b>Marks</b>
<b>Evaluation System</b>	<b>Practical Examination</b>	<b>2</b>	<b>100</b>

<b>List of Practical(To be executed using Star UML or any similar software)</b>	
<b>1.</b>	Study and implementation of class diagrams.
<b>2.</b>	Study and implementation of Use Case Diagrams.
<b>3.</b>	Study and implementation of Entity Relationship Diagrams.
<b>4.</b>	Study and implementation of Sequence Diagrams.
<b>5.</b>	Study and implementation of State Transition Diagrams.
<b>6.</b>	Study and implementation of Data Flow Diagrams.
<b>7.</b>	Study and implementation of Collaboration Diagrams.
<b>8.</b>	Study and implementation of Activity Diagrams.
<b>9.</b>	Study and implementation of Component Diagrams.
<b>10.</b>	Study and implementation of Deployment Diagrams.

<b>Books and References:</b>					
<b>Sr. No.</b>	<b>Title</b>	<b>Author/s</b>	<b>Publisher</b>	<b>Edition</b>	<b>Year</b>
1.	Object-Oriented Modeling and Design	Michael Blaha, James Rumbaugh	Pearson		2011

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<b>B. Sc. (Information Technology)</b>		<b>Semester – IV</b>	
<b>Course Name: Computer Oriented Statistical Techniques</b>		<b>Course Code: VGVUSTNCT401</b>	
<b>Periods per week (1 Period is 60 minutes)</b>		<b>2</b>	
<b>Credits</b>		<b>2</b>	
		<b>Hours</b>	<b>Marks</b>
<b>Evaluation System</b>	<b>Theory Examination</b>	<b>2</b>	<b>60</b>
	<b>Internal</b>	<b>--</b>	<b>40</b>

**Course Objective**

**To make learner understand and use**

1. Concept of various measures of Central tendency (Mean, Median Mode), Dispersion (Range, Standard deviation, variance).
2. Concept of moment, skewness and Kurtosis along with elementary probability and sampling theory.
3. Statistical Estimation and Decision theory .
4. The sampling theory and testing of hypothesis and making inferences and Chi- Square test.
5. Concept of Regression and Correlation Theory.

Unit	Details	Lectures
<b>I</b>	<p><b>The Mean, Median, Mode, and Other Measures of Central Tendency:</b> Index, or Subscript, Notation, Summation Notation, Averages, or Measures of Central Tendency ,The Arithmetic Mean , The Weighted Arithmetic Mean , Properties of the Arithmetic Mean , The Arithmetic Mean Computed from Grouped Data , The Median, The Mode, The Empirical Relation Between the Mean, Median, and Mode, The Geometric Mean G, The Harmonic Mean H ,The Relation Between the Arithmetic, Geometric, and Harmonic Means, The Root Mean Square, Quartiles, Deciles, and Percentiles, Software and Measures of Central Tendency.</p> <p><b>The Standard Deviation and Other Measures of Dispersion:</b> Dispersion, or Variation, The Range, The Mean Deviation, The Semi- Interquartile Range, the 10–90 Percentile Range, The Standard Deviation, The Variance, Short Methods for Computing the Standard Deviation, Properties of the Standard Deviation, Empirical Relations Between Measures of Dispersion, Absolute and Relative Dispersion; Coefficient of Variation</p> <p><b>Moments, Skewness, and Kurtosis:</b> Moments, Moments for Grouped Data, Relations Between Moments, Computation of Moments for Grouped Data, Moments in Dimensionless Form, Skewness, Kurtosis, Population Moments, Skewness, and Kurtosis, Software Computation of Skewness and Kurtosis</p>	<b>10</b>



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<b>II</b>	<p><b>Elementary Sampling Theory :</b> Sampling Theory, Random Samples and Random Numbers, Sampling With and Without Replacement, Sampling Distributions, Sampling Distribution of Means, Sampling Distribution of Proportions, Sampling Distributions of Differences and Sums, Standard Errors, Software Demonstration of Elementary Sampling Theory.</p> <p><b>Statistical Estimation Theory:</b> Estimation of Parameters, Unbiased Estimates, Efficient Estimates, Point Estimates and Interval Estimates; Their Reliability, Confidence-Interval Estimates of Population Parameters, Probable Error.</p> <p><b>Statistical Decision Theory:</b> Statistical Decisions, Statistical Hypotheses, Tests of Hypotheses and Significance, or Decision Rules, Type I and Type II Errors, Level of Significance, Tests Involving Normal Distributions, Two-Tailed and One-Tailed Tests, Special Tests, Operating-Characteristic Curves; the Power of a Test, p- Values for Hypothesis Tests, Control Charts, Tests Involving Sample Differences, Tests Involving Binomial Distributions</p>	<b>10</b>
<b>III</b>	<p><b>Small Sampling Theory:</b> Small Samples, Student's t Distribution, Confidence Intervals, Tests of Hypotheses and Significance, The Chi-Square Distribution, Confidence Intervals for Sigma, Degrees of Freedom, The F Distribution.</p> <p><b>The Chi-Square Test:</b> Observed and Theoretical Frequencies, Definition of chi-square, Significance Tests, The Chi-Square Test for Goodness of Fit, Contingency Tables, Yates' Correction for Continuity, Simple Formulas for Computing chi-square, Coefficient of Contingency, Correlation of Attributes, Additive Property of chi-square.</p> <p><b>Correlation Theory:</b> Correlation and Regression, Linear Correlation, Measures of Correlation, The Least-Squares Regression Lines, Standard Error of Estimate, Explained and Unexplained Variation, Coefficient of Correlation, Remarks Concerning the Correlation Coefficient, Product-Moment Formula for the Linear Correlation Coefficient, Short Computational Formulas, Regression Lines and the Linear Correlation Coefficient, Correlation of Time Series, Correlation of Attributes, Sampling Theory of Correlation, Sampling Theory of Regression.</p>	<b>10</b>

<b>Course Outcome</b>	
<b>Learner will be able to</b>	
<b>CO1</b>	Understand measures of central tendencies with the help of R programming.
<b>CO2</b>	Learn Moments, skewness, kurtosis and importing data in R with the help of Excel/CSV file
<b>CO3</b>	Learn Regression, correlation Theory and small sampling theory.
<b>CO4</b>	Understand statistical estimation with the help of hypothesis
<b>CO5</b>	Understand concepts of hypothesis, power of test, critical region

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<b>Books and References:</b>					
<b>Sr. No.</b>	<b>Title</b>	<b>Author/s</b>	<b>Publisher</b>	<b>Edition</b>	<b>Year</b>
1.	A text book of Applied Mathematics Vol I	P. N. Wartikar and J. N. Wartikar	Pune Vidyathi Graha		
2.	Statistics	Murray R. Spiegel, Larry J. Stephens.	Mcgraw –Hill International	Fourth	
3.	A Practical Approach using R	R.B. Patil, H.J. Dand and R. Bhavsar	SPD	1	2017
4.	Fundamental of Mathematical Statistics	S.C. GUPTA and V.K. KAPOOR	Sultan Chand And Sons	Eleventh revised	2011
5.	Mathematical Statistics	J.N. Kapur and H.C. Saxena	S. Chand	Twentieth revised	2005

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<b>B. Sc. (Information Technology)</b>		<b>Semester – IV</b>	
<b>Course Name: Computer Oriented Statistical Techniques Practical</b>		<b>Course Code: VGVUSTNCTP401</b>	
<b>Periods per week 1 Period is 120 minutes</b>		<b>2</b>	
<b>Credits</b>		<b>2</b>	
		<b>Hours</b>	<b>Marks</b>
<b>Evaluation System</b>	<b>Practical Examination</b>	<b>2</b>	<b>100</b>
	<b>Internal</b>	-	-

<b>List of Practical</b>	
<b>1.</b>	Using R execute the basic commands, array, list and frames.
<b>2.</b>	Create a Matrix using R and Perform the operations addition, inverse, transpose and multiplication operations.
<b>3.</b>	Using R Execute the statistical functions: mean, median, mode, quartiles, range, inter quartile range histogram
<b>4.</b>	Using R import the data from Excel / .CSV file and perform the above functions.
<b>5.</b>	Using R import the data from Excel / .CSV file and calculate the standard deviation, variance, co-variance.
<b>6.</b>	Using R import the data from Excel / .CSV file and draw the skewness.
<b>7.</b>	Import the data from Excel / .CSV and perform the hypothetical testing.
<b>8.</b>	Import the data from Excel / .CSV and perform the Chi-squared Test.
<b>9.</b>	Using R perform the binomial and normal distribution on the data.
<b>10.</b>	Perform the Linear Regression using R.
<b>11.</b>	Compute the Least squares means using R.
<b>12.</b>	Compute the Linear Least Square Regression

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<b>B. Sc (Information Technology)</b>		<b>Semester – IV</b>	
<b>Course Name: Law and Cyberspace- II</b>		<b>Course Code: VGVCUOE</b>	
<b>Periods per week (1 Period is 60 minutes)</b>		<b>2</b>	
<b>Credits</b>		<b>2</b>	
		<b>Hours</b>	<b>Marks</b>
<b>Evaluation System</b>	<b>Theory Examination</b>	<b>2</b>	<b>60</b>
	<b>Internal</b>	<b>--</b>	<b>40</b>

**Course Objective**

**To make learner understand**

1. E-Commerce Taxation real world problems, Concept of Permanent Establishment
2. Digital Signatures, Digital Signature Certificate.
3. Concept of copyright.
4. Status of Electronic Records as evidence, The Indian Evidence Act of 1872 and The Information Technology Act, 2000.
5. Protection of Cyber Consumers in India.

<b>Unit</b>	<b>Details</b>	<b>Lectures</b>
<b>I</b>	<b>E-Commerce Taxation: Real Problems in the Virtual World:</b> A Tug of War on the Concept of Permanent Establishment“, Finding the PE in Cross Border E-Commerce, The United Nations Model Tax Treaty, The Law of Double Taxation Avoidance Agreements and Taxable Jurisdiction Over Non-Residents, Under the Income Tax Act, 1961, Tax Agents of Non-Residents under the Income Tax Act,1961 and the Relevance to E-Commerce, Source versus Residence and Classification between Business Income and Royalty, The Impact of the Internet on Customer Duties, Taxation Policies in India: At a Glance.	<b>10</b>
<b>II</b>	<b>The Indian Evidence Act of 1872 v. Information Technology Act, 2000:</b> Status of Electronic Records as Evidence, Proof and Management of Electronic Records; Relevancy, Admissibility and Probative Value of E-Evidence, Proving Digital Signatures, Proof of Electronic Agreements, Proving Electronic Messages, Other Amendments in the Indian Evidence Act by the IT Act, Amendments to the Bankers Books, Evidence Act, 1891 and Reserve Bank of India Act, 1934.	<b>10</b>
<b>III</b>	<b>Digital Signature, Certifying Authorities and E-Governance:</b> Digital Signatures, Digital Signature Certificate, Certifying Authorities and Liability in the Event of Digital Signature Compromise, E-Governance in India: A Warning to Babudom! <b>Protection of Cyber Consumers in India:</b> Are Cyber Consumers Covered Under the Consumer Protection Act? Goods and Services, Consumer Complaint, Defect in Goods and Deficiency in Services, Restrictive and Unfair Trade Practices, Instances of Unfair Trade	<b>10</b>

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<b>Course Outcome</b>	
<b>Learner will achieve competency in</b>	
<b>CO1</b>	Knowledge of E-taxation, The Law of Double Taxation Avoidance Agreements.
<b>CO2</b>	Understanding the evidence in E-world
<b>CO3</b>	Knowledge of Digital signature, certifying authority.
<b>CO4</b>	Identifying the Certifying Authorities and Liability in the Event of Digital Signature compromise.
<b>CO5</b>	Protection of cyber consumers.

<b>Books and References:</b>					
<b>Sr. No.</b>	<b>Title</b>	<b>Author/s</b>	<b>Publisher</b>	<b>Edition</b>	<b>Year</b>
1.	Cyber Law Simplified	Vivek Sood	TMH Education	First edition	2001
2.	Cyber Laws	Pavan Duggal	Universal's	3 <sup>rd</sup> edition	2023
3.	The Information technology Act, 2000 -Bare act 2024	Professional's	Professional's Book publisher	Latest 2024	2024

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<b>B. Sc. (Information Technology)</b>		<b>Semester – IV</b>	
<b>Course Name: Advanced Web Programming Practical</b>		<b>Course Code: VGVUSTVSE401</b>	
<b>Periods per week (1 Period is 120 minutes)</b>		<b>2</b>	
<b>Credits</b>		<b>2</b>	
		<b>Hours</b>	<b>Marks</b>
<b>Evaluation System</b>	<b>Practical Examination</b>	<b>3</b>	<b>100</b>
	<b>Internal</b>	<b>-</b>	<b>-</b>

### Course Objective

#### To make learner aware of

1. Basics of C# fundamentals.
2. Web form fundamentals and various form controls used in website development using C#.
3. Master page and content page development in C#.
4. ADO.NET fundamentals, data binding and data controls.
5. ASP.NET AJAX basics.

### List of Practical

<b>1.</b>	<b>Working with basic C# :</b> <b>The C# Language:</b> C# Language Basics, Variables and Data Types, Variable Operations, Object-Based Manipulation, Conditional Logic, Loops, Methods, Class and Object.
a.	Create an application that obtains four int values from the user and displays the product.
b.	Create an application to demonstrate string operations.
d.	Create an application to demonstrate following operations i. Generate Fibonacci series.                      ii. Test for prime numbers. iii. Test for vowels.                                      iv. Use of foreach loop with arrays v. Reverse a number and find sum of digits of a number.
e.	Create an application to demonstrate method overloading.
<b>2.</b>	<b>Working with Object Oriented C#:</b> Constructor, destructor, Inheritance and all types of inheritance , use of Interface.
a.	Create simple application to perform following operations i. Finding factorial Value    ii. Money Conversion    iii. Temperature Conversion
b.	Create simple application to demonstrate use of following concepts i. Inheritance (all types) ii. Constructor overloading iii. Interfaces
<b>3.</b>	<b>Working with Web Forms and Controls(Part A):</b> <b>Web Form Fundamentals:</b> Writing Code, Using the Code-Behind Class, Adding Event Handlers, Introducing Server Controls with its properties, AutoPostBack mechanism.
a.	Create a simple web page with sever controls TextBox, Button, Label,CheckBox, RadioButton to demonstrate setting and use of their properties)
b.	Create a simple web page with sever controls ListBox, DropDownList, CheckBoxList, RadioButtonList , BulletedList to demonstrate setting and use of their properties)



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a.	Create a web application to demonstrate use of GridView control template and GridView hyperlink.
b.	Create a web application to demonstrate use of GridView button column and GridView events.
c.	Create a web application to demonstrate GridView paging and Creating own table format using GridView.
<b>9.</b>	<b>Working with Database more examples.</b>
a.	Create a web application bind data in a multiline textbox by querying in another textbox.
b.	Create a web application to display records by using database.
c.	Demonstrate the use of Datalist link control.
<b>10.</b>	<b>Working with AJAX and Master Page:</b> Understanding Ajax, Using Partial Refreshes, Using Progress Notification, Implementing Timed Refreshes, Working with the ASP.NET AJAX ControlToolkit. Master Page: What is Master Page, Content Page , How to create Master Page and Content Page.
a.	Create a web application to demonstrate use of Master Page with applying Styles and Themes for page beautification.
b.	Create a web application to demonstrate use of various Ajax controls.
c.	Create a web application to demonstrate use of various ASP.NET AJAX ControlToolkit.
<b>11.</b>	<b>Programs to create and use DLL</b>

Course Outcome	
Learner will be able to	
<b>CO1</b>	Design a responsive web site and demonstrate Rich Internet Application.
<b>CO2</b>	Implement interactive and dynamic web page(s) using HTML,CSS,AJAX, C# with .NET concepts.
<b>CO3</b>	Develop database oriented web application.
<b>CO4</b>	Build dynamic web site using server side .NET technology and Database connectivity.
<b>CO5</b>	Motivate to work as website developer.



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<b>Books and References:</b>					
<b>Sr. No.</b>	<b>Title</b>	<b>Author/s</b>	<b>Publisher</b>	<b>Edition</b>	<b>Year</b>
1.	Beginning ASP.NET 4.5 in C#	Matthew MacDonald	Apress		2012
2.	C# 2015	Anne Bohem and Joel Murach	Murach	Third	2016
3.	Murach's ASP.NET 4.6 Web Programming in C# 2015	Mary Delamater and Anne Bohem	SPD	Sixth	2016
4.	ASP.NET 4.0 programming	J. Kanjilal	Tata McGraw-Hill		2011
5.	Programming ASP.NET	D. Esposito	Microsoft Press (Dreamtech)		2011
6.	Beginning Visual C# 2010	K. Watson, C. Nagel, J.H Padderson, J.D. Reid, M. Skinner	Wrox (Wiley)		2010

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**Evaluation scheme**

(Major, Minor, VSEC)

**1. Internal examination: (40marks)**

i. **Test: 1 Class test of 15 marks. (Can be taken online)**

<b>Q</b>	<b>Attempt <u>any three</u> of the following:</b>	<b>15</b>
a.		
b.		
c.		
d.		
e.		
f.		

i. **15 marks project/presentation/assignment.**

ii. **10 marks: Active participation in the class, overall conduct, attendance.**

**2. External Examination: (60marks)**

<b>All questions are compulsory</b>		
<b>Q.1.</b>	<b>(Based on Unit 1) Attempt <u>any three</u> of the following:</b>	<b>15</b>
a.		
b.		
c.		
d.		
e.		
f.		
<b>Q.2.</b>	<b>(Based on Unit 2) Attempt <u>any three</u> of the following:</b>	<b>15</b>
<b>Q.3.</b>	<b>(Based on Unit 3) Attempt <u>any three</u> of the following:</b>	<b>15</b>
<b>Q.4.</b>	<b>(Based on whole syllabus) Attempt <u>any three</u> of the following:</b>	<b>15</b>

**3. Practical Exam: 100marks**

A Certified copy journal is essential to appear for the practical examination.

1.	Practical Question 1	<b>40</b>
2.	Practical Question 2	<b>40</b>
3.	Journal	10
4.	Viva Voce	10

OR

1.	Practical Question	<b>80</b>
2.	Journal	10
3.	Viva Voce	10

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**Evaluation scheme**

(AEC)

**1. Internal Evaluation (50 marks).**

i. **Test: 1 Class test of 15 marks. (Can be taken online)**

Q	Attempt <u>any three</u> of the following:	15
a.		
b.		
c.		
d.		
e.		
f.		

i. **25 marks project/presentation/assignment.**

ii. **10 marks: Active participation in the class, overall conduct, attendance.**

**Evaluation scheme**

(CC)

**1. Internal Evaluation (50 marks).**

i. **Test: 1 Class test of 15 marks. (Can be taken online)**

Q	Attempt <u>any three</u> of the following:	15
a.		
b.		
c.		
d.		
e.		
f.		

ii. **35 marks Activities**

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Technology comprised of following members**

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Mrs. Vandana Y Kadam, Member

Mrs. Rakhee D Rane, Member

Mrs. Nanda A Rupnar, Member

Ms. Mohini Bhole, Member

Ms. Pranali Pawar, Member

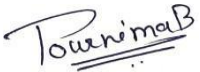
Dr. Hiren Dand , VC nominee

Professor (Dr.) Ajay S Patil, Subject Expert, North Maharashtra University

Mr. Milind Narayan Kolambe, Subject Expert, Pune University

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Chairperson



Dr. Hiren Dand  
VC Nominee