APPENDIX - AI (Three Years Six Semesters Degree Programme) (Choice Based Credit System)

Scheme of Teaching, Learning, Examination and Evaluation (B.Sc. Part-I) (Semester-I) Computer Science/CA(Voc-Non Voc)/IT

Sr. No	Subject	Subject Code	Teaching & Learning Scheme							Duration of Exams in Hrs	Examination & Evaluation Scheme						
			Teaching Period Per week				Credits				Maximum Marks					Minimum Passing	
			L	T	P	Total	Theory/ Tutorial	Practical	Total		Theory+ MCQ Ext	Skill Enhancement Module (SEM) Internal	Practical		Total Marks	Marks	Grade
													Internal	External			
1	DSC-1: Fundamentals of Computer & C programming	CS1	6	-	-	6	4.5	-	4.5	3	80	20	-	-	100	40	P
2	DSC-2: Practical for C programming	CSP1	-	-	6	6	-	2.25	2.25	3	-	-	25	25	50	25	P

Scheme of Teaching, Learning, Examination and Evaluation (B.Sc. Part-I) (Semester-II) Computer Science/CA(Voc-Non Voc)/IT

Sr. No	Subject	Subject Code	Teaching & Learning Scheme							Duration of Exams in Hrs	Examination & Evaluation Scheme						
			Teaching Period Per week				Credits				Maximum Marks					Minimum Passing	
			L	T	P	Total	Theory/ Tutorial	Practical	Total		Theory+ MCQ Ext	Skill Enhancement Module (SEM) Internal	Practical		Total Marks	Marks	Grade
													Internal	External			
3	DSC-3 Data Structure and CPP	CS2	6	-	-	6	4.5	-	4.5	3	80	20	-	-	100	40	P
4	DSC-4 Practical On DS And CPP	CSP2	-	-	6	6	-	2.25	2.25	3	-	-	25	25	50	25	P

Scheme of Teaching, Learning, Examination and Evaluation (B.Sc. Part-II) (Semester-III) Computer Science/CA(Voc-Non Voc)/IT

Sr. No	Subject	Subject Code	Teaching & Learning Scheme							Duration of Exams in Hrs	Examination & Evaluation Scheme						
			Teaching Period Per week				Credits				Maximum Marks					Minimum Passing	
			L	T	P	Total	Theory/ Tutorial	Practical	Total		Theory+ MCQ Ext	Skill Enhancement Module (SEM) Internal	Practical		Total Marks	Marks	Grade
													Internal	External			
5	DSC-5 Networking and Web Technologies	CS3	6	-	-	6	4.5	-	4.5	3	80	20	-	-	100	40	P
6	DSC-6 Practical Web Technologies	CSP3	-	-	6	6	-	2.25	2.25	3	-	-	25	25	50	25	P

Scheme of Teaching, Learning, Examination and Evaluation (B.Sc. Part-II) (Semester-IV) Computer Science/CA(Voc-Non Voc)/IT

Sr. No	Subject	Subject Code	Teaching & Learning Scheme							Duration of Exams in Hrs	Examination & Evaluation Scheme						
			Teaching Period Per week				Credits				Maximum Marks					Minimum Passing	
			L	T	P	Total	Theory/ Tutorial	Practical	Total		Theory+ MCQ Ext	Skill Enhancement Module (SEM) Internal	Practical		Total Marks	Marks	Grade
													Internal	External			
7	DSC7 RDBMS and Core Java	CS4	6			6	4.5	-	4.5	3					100	40	p
8	DSC8 Practical on RDBMS and Core Java	CSP4	--	------	6	6	-	2.25	2.25	3			25	25	50	25	p
9	Open Elective Course (Optional)		GIC/MOOC/Skill course														

Scheme of Teaching, Learning, Examination and Evaluation (B.Sc. Part-III) (Semester-V) Computer Science

Sr. No	Subject	Subject Code	Teaching & Learning Scheme							Duration of Exams in Hrs	Examination & Evaluation Scheme						
			Teaching Period Per week				Credits				Maximum Marks					Minimum Passing	
			L	T	P	Total	Theory/ Tutorial	Practical	Total		Theory+ MCQ Ext	Skill Enhancement Module (SEM) Internal	Practical		Total Marks	Marks	Grade
													Internal	External			
10	**DSC-9 Fundamentals of Open Source and Adv. Java**	CS5	6		-	6		-		3	60+20	20	-	-	100	40	p
11	**DSC 10 Practical on FOSS & Adv.Java**	CSP5			6	6		-		3			25	25	50	25	p
12	**Open Elective Course (Optional)**		GIC/MOOC/Skill course														

Scheme of Teaching, Learning, Examination and Evaluation (B.Sc. Part-III) (Semester-VI) Computer Science

Sr. No	Subject	Subject Code	Teaching & Learning Scheme							Duration of Exams in Hrs	Examination & Evaluation Scheme						
			Teaching Period Per week				Credits				Maximum Marks					Minimum Passing	
			L	T	P	Total	Theory/ Tutorial	Practical	Total		Theory+ MCQ Ext	Skill Enhancement Module (SEM) Internal	Practical		Total Marks	Marks	Grade
													Internal	External			
13	**DSE-I(1) Python Programming**	CSE1	6		-	6	4.5	-	4.5	3	60+20	20	-	-	100	40	p
14	**DSE-I(2) R Programming**	CSE2	6		-	6	4.5	-	4.5	3	60+20	20	-	-	100	40	p
15	**DSE-II(1) Practical on Python Programming**	CSEP1			6	6		2.25	2.25	3			25	25	50	25	p
16	**DSE-II(2) Practical on R Programming**	CSEP2			6	6		2.25	2.25	3			25	25	50	25	p
17	**Project / dissertation if applicable**				2	2		1	1		-	-					P
18	**(AEC) on DSC if applicable**			1		1	1	--	1	1	--		25	-	25	10	P
19	**Open Elective Course (Optional)**		**GIC/MOOC/Skill course**														

Note: Studentss shall opt one of the DSE-I (1) and DSE-I (2) papers and its related practical (either DSE-II (1) and DSE-II (2))

Sant Gadge Baba Amravati University, Amravati
Faculty of Science and Technology

Syllabus Prescribed for B.Sc.-III Year UG Programme

Programme: B.Sc. (Computer Science)

Semester: V

Code of the Course/Subject	Title of the Course/Subject	(Total Number of Periods)
CS5	**FOSS and Advance Java**	**72**

Course Objectives: After completion of this course student will be able to:

1. Use the basics of free software and their applications.
2. Use the latest version of Open-source operating System.
3. Execute commands in and run the scripts in Linux OS.
4. Get the knowledge of core concepts of Java i.e. Multithreading & Exception Handling.
5. Develop the window based front end for an application using various controls.
6. Establish the connectivity between java application and database.

Unit	Content
Unit I	**Introduction:** Introduction to FOSS, Open-Source License, History of FOSS, Need of FOSS, Features of FOSS, Difference Between FOSS and Commercial Software, Advantages & Disadvantages of FOSS, Applications of Open FOSS, Popular FOSS: Mozila Firefox, Linux, Libre Office, Python, PHP, Blender (**12 Periods)**
Unit II	**Linux:** History, Features of Linux, Difference between Unix & Linux, Difference between Windows & Linux, Components of Linux System, Architecture of Linux OS, Linux Distributions, Structure of Linux File System, Types of Linux File Systems. (**12 Periods)**
Unit III	**Working with Commands:** Directory Commands, pwd, ls, cd, mkdir, rmdir, Renaming directory **(**mv**,** find, rename) **File Commands:** file, touch, rm, cp, mv, rename **Printing Commands,** Shell &Types of Shell**,** Shell Commands, Writing & Executing First Script, Shell Variables**. (11 Periods)**
Unit IV	**Multithreading:** Introduction, Creating and Executing Multiple Threads, Life Cycle of Thread, Thread Priority **Exception Handling:** Introduction, Types of Exceptions, Exception Handling in Java, finally block, throw block, throws keyword, Multiple Catch Blocks, Nested try statements (**11 Periods)**
Unit V	**A Tour of Swing:** Introduction, Labels, Icons, Buttons, Labels, Text Fields, Check Boxes, Radio buttons, Combo Box, Tables, Dialog Boxes **Event Handling**: Event delegation model, Adapter classes, Event classes, Event Listener Interfaces, Handling Mouse and Keyboard events. (**11 Periods)**
Unit VI	**JDBC:** What is and why JDBC? JDBC Driver & its types, **JDBC API (java.sql):** Driver Manager class, **Interfaces:** Connection, Statement, Result Set, Prepared Statement, Callable Statement, Writing first JDBC application (**11 Periods)**
***SEM: A**ssignment, Class test, Seminar, Study tour, Industrial visit, Field work, Group discussion or any other innovative practice/activity	
Course Outcomes: 1. Making use of Linux operating system student will bags the one new skill i.e. operating computer with another operating system than regular one. 2. By the study of Advance Java, student will be able to develop the java application having database support.	

**Activities	1. Assignments 2. Quizzes 3.Seminars 4. Internal Assessments	**4 Periods**

Course Material/Learning Resources

Text books:

1. FUNDAMENTALS OF OPEN SOURCE SOFTWAR By M. N. RAO
2. Java Programming By, E. Balagurusami

Reference Books:

1. Ubuntu Linux Unleashed 2021 Edition 14th Edition By Matthew Helmke
2. Java The Complete Reference By, Herbert Schildt
3. Mastering Java2 J2SE1.4 By, John Zukouski

Weblink to Equivalent MOOC on SWAYAM if relevant:

https://spoken-tutorial.org/

Weblink to Equivalent Virtual Lab if relevant:

https://java-iitd.vlabs.ac.in/

Sant Gadge Baba Amravati University, Amravati
Faculty of Science and Technology

Syllabus Prescribed for B.Sc.-III Year UG Programme

Programme: B.Sc. (Computer Science)

Semester: V

Code of the Course/Subject	Title of the Course/Subject	(Total Number of Periods)
CSP5	Laboratory/Practical on FOSS and Advance Java	(06 periods per Batch per Week)

Course Objectives: After completion of this course student will be able to:

1. Use the basics of free software and their applications.
2. Use the latest version of Open-source operating System.
3. Execute commands in and run the scripts in Linux OS.
4. Get the knowledge of core concepts of Java i.e. Multithreading & Exception Handling.
5. Develop the window based front end for an application using various controls.
6. Establish the connectivity between java application and database.

*** List of Practical/Laboratory Experiments/Activities etc.**

Sr. No.	Name of Experiment/Practical
1	Research and compile a list of five different open-source software applications, highlighting their key features and use cases.
2	Examine and compare two different open-source licenses (e.g., GNU GPL and Apache License). Discuss their terms and implications for software development.
3	Create a timeline that illustrates significant milestones in the history of open-source software.
4	Compile a list of five advantages and five disadvantages of using open-source software in a real-world project.
5	Install and explore one of the popular open-source applications mentioned in the syllabus (e.g., Mozilla Firefox, LibreOffice) and document your experience.
6	Install two different Linux distributions (e.g., Ubuntu and CentOS) in a virtual machine or on separate partitions. Compare their features and performance.
7	Navigate the Linux file system, create directories, and examine their structure. List the contents of a directory using basic commands like `ls` and `pwd`.
8	Practice basic Linux commands such as creating, renaming, and deleting files and directories. Use commands like `mkdir`, `touch`, `rm`, and `mv`.
9	Open a terminal window and experiment with different shells (e.g., Bash, Zsh). Change your shell prompt and explore shell commands.
10	Write a simple shell script that prints "Hello, World!" to the console and execute it.
11	Create and use shell variables in your scripts. Display the values of variables and practice basic arithmetic operations.
12	Write a shell script that accepts command-line arguments and performs a specific task based on the provided input.
13	Create a Java program that demonstrates the creation and execution of multiple threads. Observe their life cycles and set thread priorities.

14	Write Java code that includes try-catch blocks to handle exceptions. Experiment with various types of exceptions and demonstrate the use of the `finally` block.
15	Develop a Java Swing application that includes labels, buttons, text fields, and a combo box. Customize their appearance and layout.
16	Implement event listeners for GUI components. Create actions that respond to button clicks, mouse events, or keyboard input.
17	Design a Swing application that displays dialog boxes for user input and feedback. Include options for message dialogs and file dialogs.
18	Write a Java program that establishes a connection to a database using JDBC. Display a success message upon successful connection.
19	Develop a Java application that executes SQL queries (e.g., SELECT, INSERT, UPDATE) on a database using JDBC. Retrieve and display data.
20	Modify exercise no. 19 to use prepared statements in JDBC for improved security and efficiency when interacting with a database.

Distribution of Marks for Practical Examination

Time: 4 hours (One Day Examination) Marks: 50

Exercise-I: 15

Exercise-II; 15

Viva-Voce: 10

Record: 10

Total: 50

Sant Gadge Baba Amravati University, Amravati

Faculty of Science and Technology

Part B

Syllabus Prescribed for the Year 2024-25

UG Programme: B.Sc. Part III (Computer Science)

Semester VI

Code of the Course/Subject	Title of the Course/Subject	(Total Number of Periods)
CSE1	**Python Programming**	**72**

Cos: On completion of course, the students will be able to

1. Describe the core syntax and semantics of Python programming language.
2. Discover the need for working with the strings and functions.
3. Illustrate the process of structuring the data using lists, dictionaries, tuples and sets.
4. Indicate the use of regular expressions and built-in functions to navigate the file system.
5. Infer the Object-oriented Programming concepts in Python.

Unit	Content
Unit-I	**Introduction:** History of Python Programming Language, Thrust area of Python, Installing Anaconda Python Distribution, Installing PyCharm IDE to setup a Python Development Environment, Creating and running your first Python Project **Parts of Python Programming Language:** Identifiers, Keywords, Statements and Expressions, Variables, Operators, Precedence and Associativity, Data Types, Indentation, Comments, Reading Input, Printing Output, Type Conversions, The type() Function and Is Operator, Dynamic and Strongly Typed Language **(12 Periods)**
Unit-II	**Control Flow Statements:** The if, if-else, if-elif-else Decision Control Statement, Nested if Statement, The while Loop, The for Loop, The continue and break Statements, Catching Exceptions Using try and except Statement **Functions:** 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 **(12 Periods)**
Unit-III	**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, The del Statement **(11 Periods)**
Unit-IV	**Dictionaries:** Creating Dictionary, Accessing and Modifying key:value Pairs in Dictionaries, Built-In Functions Used on Dictionaries, Dictionary Methods, The del Statement **Tuples and Sets:** Creating Tuples, Basic Tuple Operations, Indexing and Slicing in Tuples, Built-In Functions Used on Tuples, Relation between Tuples and Lists, Relation between Tuples and Dictionaries, Tuple Methods, Using zip() Function, Sets, Set Methods, Traversing of Sets, Frozenset. **(11 Periods)**
Unit-V	**Files:** Types of Files, Creating and Reading Text Data, File Methods to Read and Write Data, Reading and Writing Binary Files, The Pickle Module, Reading and Writing CSV Files, Python os and os.path Modules, **Regular Expression Operations:** Using Special Characters, Regular Expression Methods, Named Groups in Python Regular Expressions, Regular Expression with glob Module. **(11Periods)**

Unit-VI	**Object-Oriented Programming:** Classes and Objects, Creating Classes in Python, Creating Objects in Python, The Constructor Method, Classes with Multiple Objects, Class Attributes versus Data Attributes, Encapsulation, Inheritance, The Polymorphism. **(11 Periods)**
SEM: **A**ssignment, Class test, Seminar, Study tour, Industrial visit, Field work, Group discussion or any other innovative practice/activity	
**Activities	1. Download and install python. 2. Write and execute python program which prints "Welcome to Python" **(4 Periods)**

Course Material/Learning Resources

Text books:

1. "Introduction to Python Programming", 1st Edition, by Gowrishankar S, Veena A

Reference Books:

1. "Python Data Science Handbook: Essential Tools for Working with Data", by Jake VanderPlas,
2. "Hands-On Machine Learning with Scikit-Learn and TensorFlow: Concepts, Tools, and Techniques to Build Intelligent Systems", by Aurelien Geron
3. "Core Python Applications Programming", 3rd Edition, by Wesley J Chun
4. "Flask Web Development: Developing Web Applications with Python", 2nd Edition, by Miguel Grinberg,

Weblink to Equivalent MOOC on SWAYAM if relevant:

1. https://onlinecourses.swayam2.ac.in/aic20_sp33/preview
2. https://onlinecourses.nptel.ac.in/noc19_cs40/preview
3. https://www.classcentral.com/course/swayam-python-for-data-science-14266

Weblink to Equivalent Virtual Lab if relevant:

1. https://python-iitk.vlabs.ac.in/
2. http://vlabs.iitb.ac.in/vlabs-dev/labs/python-basics/index.html
3. https://www.vlab.co.in/broad-area-computer-science-and-engineering

Any pertinent media (recorded lectures, YouTube, etc.) if relevant:

1. https://www.youtube.com/watch?v=daefaLgNkw0
2. https://www.youtube.com/watch?v=W8KRzmHUcc
3. https://www.youtube.com/watch?v=gfDE2a7MKjA

Sant Gadge Baba Amravati University, Amravati

Part B

Faculty of Science and Technology

Syllabus Prescribed for the Year 2024-25

UG Programme: B.Sc. Part III (Computer Science)

Semester VI

Code of the Course/Subject	Title of the Course/Subject	(Total Number of Periods)
CSE2	**R Programming**	**72 Periods**

Cos:

After successful completion this course learner will be able to:

1. Learn Fundamentals of R, Develop an R script and execute it
2. Apply the knowledge of R to data Analytics for real life applications
3. Install and use R for simple programming tasks
4. Install, load and deploy the required packages, and build new packages for sharing and reusability
5. Covers how to use different functions in R, how to read data into R, accessing R packages, writing R functions, debugging, and organizing data using R functions.
6. Extract data from different sources using API and use it for data analysis
7. Visualize and summarize the data using statistical functions.
8. Design application with database connectivity for data analysis

Unit	Content
Unit I	**Introduction to R:** History, Features, and Environment Setup, R Basic Syntax and R Studio, Data Types in R, Vectors, Lists, and Matrices Exploring R's Data Structures: Arrays, Factors, and, Data Frames, Special Values in R: NA, Inf, and -Inf, Input and Output in R. **(12) Periods**
Unit II	**R Programming Language:** Variables, Basic Data Types and Assignment **R Operators:** Arithmetic, Relational, Logical. **Decision Making in R**: if Statements if-else Statements, and switch Statements, **Loops in R:** repeat, while, and for Loops, Loop Control Statements: break and next. **(12) Periods**
Unit III	**R Functions:** Defining and Using Functions. **Built-in Functions in R:** mean(), sum(), paste(), and More **Manipulating Text Data in R:** String Functions, Working with Vectors: Sequence, Replication, Access, and Math Operations, Understanding Lists and Their Operations. **(11) Periods**
Unit IV	**Introduction to Data Frames:** Creation, Access, and Manipulation, Loading and Handling Data in R: Working with CSV and Excel Files. **Data Visualization in R:** Creating Histograms, Bar Charts, and Pie Charts, Scatter Plots and Visualization of Relationships, Data Transformation: Logarithm Transformation. **(11) Periods**
Unit V	**Descriptive Statistics:** Data Range, Mean, Median, Mode, and Standard Deviation, Correlation Analysis and Hypothesis Testing **Data Distribution Checking:** Normality Assessment, Introduction to Statistical Tests: t-tests, Wilcoxon tests. **(11) Periods**
Unit VI	**Advanced Data Manipulation:** Merging and Joining Data, Working with Factors and Levels, Practical Data Analysis with Real-world Datasets, Database **Connectivity with R:** Accessing and Querying Data, Mini Project: Applying R for Data Analysis on a Real Dataset. **(11) Periods**
***SEM: A**ssignment, Class test, Seminar, Study tour, Industrial visit, Field work, Group discussion or any other innovative practice/activity	
Course Outcomes: 1. Proficiency in Data Analysis with R 2. Programming Skills and Statistical Knowledge	
**Activities	1.Assignments 2.Quizzes 3.Group Discussion 4.Seminar **(04 Periods)**

Course Material/Learning Resources

Text books:

1. R Programming for Beginners, by Sandip Rakshit, McGraw Hill Education (India), 2017, ISBN : 978-93-5260-455-5.
2. Data Analytics using R, Data Analytics using R, by Seema Acharya, McGrawHill Education (India), 2018, ISBN: 978-93-5260-524-8.

3. R Programming, Retrieved by Tutorials Point (I) simply easy learning, Online Tutorial Library (2018), from https://www.tutorialspoint.com/r/r_tutorial.pdf.
4. R for Dummies by Andrie de Vries, Joris Meys, A Wiley Brand, 2nd Edition, John Wiley and Sons, Inc, 2015, ISBN: 978-1-119-05580-8

References books:

1. Learning R: a step by step function guide to data analysis. 1st edition. By Cotton, R., O'reilly Media Inc. Additional Resources:
2. Beginning R: The statistical programming language, by Gardener, M.(2017). WILEY.
3. Programming Graphical User Interfaces in R. by Lawrence, M., & Verzani, J. (2016). CRC press. (ebook)

Web link to Equivalent MOOC on SWAYAM if relevant:

1. https://jrnold.github.io/r4ds-exercise-solutions/index.html
2. https://www.r-project.org/
3. https://cran.r-project.org/

Web link to Equivalent Virtual Lab if relevant:

1. https://onlinecourses.swayam2.ac.in/aic20_sp35/unit?unit=2&lesson=5
2. https://onlinecourses.swayam2.ac.in/aic20_sp35/unit?unit=2&lesson=6

Any pertinent media (recorded lectures, YouTube, etc.) if relevant:

1. https://youtu.be/fDRa82lxzaU?si=OiwW1smoBpyFrA-8

Sant Gadge Baba Amravati University, Amravati
Faculty of Science and Technology

Part B

Syllabus Prescribed for the Year 2024-25

UG Programme: B.Sc. Part III (Computer Science)

Semester VI

Code of the Course/Subject	Title of the Course/Subject	(Total Number of Periods)
CSEP1	Practical on Python Programming	(06 periods per Batch per Week)

COs

1. To implement Python programs with conditionals and loops.
2. Use functions for structuring Python programs.
3. Represent compound data using Python lists, tuples, and dictionaries.
4. Read and write data from/to files in Python.

*** List of Practical/Laboratory Experiments/Activities etc.**

Sr. No.	Name of Experiment/Practical
1	Write a program to perform different arithmetic operations on numbers in Python.
2	Write a Program for checking whether the given number is an even number or not Using a for loop.
3	Write a program using a while loop that asks the user for a number, and prints a Countdown from that number to zero.
4	Write a program to create, concatenate and print a string and accessing substring from a given string.
5	Write a Python script to print the current date in following format “Sun June 26 02:26:23 IST 2022”
6	Write a Python program to create, append and remove lists.
7	Python program to check if a substring is present in a given string.
8	Write a program to demonstrate working with tuples in Python.
9	Write a program to demonstrate working with dictionaries in Python.
10	Write a Python program to find largest of three numbers.
11	Write a Python program to construct the following pattern using nested for loop. * * * * * * * * * *
12	Write a Python program to print prim numbers less than 20.
13	Write a Python program to find factorial of a number using recursion.
14	Write a Python program to map two lists into a dictionary.
15	Write a Python program to count the frequency of words appearing in a string using a dictionary.
16	Write a Python program to create a dictionary with key as first character and value as words starting with that character.
17	Write a Python program to read the contents of a file in reverse order.
18	Write a Python program to map two lists into a dictionary.
19	Write a Python Program to demonstrate the class and object.
20	Write a Python Program to demonstrate constructor method.

Weblink to Equivalent Virtual Lab if relevant:

1. https://python-iitk.vlabs.ac.in/
2. http://vlabs.iitb.ac.in/vlabs-dev/labs/python-basics/index.html
3. https://www.vlab.co.in/broad-area-computer-science-and-engineering

Distribution of Marks for Practical Examination

Time: 4 hours (One Day Examination) Marks: 50

Exercise-I:	15
Exercise-II;	15
Viva-Voce:	10
Record:	10
Total:	50

Sant Gadge Baba Amravati University, Amravati
Faculty of Science and Technology
Part B
Syllabus Prescribed for the Year 2024-25
UG Programme: B.Sc. Part III (Computer Science)
Semester VI

Code of the Course/Subject	**Title of the Course/Subject** (Laboratory/Practical/practicum/hands-on/Activity)	**(No. of Periods/Week)**
CSEP2	**Practical on R Programming**	**4 periods**

COs

1. Understand the basics of Fundamentals of R.
2. Understands the loading, retrieval techniques of data.
3. Understand how data is analyzed and visualized using statistic functions.

*** List of Practical/Laboratory Experiments/Activities etc.**

Sr. No.	Name of Program/ Experiment
1	Write an R script to do the following: • simulate a sample of 100 random data points from a normal distribution with mean 100 and standard deviation 5 and store the result in a vector. • visualize the vector created above using different plots. • test the hypothesis that the mean equals 100. • use wilcox test to test the hypothesis that mean equals 90.
2	Using the Algae data set from package DMwR to complete the following tasks. • create a graph that you find adequate to show the distribution of the values of algae a6. • show the distribution of the values of size 3. • check visually if oPO4 follows a normal distribution. • produce a graph that allows you to understand how the values of NO3 are distributed across the sizes of river. • using a graph check if the distribution of algae a1 varies with the speed of the river. • visualize the relationship between the frequencies of algae a1 and a6. Give the appropriate graph title, x-axis and y-axis title.
3	Read the file Coweeta.CSV and write an R script to do the following: • count the number of observations per species. • take a subset of the data including only those species with at least 10 observations. • make a scatter plot of biomass versus height, with the symbol colour varying by species, and use filled squares for the symbols. Also add a title to the plot, in italics. • log-transform biomass, and redraw the plot.
4	The built-in data set mammals contain data on body weight versus brain weight. Write R commands to: • Find the Pearson and Spearman correlation coefficients. Are they similar? • Plot the data using the plot command. • Plot the logarithm (log) of each variable and see if that makes a difference.
5	In the library MASS is a dataset UScereal which contains information about popular breakfast cereals. Attach the data set and use different kinds of plots to investigate the following relationships: • relationship between manufacturer and shelf • relationship between fat and vitamins • relationship between fat and shelf • relationship between carbohydrates and sugars • relationship between fiber and manufacturer • relationship between sodium and sugars.
6	Write R script to: • Do two simulations of a binomial number with n = 100 and p = .5. Do you get the same results each time? What is different? What is similar? • Do a simulation of the normal two times. Once with n = 10, μ = 10 and σ = 10, the other with n = 10, μ = 100 and σ = 100. How are they different? How are they similar? Are both approximately normal?
7	Create a database medicine that contains the details about medicines such as {manufacturer, composition, price}. Create an interactive application using which the user can find an alternative to a given medicine with the same composition.
8	Create a database song that contains the fields {song_name, mood, online_link_play_song}. Create an application where the mood of the user is given as input and the list of songs corresponding to that mood appears as the output. The user can listen to any song form the list via the online link given.
9	Create a package in R to perform certain basic statistics functions. Mini project using data set of your choice from Open Data Portal (https://data.gov.in/) for the following exercise