



**THIRUVALLUVAR UNIVERSITY**  
**SERKKADU, VELLORE-632115**

# **M.C.A. COMPUTER APPLICATIONS**

**SYLLABUS**

**FROM THE ACADEMIC YEAR**  
**2023 - 2024**

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<b>TANSICHE REGULATIONS ON LEARNING OUTCOMES-BASED CURRICULUM FRAMEWORK FOR POSTGRADUATE EDUCATION</b>	
<b>Programme</b>	<b>M.C.A.,</b>
<b>Programme Code</b>	
<b>Duration</b>	<b>PG - Two Years</b>
<b>Programme Outcomes (Pos)</b>	<p><b>PO1 : Problem Solving Skill</b> Apply knowledge of Management theories and Human Resource practices to solve business problems through research in Global context.</p> <p><b>PO2 : Decision Making Skill</b> Foster analytical and critical thinking abilities for data-based decision-making.</p> <p><b>PO3 : Ethical Value</b> Ability to incorporate quality, ethical and legal value-based perspectives to all organizational activities.</p> <p><b>PO4 : Communication Skill</b> Ability to develop communication, managerial and interpersonal skills.</p> <p><b>PO5 : Individual and Team Leadership Skill</b> Capability to lead themselves and the team to achieve organizational goals.</p> <p><b>PO6 : Employability Skill</b> Inculcate contemporary business practices to enhance employability skills in the competitive environment.</p> <p><b>PO7 : Entrepreneurial Skill</b> Equip with skills and competencies to become an entrepreneur.</p> <p><b>PO8 : Contribution to Society</b> Succeed in career endeavors and contribute significantly to society.</p> <p><b>PO9 : Multicultural competence</b> Possess knowledge of the values and beliefs of multiple cultures and a global perspective.</p> <p><b>PO10 : Moral and ethical awareness/reasoning</b> Ability to embrace moral/ethical values in conducting one's life.</p>

<p><b>Programme Specific Outcomes (PSOs)</b></p>	<p><b>PSO1 – Placement</b> To prepare the students who will demonstrate respectful engagement with others’ ideas, behaviors, beliefs and apply diverse frames of reference to decisions and actions.</p> <p><b>PSO 2 - Entrepreneur</b> To create effective entrepreneurs by enhancing their critical thinking, problem solving, decision making and leadership skill that will facilitate startups and high potential organizations.</p> <p><b>PSO3 – Research and Development</b> Design and implement HR systems and practices grounded in research that comply with employment laws, leading the organization towards growth and development.</p> <p><b>PSO4 – Contribution to Business World</b> To produce employable, ethical and innovative professionals to sustain in the dynamic business world.</p> <p><b>PSO 5 – Contribution to the Society</b> To contribute to the development of the society by collaborating with stakeholders for mutual benefit.</p>
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<b>METHODS OF EVALUATION FOR THEORY SUBJECTS</b>		
<b>Internal Evaluation</b>	Continuous Internal Assessment Test	<b>25 Marks</b>
	Assignments / Snap Test / Quiz	
	Seminars	
	Attendance and Class Participation	
<b>External Evaluation</b>	End Semester Examination	<b>75 Marks</b>
<b>Total</b>		<b>100 Marks</b>
<b>METHODS OF EVALUATION FOR PRACTICAL SUBJECTS</b>		
<b>Internal Evaluation</b>	Preparation for the Practical Session	<b>40 Marks</b>
	Executing an Exercise within the Stipulated Time	
	Continuous Internal Practical Tests	
	Completing All the Exercises of the Course	
<b>External Evaluation</b>	Coding / Solutions for the Two Problems	<b>50 Marks</b>
	Preparation of the Record	<b>10 Marks</b>
<b>Total</b>		<b>100 Marks</b>

<b>METHODS OF ASSESSMENT</b>	
<b>Remembering (K1)</b>	<ul style="list-style-type: none"> <li>• The lowest level of questions requires students to recall information from the course content.</li> <li>• Knowledge questions usually require students to identify information in the textbook.</li> </ul>
<b>Understanding (K2)</b>	<ul style="list-style-type: none"> <li>• Understanding of facts and ideas by comprehending organizing, comparing, translating, interpolating, and interpreting in their own words.</li> <li>• The questions go beyond implore call and require students to combined at a together.</li> </ul>
<b>Application (K3)</b>	<ul style="list-style-type: none"> <li>• Students must solve problems by using / applying a concept learned in the classroom.</li> <li>• Students must use their knowledge to determine an exact response.</li> </ul>
<b>Analyze (K4)</b>	<ul style="list-style-type: none"> <li>• Analyzing the question is one that asks the students to breakdown something into its component parts.</li> <li>• Analyzing requires students to identify reasons causes or motives and reach conclusions or generalizations.</li> </ul>
<b>Evaluate (K5)</b>	<ul style="list-style-type: none"> <li>• Evaluation requires an individual to make judgment on something.</li> <li>• Questions to be asked to judge the value of an idea, a character, a work of art, or a solution to a problem.</li> <li>• Students are engaged in decision-making and problem-solving.</li> <li>• Evaluation questions do not have single right answers.</li> </ul>
<b>Create (K6)</b>	<ul style="list-style-type: none"> <li>• The questions of this category challenge students to get engaged in creative and original thinking.</li> <li>• Developing original ideas and problem-solving skills.</li> </ul>

**PROGRAMME OUTCOMES (PO) - PROGRAMME SPECIFIC OUTCOMES (PSO)  
MAPPING**

<b>PROGRAMME SPECIFIC OUTCOMES (PSO)</b>					
	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>
<b>PSO1</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>
<b>PSO2</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>
<b>PSO3</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>
<b>PSO4</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>
<b>PSO5</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>

**Level of Correlation between PO's and PSO's**

*(Suggested by UGC as per Six Sigma Tool – Cause and Effect Matrix)*

Assign the value.

**1 – Low**

**2 – Medium**

**3 – High**

**0 – No Correlation**

Course	Number of Credits	Hours Per Week	Examination Duration (hrs)	Marks		
				I. A	ESE	Total
<b>Semester - I</b>						
Core – I : Theory Discrete Mathematics	5	7	3	25	75	100
Core – II : Theory Linux and Shell Programming	5	7	3	25	75	100
Core – III : Theory Python Programming	4	6	3	25	75	100
Elective – I : Lab Data Engineering and Management Lab / Architecture and Frameworks Lab / Linux and Shell Programming Lab	3	5	3	40	60	100
Elective – II : Lab Software Development Technologies Lab / Soft Computing Lab / Python Programming Lab	3	5	3	40	60	100
	20	30				500



Course	Number of Credits	Hours Per Week	Examination Duration (hrs)	Marks		
				I. A	ESE	Total
<b>Semester - II</b>						
Core - IV : Theory Data Structures and Algorithms	5	6	3	25	75	100
Core - V : Theory Internet of Things	5	6	3	25	75	100
Core - VI : Lab Data Structures and Algorithms Lab	4	4	3	40	60	100
Elective - III : Lab Internet of Things Lab / Computer Vision Lab	3	4	3	40	60	100
Elective - IV : Lab Cyber Security Lab / Block Chain Technologies Lab	3	4	3	40	60	100
Skill Enhancement Course I : Theory Cyber Security / Block Chain Technologies	2	4	3	25	75	100
Fundamentals of Human Rights	2	2	3	25	75	100
MOOC Course	2	-	-	-	-	-
	26	30				700

Course	Number of Credits	Hours Per Week	Examination Duration (hrs)	Marks		
				I. A	ESE	Total
<b>Semester - III</b>						
Core VII : Theory Advanced Java Programming	5	6	3	25	75	100
Core VIII : Theory Web Technologies	5	6	3	25	75	100
Core IX : Theory Advanced Machine Learning Techniques	5	6	3	25	75	100
Core X : Lab Advanced Java Programming Lab	4	6	3	40	60	100
Elective – V : Lab Web Technologies Lab / Web Application Development and Hosting Lab	3	3	3	40	60	100
Skill Enhanced Course – II : Lab Advanced Machine Learning Techniques Lab / Social Networking Lab	2	3	3	40	60	100
Internship Industrial Activity	2	-	-	40	60	100
	26	30				700

Course	Number of Credits	Hours Per Week	Examination Duration (hrs)	Marks		
				I. A	ESE	Total
<b>Semester - IV</b>						
Core – XI : Theory High Performance Computing	5	6	3	25	75	100
Core – XII : Theory Big Data Analytics	5	6	3	25	75	100
Project Work and Viva-Voce	7	10	-	80	120	200
Elective – VI : Theory High Performance Computing Lab / Big Data Analytics Lab	3	4	3	40	60	100
Skill Enhancement Course : III : Lab Soft Skills Development Lab / Professional Competency Skill : Data Visualization Lab	2	4	3	40	60	100
Extension Activity	1	-	-	-	-	-
<b>Total</b>	<b>23</b>	<b>30</b>				<b>600</b>
<b>Total Credits</b>	<b>95</b>					

## Discrete Mathematics

### Course Objective

- To know the concepts of relations and functions
- To distinguish among different normal forms and quantifiers
- To solve recurrence relations and permutations & combinations
- To know and solve matrices, rank of matrix & characteristic equations
- To study the graphs and its types

### Unit-I

**Relations**- Binary Relations-Operations on relations- properties of binary relations in a set – Equivalence relations-- Representation of a relation by a matrix -Representation of a relation by a digraph – **Functions**-Definition and examples-Classification of functions-Composition of functions-Inverse function.

### Unit-II

**Mathematical Logic**-Logical connectives-**Well formed formulas** – Truth table of well formed formula –Algebra of proposition –Quine’s method-**Normal forms of well formed formulas**- Disjunctive normal form-Principal Disjunctive normal form-Conjunctive normal form-Principal conjunctive normal form-**Rules of Inference for propositional calculus** – **Quantifiers**- Universal Quantifiers- Existential Quantifiers.

### Unit-III

**Recurrence Relations**- Formulation -solving recurrence Relation by Iteration- solving Recurrence Relations- Solving Linear Homogeneous Recurrence Relations of Order Two- Solving Linear Non homogeneous Recurrence Relations. **Permutations**-Cyclic permutation- Permutations with repetitions- permutations of sets with indistinguishable objects-**Combinations**- Combinations with repetition.

### Unit-IV

**Matrices**- special types of matrices-Determinants-Inverse of a square matrix-Cramer’s rule for solving linear equations-Elementary operations-Rank of a matrix-solving a system of linear equations-characteristic roots and characteristic vectors-Cayley-Hamilton Theorem-problems.

### Unit-V

**Graphs** -Connected Graphs -Euler Graphs- Euler line-Hamiltonian circuits and paths –planar graphs – Complete graph-Bipartite graph-Hyper cube graph-Matrix representation of graphs.

### Text book

1. N.Chandrasekaran and M.Umaparvathi, Discrete mathematics, PHI Learning Private Limited, New Delhi, 2010.

### Reference Book

1. Kimmo Eriksson &Hillevi Gavel, Discrete Mathematics & Discrete Models, Studentlitteratur AB, 2015.
2. Kenneth H. Rosen Discrete Mathematics and applications, Mc Graw Hill, 2012

### Course Outcomes

On the successful completion of the course, students will be able

CO1:	To understand the concepts of relations and functions distinguish among normal forms	K2	IO
CO2:	To analyze and evaluate the recurrence relations	K4,K5	HO
CO3:	To distinguish among various normal forms and predicate calculus	K5	HO
CO4:	To solve and know various types of matrices	K1	LO
CO5:	To evaluate and solve various types of graphs	K5	HO

**K1- Remember, K2- Understand, K3- Apply, K4- Analyze, K5- Evaluate, K6- Create**

## Linux and Shell Programming

### Course Objective

- To teach principles of operating system including File handling utilities, Basic Linux commands, Scripts and filters.
- To familiarize fundamentals of shell (bash), shell programming, pipes, Control structures, arithmetic in shell interrupt processing, functions, debugging shell scripts.
- To impart fundamentals of file concepts kernel support for file, File structure related system calls (file API's).
- To facilitate students in understanding Inter process communication, semaphore and shared memory.
- To explore real-time problem solution skills in Shell programming.

### Unit-I

**Basic bash Shell Commands:** Interacting with the shell-Traversing the file system-Listing files and directories-Managing files and directories-Viewing file contents. **Basic Script Building:**Using multiple commands-Creating a script file-Displaying messages-Using variables-Redirecting input and output-Pipes-Performing math-Exiting the script. **Using Structured Commands:**Working with the if-then statement-Nesting ifs-Understanding the test command-Testing compound conditions-Using double brackets and parentheses-Looking at case.

(Book-1, Chapters: 3, 11, and 12)

### Unit-II

**More Structured Commands:** Looping with for statement-Iterating with the until statement-Using the while statement-Combining loops-Redirecting loop output. **Handling User Input:** Passing parameters-Tracking parameters-Being shifty-Working with options-Standardizing options-Getting user input. **Script Control:** Handling signals-Running scripts in the background-Forbidding hang-ups -Controlling a Job-Modifying script priority-Automating script execution.

(Book-1, Chapters: 13, 14, and 16)

### Unit-III

**Creating Functions:** Basic script functions-Returning a value-Using variables in functions-Array and variable functions-Function recursion-Creating a library-Using functions on the command line. **Writing Scripts for Graphical Desktops:** Creating text menus-Building text window widgets-Adding X Window graphics. **Introducing sed and gawk:** Learning about the sed Editor-Getting introduced to the gawk Editor-Exploring sed Editor basics.

(Book-1, Chapters: 17, 18, and 19)

### Unit-IV

**Regular Expressions:** Defining regular expressions-Looking at the basics-Extending our patterns-Creating expressions. **Advanced sed:** Using multiline commands-Understanding the hold space-Negating a command-Changing the flow-Replacing via a pattern-Using sed in scripts-Creating sed utilities. **Advanced gawk:** Reexamining gawk-Using variables in gawk-Using structured commands-Formatting the printing-Working with functions.

(Book-1, Chapters: 20, 21, and 22)

### Unit-V

**Working with Alternative Shells:** Understanding the dash shell-Programming in the dash shell-Introducing the zsh shell-Writing scripts for zsh. **Writing Simple Script Utilities:** Automating backups-Managing user accounts-Watching disk space. **Producing Scripts for Database, Web, and E-Mail:** Writing database shell scripts-Using the Internet from your scripts-Emailing reports from scripts. **Using Python as a Bash Scripting Alternative:** Technical requirements-Python Language>Hello World the Python way-Pythonic arguments-Supplying arguments-Counting arguments-Significant whitespace-Reading user input-Using Python to write to files-String manipulation.

(Book-1, Chapters: 23, 24, 25, and Book-2, Chapter: 14)

### Text book:

1. Richard Blum, Christine Bresnahan, "Linux Command Line and Shell Scripting BIBLE", Wiley Publishing, 3<sup>rd</sup> Edition, 2015. **Chapters:** 3, 11 to 14, 16 to 25.
2. Mokhtar Ebrahim, Andrew Mallett, "Mastering Linux Shell Scripting", Packt Publishing, 2<sup>nd</sup> Edition, 2018. **Chapter:** 14.

## Reference Books:

1. Clif Flynt, Sarath Lakshman, Shantanu Tushar, "Linux Shell Scripting Cookbook ", Packt Publishing, 3<sup>rd</sup> Edition, 2017.
2. Stephen G. Kochan, Patrick Wood, "Shell Programming in Unix, Linux, and OS X", Addison Wesley Professional, 4<sup>th</sup> Edition, 2016.
3. Robert Love, "Linux System Programming", O'Reilly Media, Inc, 2013
4. W.R. Stevens, "Advanced Programming in the UNIX environment", 2nd Edition, Pearson Education, 2013
5. Graham Glass, King Ables, "UNIX for Programmers and Users", 3rd Edition, Pearson Education, 2003

## Course Outcomes

On the successful completion of the course, students will be able

CO1:	To understand, apply and analyze the concepts and methodology of Linux shell programming	K1-K6
CO2:	To comprehend, impart and apply fundamentals of control structure and script controls	K1-K6
CO3:	To understand, analyses and evaluate the functions, graphical desktop interface and editors	K1-K6
CO4:	To collaborate, apply and review the concepts and methodology of regular expression and advanced gawk	K1-K6
CO5:	To comprehend, use and illustrate the advance concepts such as alternate shell script, data connectivity and bash scripting using python	K1-K6

**K1- Remember, K2- Understand, K3- Apply, K4- Analyze, K5- Evaluate, K6- Create**



## Mapping with Programme Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	S	-	S	L	-	M	M	M	M	S
CO2	S	S	M	-	S	L	-	M	M	M	M	S
CO3	S	S	M	-	S	L	-	M	M	S	S	S
CO4	S	S	M	-	S	L	-	M	M	M	M	S
CO5	S	S	M	-	S	L	-	M	M	M	M	S

**S- Strong; M-Medium; L-Low**

# Python Programming

## Course Objectives:

- To acquire programming skills in core Python
- To learn Strings and function
- To develop object-oriented skills in Python
- To comprehend various Python Packages
- To develop web applications using Django

## Unit I

Introduction : Fundamental ideas of Computer Science - Strings, Assignment, and Comments - Numeric Data types and Character sets – Expressions – Loops and Selection Statements: Definite iteration: the for Loop - selection: if and if-else statements - Conditional iteration: the while Loop

## Unit II

Strings and Text Files: Accessing Characters and substrings in strings - Data Encryption-Strings and Number systems- String methods – Text - Lists and Dictionaries: Lists – Dictionaries – Design with Functions: A Quick review - Problem Solving with top-Down Design - Design with recursive Functions - Managing a Program's namespace - Higher-Order Functions

## Unit III

Design with Classes: Getting inside Objects and Classes – Data-Modeling Examples – Building a New Data Structure – The Two – Dimensional Grid - Structuring Classes with Inheritance and Polymorphism – Graphical User Interfaces - The Behavior of terminal-Based programs and GUI-Based programs - Coding Simple GUI-Based programs - Windows and Window Components - Command Buttons and responding to events.

## Unit IV

Working with Python Packages: NumPy Library-Nd array – Basic Operations – Indexing, Slicing and Iteration – Array manipulation - Pandas –The Series – The Data Frame - The Index Objects – Data Vizualization with Matplotlib – The Matplotlib Architecture – pyplot – The Plotting Window – Adding Elements to the Chart – Line Charts – Bar Charts – Pie charts

## Unit V

Django: Installing Django – Building an Application – Project Creation – Designing the Data Schema - Creating an administration site for models - Working with Query Sets and Managers – Retrieving Objects – Building List and Detail Views

### Text Book:

1. K.A. Lambert, "Fundamentals of Python: first programs", Second Edition, Cengage Learning, 2018 **(Unit - I, II and III)**
2. Fabio Nelli, "Python Data Analytics: With Pandas, NumPy, and Matplotlib", Second Edition, Kindle Edition, 2018 **(Unit - IV)**
3. Antonio Mele, "Django 3 By Example", Third Edition, 2020 **(Unit - V)**

### Course Outcomes

**On the successful completion of the course, students will be able to**

<b>CO1</b>	Comprehend the programming skills in python and develop applications using conditional branches and loop	<b>K1- K6</b>
<b>CO2</b>	Create python applications with strings and functions	
<b>CO3</b>	Understand and implement the Object Oriented Programming paradigm with the concept of objects and classes, Inheritance and polymorphism	
<b>CO4</b>	Evaluate the use of Python packages to perform numerical computations and data vizualization	
<b>CO5</b>	Design interactive web applications using Django	

**K1- Remember, K2- Understand, K3- Apply, K4- Analyze, K5- Evaluate, K6- Create**

### Mapping with Programme Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	M	S	M	S	S	S	S	M	S	S
CO2	S	S	S	M	S	S	S	S	S	S	M	S
CO3	S	M	S	S	M	S	M	S	S	M	S	S
CO4	S	S	S	S	S	S	S	M	S	S	M	S
CO5	S	S	S	S	S	S	S	S	S	M	M	S

**S- Strong; M-Medium; L-Low**

## **Data Engineering and Management Lab**

### **Course Objectives:**

- To acquire basic scripting knowledge in MongoDB.
  - To learn CRUD Operation on MongoDB database.
  - To comprehend MongoDB using DbVisualizer.
  - To be familiar with Zoho CRM features.
  - To customize your application using Zoho CRM.
1. Write a script to create a MongoDB database and perform insert operation.
  2. Write a MongoDB script to perform query operations.
  3. Write a MongoDB Script to perform update operations.
  4. Write a MongoDB Script to update documents with aggregation pipeline.
  5. Write a MongoDB script to delete single and multiple documents.
  6. Write a MongoDB script to perform string aggregation operations.
  7. Design a Data Model for MongoDB using DbVisualizer.
  8. Perform CRUD operations using DbVisualizer.
  9. Create a Zoho CRM account and organize your Tasks, Meetings and Deals.
  10. Create and maintain a project using Zoho CRM features.

## Course Outcomes

On the successful completion of the course, students will be able to

Course Outcome	Description	Knowledge Level
<b>C01</b>	Comprehend the scripting knowledge in MongoDB and perform basic operations in shell prompt	<b>K1- K6</b>
<b>C02</b>	Implement, Create, Read, Update and Delete Operations on MongoDB database	
<b>C03</b>	Analyze MongoDB using DbVisualizer	
<b>C04</b>	Assess Zoho CRM features for managing the customer relationships	
<b>C05</b>	Create a customized application in Zoho CRM	

**K1-Remember, K2-Understand, K3-Apply, K4-Analyze, K5-Evaluate, K6-Create**

## Mapping with Programme Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
C01	S	S	S	S	S	M	S	S	S	M	S	S
C02	S	S	S	S	S	S	S	S	S	S	L	S
C03	S	M	S	S	M	S	M	S	S	S	S	S
C04	S	S	S	M	S	S	S	L	S	S	M	S
C05	S	S	S	S	M	S	S	S	S	S	S	S

**S- Strong; M-Medium; L-Low**

## Architecture and Frameworks - Lab

### Course Objectives

- To understand and implement the basic concepts of Software architecture and its functions.
- To acquire programming skills to develop Implement various technologies and services associated with network protocols along with the challenges of data transfer.
- Implement the importance and functioning of Routing Protocols over communication service.
- To acquire skills to connect two routers and any two switches.
- To comprehend related to SSH protocols and accessing the remote device.

**Note: Use the solid servers and client specification for implementation <https://github.com/solid/specification/>.**

### Implement the following using Linux / Windows environments.

1. Find the WebID profile document and display the necessary attributes.
2. Set and access the primary authentications with account recovery mechanisms.
3. Set and access the secondary authentications with account recovery mechanisms.
4. Design authorization and web access control.
5. Find the content representation.
6. Reading resources from HTTP REST API and Web Sockets API.
7. Writing resources from HTTP REST API and Web Sockets API.
8. Data notification using Social Web App protocol.
9. Managing subscriptions and friends list using Social Web App protocol.
10. Managing list of followers and following list using Social Web App protocol.

## Course Outcomes

On the successful completion of the course, students will be able to,

CO1	Comprehend the programming skills of Software architecture tools and packages.	K1-K6
CO2	Understand and implement the user profiles and authentication with recovery mechanism.	K1-K6
CO3	Comprehend and evaluate the access control and content representation use of FTP server.	K1-K6
CO4	Understand and implement reading and writing resources for various applications.	K1-K6
CO5	Identify and examine the notifications, friends, and follower list of social application protocols.	K1-K6

**K1- Remember, K2- Understand, K3- Apply, K4- Analyze, K5-Evaluate, K6- Create**

## Mapping Course outcomes with Programme outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	M	L	M	S	-	-	-	-	-	-
CO2	S	M	S	S	S	M	-	-	-	-	-	-
CO3	S	M	S	M	S	M	-	-	-	-	-	-
CO4	S	M	L	S	M	L	-	-	-	-	-	-
CO5	M	S	M	L	S	L	-	-	-	-	-	-

**S- Strong; M-Medium; L-Low**



## **Linux and Shell Programming Lab**

### **Course Objectives**

- To enable the students to study and understand the efficiency of Linux shell script.
- To demonstrate the File Backup process.
- To develop and implement the shell script for GUI processing.
- To develop and implement the shell script for IPC and Networking.
- To demonstrate PostgreSQL.

### **List of Programs**

1. Write a Shell Script program to calculate the number of days between two dates.
2. Write a Shell Script program to check systems on local network using control structures with user input.
3. Write a Shell Script program to check systems on local network using control structures with file input.
4. Write a Shell Script program to demonstrate the script control commands.
5. Write a Shell Script program to demonstrate the Shell script function.
6. Write a Shell Script program to demonstrate the Regular Expressions.
7. Write a Shell Script program to demonstrate the sed and awk Commands.
8. Write a Shell Script program to demonstrate the File Backup process through creating a daily archive location.
9. Write a Shell Script program to create a following GUI tools.
  - a) Creating text menus
  - b) Building text window widgets
10. Write a Shell Script program to demonstrate to connect a PostgreSQL database and performing CRUD operations.

## Course Outcomes

On the successful completion of the course, students will be able to

C01:	To understand, apply and analyze the concepts and methodology of Linux shell programming	K1-K6
C02:	To comprehend, impart and apply fundamentals of control structure and script controls	K1-K6
C03:	To understand, analyses and evaluate the functions, graphical desktop interface and editors	K1-K6
C04:	To collaborate, apply and review the concepts and methodology of regular expression and advanced gawk	K1-K6
C05:	To comprehend, use and analyze the advance concepts such as alternate shell script, dy and bash scripting using PostgreSQL	K1-K6

**K1- Remember, K2- Understand, K3- Apply, K4- Analyze, K5- Evaluate, K6- Create**

### Mapping with Programme Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
C01	S	S	S	-	S	-	-	-	M	-	-	-
C02	S	S	S	-	S	-	-	-	M	-	-	-
C03	S	S	S	-	S	-	-	-	M	S	S	S
C04	S	S	S	-	S	-	-	-	M	-	-	-
C05	S	S	S	-	S	-	-	-	M	S	S	S

**S- Strong; M-Medium; L-Low**

## **Software Development Technologies Lab**

### **Course Objectives**

- To understand the concept of DevOps with associated technologies and methodologies.
- To be familiarized with Jenkins, which is used to build & test software Applications
- To understand Continuous integration in Devops environment.
- To understand Docker to build, ship and run containerized images
- To use Docker to deploy and manage Software applications running on Container.

### **List of Programs**

1. Deploy Version Control System / Source Code Management, install git and create a GitHub account.
2. Perform various GIT operations on local and Remote repositories using GIT Cheat-Sheet
3. Continuous Integration: install and configure Jenkins with Maven/Ant/Gradle to setup a build Job.
4. Build the pipeline of jobs using Maven / Gradle / Ant in Jenkins, create a pipeline script to Test and deploy an application over the tomcat server.
5. Implement Jenkins Master-Slave Architecture and scale your Jenkins standalone implementation by implementing slave nodes.
6. Setup and Run Selenium Tests in Jenkins Using Maven.
7. Implement Docker Architecture and Container Life Cycle, install Docker and execute docker commands to manage images and interact with containers.
8. Implement Dockerfile instructions, build an image for a sample web application using Dockerfile.
9. Install and Configure Pull based Software Configuration Management and provisioning tools using Puppet.
10. Implement LAMP/MEAN Stack using Puppet Manifest.

## Course Outcomes

On the successful completion of the course, students will be able to

CO1:	To Understand and analyse the importance of Jenkins to Build, Deploy and Test Software Applications	K1-K6
CO2:	To synthesis and summarize the importance of Software Configuration Management in DevOps	K1-K6
CO3:	To identify, analyze and illustrate the Containerization of OS images and deployment of applications over Docker	K1-K6
CO4	To design, analyze and develop the Pull based Software Configuration Management	K1-K6
CO5	To design, analyze and develop Puppet Manifest	K1-K6

**K1- Remember, K2- Understand, K3- Apply, K4- Analyze, K5- Evaluate, K6- Create**

### Mapping with Programme Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	M	-	M	-	-	-	S	S	S	S
CO2	S	S	M	-	M	-	-	-	S	S	S	S
CO3	S	S	M	-	M	-	-	-	S	S	S	S
CO2	S	S	M	-	M	-	-	-	S	S	S	S
CO3	S	S	M	-	M	-	-	-	S	S	S	S

**S- Strong; M-Medium; L-Low**

## Soft Computing Lab

### COURSE OBJECTIVES:

- To implement various Supervised Neural Network-based approaches
- To apply the fuzzy-based logical operations and arithmetic operations
- To implement unsupervised neural network approaches
- To solve a problem using a simple genetic algorithm
- To implement logic gates.

### Program List

1. Implementation of Logic gates using Artificial Neural Network.
2. Implementation of Perception Algorithm.
3. Implementation of Back Propagation Algorithm.
4. Implementation of Self Organizing Maps.
5. Implementation of Radial Basis Function Network.
6. Implementation of De-Morgan's Law.
7. Implementation of McCulloch Pits Artificial Neuron model
8. Implementation of Simple genetic algorithm
9. Implementation of fuzzy based Logical operations
10. Implementation of fuzzy based arithmetic operations

### COURSE OUTCOMES:

On the successful completion of the course, students will be able to

CO1	To apply supervised learning algorithms for real datasets	K- 1K2	LO
CO2	To implement Unsupervised Learning techniques	K3	IO
CO3	To apply fuzzy based arithmetic and logical operations	K3- K4	HO
CO4	To find solutions for problems using Genetic algorithm	K4	IO
CO5	To implement DeMorgan's Law	K5	HO

**K1- Remember, K2- Understand, K3- Apply, K4- Analyze, K5- Evaluate, K6- Create**

### MAPPING WITH PROGRAMME OUTCOMES

	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>C01</b>	M	M	S	M	S	S	S	M	S	M	S	S
<b>C02</b>	M	S	M	M	M	M	M	S	M	S	M	M
<b>C03</b>	M	M	S	S	S	M	M	S	S	S	S	S
<b>C04</b>	S	S	S	M	M	S	S	M	S	S	S	M
<b>C05</b>	S	S	S	S	S	M	M	M	M	S	M	M

**S- STRONG; M-MEDIUM; L-LOW**

## Python Programming Lab

### Course Objectives:

This course enables the students:

- To master the fundamentals of writing python scripts
- To create program using elementary data items
- To implement Python programs with conditionals and loops
- To use functions for structuring Python programs
- To develop web programming with Django

Implement the following in Python:

1. Program using elementary data items, lists, dictionaries and tuples
2. Program using conditional branches, loops
3. Program using functions
4. Program using classes and objects
5. Program using inheritance
6. Program using polymorphism
7. Program using Numpy
8. Program using Pandas
9. Program using Matplotlib
10. Program for creating dynamic and interactive web pages using forms

### Course Outcomes

**On the successful completion of the course, students will be able to**

<b>CO1</b>	Comprehend the programming skills in python and write scripts	<b>K1- K6</b>
<b>CO2</b>	Create python applications with elementary data items, lists, dictionaries and tuples	
<b>CO3</b>	Implement the Object-Oriented Programming programming concepts such as objects and classes, Inheritance and polymorphism	
<b>CO4</b>	Assess the use of Python packages to perform numerical computations and perform data vizualization	
<b>CO5</b>	Create interactive web applications using Django	

**K1- Remember, K2- Understand, K3- Apply, K4- Analyze, K5- Evaluate, K6- Create**

### Mapping with Programme Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
C01	S	S	M	S	S	S	S	S	S	M	S	S
C02	S	S	S	S	S	S	S	S	S	S	M	S
C03	S	S	S	S	S	S	M	S	S	M	L	S
C04	S	S	S	S	S	S	S	M	S	S	S	S
C05	S	S	S	S	L	S	M	S	S	M	M	S

**S- Strong; M-Medium; L-Low**



## Data Structures and Algorithms

### Course Objectives:

- To get a clear understanding of various ADT structures.
- To understand how to implement different ADT structures with real-time scenarios.
- To analyze the various data structures with their different implementations.
- To get an idea of applying the right models based on the problem domain.
- To realize and understand how and where to implement modern data structures with Python language.

### Unit-I

**Abstract Data Types:** Introduction-Date Abstract Data Type-Bags-Iterators.  
**Arrays:** Array Structure-Python List-Two Dimensional Arrays-Matrix Abstract Data Type. **Sets, Maps:** Sets-Maps- Multi-Dimensional Arrays.

### Unit-II

**Algorithm Analysis:** Experimental Studies-Seven Functions-Asymptotic Analysis. **Recursion:** Illustrative Examples-Analyzing Recursive Algorithms-Linear Recursion- Binary Recursion-Multiple Recursion.

### Unit-III

**Stacks, Queues, and Deques:** Stacks- Queues- Double-Ended Queues Linked. **Lists:** Singly Linked Lists-Circularly Linked Lists-Doubly Linked Lists. **Trees:** General Trees-Binary Trees-Implementing Trees-Tree Traversal Algorithms.

### Unit-IV

**Priority Queues:** Priority Queue Abstract Data Type- Implementing a Priority Queue- Heaps-Sorting with a Priority Queue. **Maps, Hash Tables, and Skip Lists:** Maps and Dictionaries-Hash Tables- Sorted Maps-Skip Lists-Sets, Multisets, and Multimaps.

### Unit-V

**Search Trees:** Binary Search Trees-Balanced Search Trees-AVL Trees-Splay Trees. **Sorting and Selection:** Merge sort-Quick sort-Sorting through an

Algorithmic Lens- Comparing Sorting Algorithms-Selection. **Graph Algorithms:** Graphs-Data Structures for Graphs-Graph Traversals-Shortest Paths-Minimum Spanning Trees.

**Text book:**

1. Rance D. Necaie, "Data Structures and Algorithms Using Python", John Wiley & Sons, 2011. (Unit – 1) **Chapters:** 1, 2, 3.
2. Michael T. Goodrich, Roberto Tamassia, Michael H. Goldwasser, "Data Structures and Algorithms in Python", John Wiley & Sons, 2013. (Unit – 2, 3, 4, and 5) **Chapters:** 3 to 12, and 14.

**Reference books:**

1. Dr. Basant Agarwal; Benjamin Baka, "Hands-On Data Structures and Algorithms with Python: Write complex and powerful code using the latest features of Python 3.7", Packt Publishing, 2018.
2. Magnus Lie Hetland, "Python Algorithms: Mastering Basic Algorithms in the Python Language", Apress, 2014.

**Course Outcome:**

**On the successful completion of the course, students will be able to,**

CO1	Understand various ADT concepts	K1-K6
CO2	Familiar with implementation of ADT models with Python language and understand how to develop ADT for the various real-time problems	
CO3	Apply with proper ADT models with problem understanding	
CO4	Apply and analyze right models based on the problem domain	
CO5	Evaluate modern data structures with Python language	

**K1- Remember, K2 - Understand, K3 - Apply, K4 - Analyze, K5 - Evaluate, K6 -Create**

**Mapping with Programme Outcomes:**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	M	L	L	L	L	S	S	S	L	M	M
CO2	S	M	S	M	M	L	L	L	L	L	M	M
CO3	S	S	S	L	L	L	M	M	M	M	M	L
CO4	S	S	S	L	L	L	M	M	M	L	L	L
CO5	S	S	S	L	M	M	S	S	S	S	M	L

**L - Low, M- Medium, S - Strong**

# **Internet of Things**

## **Course Objectives:**

- To get familiar with the evolution of IOT with its design principles.
- To outline the functionalities and protocols of internet communication.
- To analyze the hardware and software components needed to construct IOT applications.
- To identify the appropriate protocol for API construction and writing embedded code.
- To realize various business models and ethics in Internet of Things.

## **UNIT I FUNDAMENTALS OF IOT**

Evolution of Internet of Things – Enabling Technologies – IOT Architectures: oneM2M, IOT World Forum (IOTWF) and Alternative IOT models – Simplified IOT Architecture and Core IOT Functional Stack -- Fog, Edge and Cloud in IOT – Functional blocks of an IOT ecosystem – Sensors, Actuators, Smart Objects and Connecting Smart Objects.

## **UNIT II IOT PROTOCOLS**

IOT Access Technologies: Physical and MAC layers, topology and Security of IEEE 802.15.4, 802.15.4g, 802.15.4e, 1901.2a, 802.11ah and LoRaWAN – Network Layer: IP versions, Constrained Nodes and Constrained Networks – Optimizing IP for IOT: From 6LoWPAN to 6Lo, Routing over Low Power and Lossy Networks – Application Transport Methods: Supervisory Control and Data Acquisition – Application Layer Protocols: CoAP and MQTT.

## **UNIT – III DESIGN AND DEVELOPMENT**

Prototyping Embedded Devices: Electronics - Embedded Computing Basics – Arduino - Raspberry Pi - Beagle Bone Black - Electric Imp. Prototyping the Physical Design: Non digital Methods - Laser Cutting - 3D printing - CNC Milling - Repurposing/Recycling.

## **UNIT – IV**

Prototyping Online Components: Getting started with an API - Writing a New API - Real-Time Reactions - Other Protocols. Techniques for Writing Embedded Code: Memory Management - Performance and Battery Life – Libraries - Debugging.

## **UNIT – V**

Business Models: History of Business Models – Model – Internet of Starting up – Lean Startups. Moving to Manufacture: Designing Kits - Designing Printed circuit boards – Certification – Costs - Scaling Up Software. Ethics: Privacy – Control – Environment – Solutions.

### **Text Books:**

1. David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Rob Barton and Jerome Henry, –IoT Fundamentals: Networking Technologies, Protocols and Use Cases for Internet of Things, Cisco Press, 2017 (UNIT I and II)
2. Adrian McEwen and Hakim Cassimally, "Designing the Internet of Things", Wiley, 2014. (UNIT III, IV and V)

### **Reference Books:**

1. Ovidiu Vermesan and Peter Friess, "Internet of Things – From Research and Innovation to Market Deployment" , River Publishers, 2014.
2. Peter Waher, "Learning Internet of Things", Packt Publishing, 2015.
3. Donald Norris, "The Internet of Things: Do-It-Yourself at Home Projects for Arduino, Raspberry Pi and Beagle Bone Black", McGraw Hill, 2015.

## Course Outcomes

On the successful completion of the course, students will be able to

CO1:	Comprehend the IoT evolution with its architecture and sensors	K1- K6
CO2:	Understand the networking concepts for communication and underlying IoT protocols	
CO3:	Assess the embedded technologies and develop prototypes for the IoT products	
CO4:	Evaluate the use of Application Programming Interface and design an API for IoT in real time	
CO5:	Recognize the ethics of business models and perform security analysis	

**K1- Remember, K2- Understand, K3- Apply, K4- Analyze, K5- Evaluate, K6- Create**

## Mapping with Programme Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	M	S	S	S	S	S	S	S	S	S
CO2	S	S	S	S	S	S	S	M	S	S	M	S
CO3	S	M	S	S	S	S	M	S	S	M	S	S
CO4	S	S	S	S	S	S	S	S	S	S	M	S
CO5	S	S	S	S	M	S	S	S	S	M	M	S

**S- Strong; M-Medium; L-Low**

## **Data Structures and Algorithms Lab**

### **Course Objectives:**

- To understand Stack, Queue and Doubly Linked ADT structures.
- To implement different ADT structures with real-time scenarios.
- To analyze the recursion concepts.
- To apply different sorting and tree techniques.
- To implement modern data structures with Python language.

### **Implement the following problems using Python 3.4 and above**

1. Recursion concepts.
  - i) Linear recursion
  - ii) Binary recursion.
2. Stack ADT.
3. Queue ADT.
4. Doubly Linked List ADT.
5. Heaps using Priority Queues.
6. Merge sort.
7. Quick sort.
8. Binary Search Tree.
9. Minimum Spanning Tree.
10. Depth First Search Tree traversal.

**Course Outcome:**

**On the successful completion of the course, students will be able to,**

CO1	Strong understanding in various ADT concepts	K1-K6
CO2	To become a familiar with implementation of ADT models	
CO3	Apply sort and tree search algorithms	
CO4	Evaluate the different data structure models	
CO5	Learn how to develop ADT for the various real-time problems	

**K1- Remember, K2 - Understand, K3 - Apply, K4 - Analyze, K5 - Evaluate, K6 -Create**

**Mapping with Programme Outcomes:**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	M	L	L	L	L	S	S	M	M	S	S
CO2	S	M	S	M	M	L	S	M	S	L	M	M
CO3	S	S	S	L	L	L	M	M	M	M	S	L
CO4	S	S	S	M	M	S	M	M	S	S	S	L
CO5	S	S	S	S	L	M	S	M	M	M	M	L

**L - Low, M- Medium, S - Strong**



## **Internet of Things Lab**

### **Course Objectives:**

- To create IoT program to turn ON/OFF LED
  - To implement IoT program for object detection
  - To develop IoT programs for agricultural purpose
  - To create web server program for local hosting
  - To design IoT application for health monitoring
- 
1. To develop an IoT program to turn ON/OFF LED light (3.3V)
  2. To develop an IoT program using IR sensor (Smart Garbage Monitoring, Detecting Parking Availability, etc.)
  3. To develop an IoT program using Humidity and Temperature Monitoring (Forest fire Detection, Weather Monitoring)
  4. To develop an IoT web server program for local hosting
  5. To develop an IoT program using Soil Moisture Sensor
  6. To develop an IoT program using Ultrasonic Sensor (Distance Measurement, etc.)
  7. To develop an real-time IoT program using Relay Module (Smart Home Automation with 230V)
  8. To develop an IoT program for Fire Detection (Home, Industry, etc.)
  9. To develop an IoT program for Gas Leakage detection (Home, Industry, etc.)
  10. To develop an IoMT program using Heartbeat Sensor

## Course Outcomes

On the successful completion of the course, students will be able to,

<b>C01</b>	Implement IoT programs to turn ON/OFF LED	K1 - K6
<b>C02</b>	Develop IoT programs for object detection	
<b>C03</b>	Create IoT programs for agricultural purpose	
<b>C04</b>	Implement web server program for local hosting	
<b>C05</b>	Design IoT application for health monitoring	

**K1- Remember, K2- Understand, K3- Apply, K4- Analyze, K5- Evaluate, K6- Create**

## Mapping with Programme Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
C01	S	S	M	S	S	S	M	S	S	S	S	S
C02	S	S	S	S	S	S	S	M	S	S	M	S
C03	S	M	S	S	S	S	M	S	S	M	S	S
C04	S	S	S	S	S	S	S	S	S	L	M	S
C05	S	S	S	S	M	S	L	S	S	M	M	S

**S- Strong; M-Medium; L-Low**

## **Computer Vision Lab**

### **Course Objectives:**

- To get an idea of how to build a computer vision application with Python language.
- To learn the basic image handling and processing
- To get familiar with various Computer Vision fundamental algorithms and how to implement and apply.
- To get an idea of how to implement the image transforms.
- To understand various image segmentation algorithms.

### **Implement the following problems using Python with OpenCV**

1. Image Loading, Exploring, and displaying an Image.
2. Access and Manipulate of Image Pixels.
3. Image Transformations.
  - i) Resizing
  - ii) Rotation
4. Addition operation of Two Images.
5. Image filtering operations
  - i) Mean Filtering
  - ii) Gaussian Filtering
6. Image Binarization Using Simple Thresholding method.
7. Edge Detection operation using Sobel and Scharr Gradients.
8. Find Grayscale and RGB Histograms of an Image.
9. Segment an Image using K-means Clustering algorithm.
10. Write a program to classify an Image using KNN Classification algorithm.

**Course Outcome:****On the successful completion of the course, students will be able to,**

C01	To develop and implement the image loading and exploring	K1-K6
C02	To Evaluate the image transforms	
C03	To apply and analyse for image processing denoising algorithms	
C04	To design and develop the Image Segmentation using Edge	
C05	To apply and analyse image clustering and classification algorithms	

**K1- Remember, K2 - Understand, K3 - Apply, K4 - Analyze, K5 - Evaluate, K6 -Create****Mapping with Programme Outcomes:**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
C01	S	L	M	L	L	L	M	M	M	S	S	L
C02	S	M	L	M	M	L	S	L	S	L	S	L
C03	S	S	S	M	M	L	M	L	M	L	M	L
C04	S	S	S	M	M	L	M	L	M	L	S	L
C05	S	S	S	M	M	L	S	L	S	L	S	L

**L - Low, M- Medium, S - Strong**

# Cyber Security

## Course Objectives:

- To understand the basics of Cybercrime and Computer forensics with protecting mechanism.
- To explore the working principles of WLAN, Email and Smartphone along with security mechanism and guidelines.
- To gain the ability to understand the importance of cyber investigations with their functioning role and learn the basics of Wi Fi and its security measures.
- To understand and learn the method of seizing digital evidence.
- To learn and analyze the concepts of digital forensics with cybercrime prevention techniques.

## Unit – I

Introduction to cybercrime: Classification of cybercrimes – reasons for commission of cybercrime – malware and its type – kinds of cybercrime – authentication – encryption – digital signatures – antivirus – firewall – steganography – computer forensics – why should we report cybercrime – introduction counter cyber security initiatives in India – generating secure password – using password manager-enabling two-step verification – security computer using free antivirus.

## Unit – II

Tips for buying online: Clearing cache for browsers – wireless LAN-major issues with WLAN-safe browsing guidelines for social networking sites – email security tips – introduction-smartphone security guidelines – purses, wallets, smart phones – platforms, setup and installation-communicating securely with a smartphone.

## Unit – III

Cyber investigation roles: Introduction – role as a cybercrime investigator – the role of law enforcement officers – the role of the prosecuting attorney – incident response: introduction-post mortem versus live forensics – computer analysis for the hacker defender program-network analysis – legal issues of intercepting Wi-Fi transmission – Wi-Fi technology – Wi-Fi RF-scanning RF – eavesdropping on Wi-Fi – fourth amendment expectation of privacy in WLAN.

## **Unit – IV**

Seizure of digital information: introduction – defining digital evidence – digital evidence seizure methodology – factors limiting the wholesale seizure of hardware – other options for seizing digital evidence – common threads within digital evidence seizure – determining the most appropriate seizure method–conducting cyber investigations–demystifying computer/cyber-crime – IP addresses – the explosion of networking – interpersonal communication.

## **Unit – V**

Digital forensics and analyzing data: introduction – the evolution of computer forensics–phases of digital forensics-collection – examination-analysis – reporting – Cyber-crime prevention: Introduction – crime targeted at a government agency.

### **Text books:**

1. Dr.Jeetendra Pande, "Introduction to Cyber Security" Published by Uttarakhand Open University, 2017. (Chapter: 1.2-6.4,9.3-12.2)
2. Anthony reyes, Kevin o'shea, Jim steele, Jon R. Hansen, Captain Benjamin R. Jean Thomas Ralph, "Cyber-crime investigations" - bridging the gaps between security professionals, law enforcement, and prosecutors, 2007. (Chapter: 4, 5, 6, 7, 8, 9,10)

### **Reference Books:**

1. Sebastian Klipper, "Cyber Security" Ein Einblickfur Wirtschaft swissen schaftler Fachmedien Wiesbaden,2015
2. John G.Voller Black and Veatch, "Cyber Security" Published by John Wiley & Sons, Inc., Hoboken, New Jersey Published simultaneously in Canada ©2014.

## Course Outcomes

On the successful completion of the course, students will be able to

CO1:	Understand, describe, analyze and examine the basics of Cyber security concepts and its implementation in India	K1- K6
CO2:	Comprehend and demonstrate the security tips in browsers, WLAN, social networks, Email security and Smart phone. Apply the investigations in postmortem and Forensics	K1- K6
CO3:	Understand, apply and evaluate the various investigation roles and Wi Fi protecting mechanisms.	K1- K6
CO4:	Understand, illustrate and evaluate the method of seize the digital information and evidences forensics data and evaluate the forensics reports	K1- K6
CO5:	Comprehend, apply and appraise the methods digital forensics with cybercrime prevention techniques	K1- K6

**K1- Remember, K2- Understand, K3- Apply , K4- Analyze, K5- Evaluate, K6- Create**

## Mapping with Programme Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
<b>CO1</b>	S	L	-	L	M	L	M	M	-	M	-	-
<b>CO2</b>	M	S	-	L	M	L	M	M	-	M	-	-
<b>CO3</b>	M	S	L	L	M	L	M	M	-	M	M	L
<b>CO4</b>	S	M	L	S	M	L	S	M	-	M	-	-
<b>CO5</b>	M	S	M	L	S	L	M	S	-	S	-	-

**S- Strong; M-Medium; L-Low**

## **Cyber Security Lab**

### **COURSE OBJECTIVES**

- To learn and implement to Change the wireless device mode as monitor mode.
- To develop in multiple vulnerabilities webserver.
- To understand and implement the open ports in the network.
- To acquire programming skills in Implement various wireless device modes.
- To comprehend related to find the sub domains of webpage.

### **Implement the following using any cyber security tools.**

1. Install virtual box (kali Linux).
2. Generate a secure password using keepass.
3. Change the wireless device mode as monitor mode.
4. Find the known and open vulnerabilities of system using metasploit.
5. Identify the multiple vulnerabilities webserver using nikto tool.
6. Identify the open ports in the network using nmap tools.
7. List all the network around us and display the information about the networks.
8. Sniff and capture the packet sent over HTTP requests.
9. Find the owners of internet resources using Whois Lookup tool.
10. Find the subdomains of webpage using knock tool



## Course Outcomes

On the successful completion of the course, students will be able to

CO1:	Comprehend the programming skills in Change the wireless device mode as monitor mode	K1-K6
CO2:	Understand and implement multiple vulnerabilities webserver	K1-K6
CO3:	Evaluate the use of different wireless device modes	K1-K6
CO4:	Design to Solve related to find the subdomains of webpage	K1-K6
CO5:	Create and apply open ports in the network	K1-K6

**K1- Remember, K2- Understand, K3- Apply, K4- Analyze, K5-Evaluate, K6- Create**

## Mapping Course outcomes with Programme outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	-	-	-	-	L	-	-	-	-	-	-
CO2	S	-	M	-	M	L	-	-	-	-	-	-
CO3	S	-	S	-	S	L	-	-	-	S	S	S
CO4	S	-	S	-	S	L	-	-	-	S	S	S
CO5	S	-	S	-	S	L	-	-	-	S	S	S

**S- Strong; M-Medium; L-Low**

## Blockchain Technologies

### COURSE OBJECTIVES

- To understand about Blockchain is an emerging technology platform for developing decentralized applications and data storage.
- To comprehend fundamentals of Public Key Cryptography technology and Consensus Algorithms.
- To familiarize yourself with Bitcoin Network, Bitcoin Clients, APIs and Payments technology of blockchain operations.
- To engage with Components of the Ethereum ecosystem.
- To grasp Development Tools and Frameworks.

### Unit I: Blockchain, Decentralization

**Blockchain :** The growth of blockchain technology - Distributed systems - The history of blockchain and Bitcoin - Blockchain - Consensus - CAP theorem and blockchain. **Decentralization:** Decentralization using blockchain - Methods of decentralization -Routes to decentralization - Blockchain and full ecosystem decentralization - Pertinent terminology - Platforms for decentralization - Innovative trends.

### Unit II: Public Key Cryptography, Consensus Algorithms and Smart Contracts

**Public Key Cryptography:** Asymmetric cryptography - Cryptographic constructs and blockchain technology. **Consensus Algorithms:** Introducing the consensus problem -Analysis and design - Classification - Algorithms - Choosing an algorithm. **Smart Contracts:** History - Definition - Ricardian contracts - Smart contract templates – Oracles - Deploying smart contracts – DAO.

### Unit III: Bitcoin

**Bitcoin:** Bitcoin—an overview - Cryptographic keys - Transactions - Blockchain – Mining. **Bitcoin Network and Payments:** The Bitcoin network - Wallets - Bitcoin payments -Innovation in Bitcoin - Advanced protocols - Bitcoin investment and buying and selling Bitcoin. **Bitcoin Clients and APIs:** Bitcoin client installation - Experimenting further with bitcoin-cli - Bitcoin programming.

## **Unit IV: Alternative Coins**

**Alternative Coins:** Theoretical foundations - Difficulty adjustment and retargeting algorithms - Bitcoin limitations - Extended protocols on top of Bitcoin -Development of altcoins. **Ethereum: Ethereum** – an overview - Ethereum network - Components of the Ethereum ecosystem - Ethereum Virtual Machine (EVM) - Smart contracts. - Blocks and blockchain - Wallets and client - Nodes and miners - APIs, tools, and DApps - Supporting protocols - Programming languages.

## **Unit V: Development Tools and Frameworks, Use Cases & Security**

**Development Tools and Frame works :** Languages - Compilers - Tools and libraries - Frameworks - Contract development and deployment - Layout of a Solidity source code file - Solidity language. **Use Cases:** IoT – Government - Health -Finance – Media. **Scalability and Other Challenges:** Scalability - Privacy - Security - Other challenges.

### **TEXT BOOKS**

Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller, Steven Goldfeder. Bitcoin and Cryptocurrency Technologies. Princeton University Press, 2016. ISBN 978-0691171692.

### **REFERENCES**

Andreas Antonopoulos. Mastering Bitcoin: Programming the open block chain. Oreilly Publishers, 2017. ISBN 978-9352135745

## Course Outcomes

On the successful completion of the course, students will be able to

CO1:	Understand, apply and examine the characteristics of blockchain, bitcoin and consensus algorithm in centralized and decentralized methods.	K1-K6
CO2:	Comprehend and demonstrate the application of hashing and public key cryptography in protecting the blockchain.	K1-K6
CO3:	Understand and analyse the elements of trust in a Blockchain: validation, verification, and consensus.	K1-K6
CO4	Comprehend and evaluate the alternate coin, Ethereum and smart contract.	K1-K6
CO5	Grasp and apply the knowledge of Tools and languages for applications	K1-K6

**K1- Remember, K2- Understand, K3- Apply, K4- Analyze, K5-Evaluate, K6- Create**

### Mapping Course outcomes with Programme outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	-	-	-	-	L	-	-	-	-	-	-
CO2	S	-	M	-	M	L	-	-	-	-	-	-
CO3	S	-	S	-	S	L	-	-	-	S	S	S
CO4	S	-	S	-	S	L	-	-	-	S	S	S
CO5	S	-	S	-	S	L	-	-	-	S	S	S

**S- Strong; M-Medium; L-Low**

## **Blockchain Technologies Lab**

### **Course Objectives**

- To learn the basics of Blockchain and apply cryptographic algorithms.
- To design, build, and deploy smart contracts and distributed applications.
- To deploy Private Blockchain and smart contracts on Ethereum.
- To understand and deploy cryptocurrencies and their functions in applications.
- To implement Blockchain for various use cases.

### **Implement the following**

1. Create a Public Ledger and Private Ledger with various attributes like Access, Network Actors, Native token, Security, Speed and examples.
2. Building and Deploying Multichain private Blockchain
3. Write Hello World smart contract in a higher programming language (Solidity)
4. Construct the Naïve block chain.
5. Construct and deploy your contract (Use deploy method).
6. Set up a Regtest environment.
7. Build a payment request URI
8. Hashcash implementation.
9. Develop a toy application using Blockchain.
10. Create simple wallet transaction from one account to another account using Metamask.

## Course Outcomes

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

CO1:	Enable to setup your own private Blockchain and deploy smart contracts on Ethereum.	K1-K6
CO2:	Gains familiarity and implement with cryptography and Consensus algorithms.	K1-K6
CO3:	Create and deploy projects using Web3j.	K1-K6
CO4:	Recall and deploy the structure and mechanism of Bitcoin, Ethereum, Hyperledger	K1-K6
CO5:	Implement Blockchain for various use cases	K1-K6

**K1- Remember, K2- Understand, K3- Apply, K4- Analyze, K5-Evaluate, K6- Create**

**Mapping with Programme Outcomes:**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	M	L	M	S	-	-	-	-	-	-
CO2	S	M	S	S	S	M	-	-	-	-	-	-
CO3	S	S	S	S	S	S	-	-	-	-	-	-
CO4	S	M	L	S	M	L	-	-	-	-	-	-
CO5	M	S	M	L	S	L	-	-	-	-	-	-

**S – Strong, M – Medium, L - Low**

# **Advanced Java Programming**

## **Course Objectives**

- To gain knowledge of Object-Oriented Programming Concept in Java.
- To understand usages of String functions in Java.
- To familiarize with the applet and swing.
- To grasp the concepts on Java Beans.
- To comprehend the connection between Relational Database and Java.

## **Unit – I**

An Overview of Java: Object Oriented Programming- Data Types, Variables, and Arrays: Primitive Types-Literals Variables - Type Conversion and Casting- Arrays-Operators: Control Statements-Classes and Methods – Inheritance-Exception Handling.

## **Unit – II**

String Handling: The String Constructors - String Length - Special String Operations - Character Extraction - String Comparison - Searching Strings - Modifying a String - Input/Output: The I/O Classes and Interfaces – File - Byte Streams - Character Streams.

## **Unit – III**

The Applet Class: Basic Architecture - Applet Skeleton - Display methods - Status Window – Passing Parameters. Introducing GUI Programming with Swing– Introducing Swing - Swing Is Built on the AWT- Two Key Swing Features - The MVC Connection - Components and Containers - The Swing Packages - A Simple Swing Application - Exploring Swing.

## **Unit- IV**

Java Beans: Introduction - Advantages of Beans – Introspection - The JavaBeans API - A Bean Example. Servlets: Life Cycle Simple Servlet-Servlet API-Packages-Cookies session tracking.

## **Unit – V**

Network Programming: Working with URLs- Working with Sockets - Remote Method Invocation. Introduction to Database Management Systems - Tables, Rows, and Columns - Introduction to the SQL SELECT Statement - Inserting Rows - Updating and Deleting Existing Rows - Creating and Deleting Tables - Creating a New Database with JDBC - Scrollable Result Sets.

**Text Books :**

1. Herbert Schildt, "Java the Complete Reference", 10<sup>th</sup> edition, McGraw Hill Publishing Company Ltd, New Delhi, 2017.
2. Tony Goddis, "Starting out with Java from Control Structures Through Objects" 6th Edition, Pearson Education Limited, 2016.

**Reference books :**

1. Herbert Schildt, Dale Skrien, "Java Fundamentals – A Comprehensive Introduction", TMGH Publishing Company Ltd, New Delhi, 2013.
2. John Dean, Raymond Dean, "Introduction to Programming with JAVA – A Problem Solving Approach", TMGH Publishing Company Ltd, New Delhi, 2012.

**Course Outcomes**

**On the successful completion of the course, students will be able to,**

CO1:	Understand the Object-Oriented Program including classes and methods; inheritance and exception handling	K1-K6
CO2:	Complete comprehension of String functions and I/O Streams	K1-K6
CO3:	Creation of graphical representation using Applet	K1-K6
CO4:	Application of Servlets for designing Web based applications	K1- K6
CO5:	Usage of JDBC connectivity and implementation of the concept to get desired results from database	K1-K6

**K1- Remember, K2- Understand, K3- Apply, K4- Analyze, K5- Evaluate, K6- Create**



## Mapping with Programme Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
C01	S	S	S	-	M	S	-	-	-	S	M	-
C02	S	S	S	-	M	S	-	-	-	L	M	-
C03	S	S	M	-	L	S	-	-	-	M	M	-
C04	M	S	M	-	S	S	-	-	-	M	S	-
C05	S	M	M	-	M	L	-	-	-	M	M	-

**S- Strong; M-Medium; L-Low**

## Web Technologies

### COURSE OBJECTIVES:

- Understand the fundamentals of the web and thereby develop web applications using various development languages and tools.
- Enrich knowledge about XHTML control and Cascading Style Sheets.
- Provide in- depth knowledge about Javascript.
- To enhance knowledge in XML documents with presentations using CSS and XSLT.
- Deliver in-depth knowledge about PHP, Angular JS, JQuery.

### UNIT -I

**WEB FUNDAMENTALS AND HTML:** A Brief Introduction to the Internet - The World Wide Web - Web Browsers - Web Servers -URLs, MIME, HTTP, Security- Introduction to HTML- Origins and Evolution of HTML and HTML - Basic Syntax - Standard HTML Document Structure - Basic Text Markup - Images- Hypertext Links - Lists, Tables, Forms, The Audio Element, The Video Element - Organization Elements, The Time Element

### UNIT – II

**INTRODUCTION TO XHTML AND CSS:** Basic syntax, Standard structure, Basic text-markup, Images, Hypertext Links. Lists, Tables, Forms, Frames, syntactic differences between HTML and XHTML-Introduction, Levels of style sheets, Style specification formats, Selector forms, Property value forms, Font properties, List properties, Color, Alignment of text, The box model, Background images, The<span> and <div>tags, Conflict resolution.

### UNIT - III

**THE BASICS OF JAVASCRIPT:** Overview of JavaScript, Object orientation and JavaScript, general Syntactic characteristics, Primitives, operations, and expressions, Screen output and keyboard input, Control statements, Object creation and modification, Arrays, Functions, Constructors, Pattern matching using regular expressions, Errors in scripts.

**JAVASCRIPT AND XHTML DOCUMENTS:** The JavaScript Execution Environment, The Document Object Model, Elements Access in Java Script, Events and Event Handling, Handling Events from Body Elements, Handling Events from Text Box and password Elements, The DOM2 Model.

## **UNIT- IV**

**DYNAMIC DOCUMENTS WITH JAVASCRIPT AND XML:** Introduction, Positioning Elements, Moving Elements, Element Visibility, Changing Color and Fonts, Dynamic Content, Stacking Elements, Locating the Mouse Cursor, Reacting to a Mouse Click, Slow Movement of Elements, Dragging and Dropping Elements. Introduction to XML, Syntax of XML, XML Document Structure, Document type definitions, Namespaces, XML schemas, displaying raw XML documents, Displaying XML documents with CSS, XSLT Style Sheets, Web services.

## **UNIT - V**

**PHP, ANGULAR JS AND JQUERY:** Introduction to PHP: Overview of PHP - General Syntactic Characteristics - Primitives, Operations, and Expressions - Output - Control Statements - Arrays - Functions - Pattern Matching - Form Handling - Cookies - Session Tracking - Introduction to JQuery, Syntax, selectors, events, JQuery HTML, JQuery Effects, JQuery CSS. Introduction to Angular JS, Directives, Expressions, Controllers, Filters, Services, Events, Forms, Validations, Examples.

### **TEXT BOOKS:**

1. Robert W. Sebesta: Programming the World Wide Web, Eighth Edition, Pearson education, 2015. **UNITS:** 1,2,3,4.
2. Dayley Brad, Dayley Brendan , "AngularJS, JavaScript, and jQuery All in One", Sams Teach Yourself 1st Edition, Kindle Edition, 2015. **UNIT:** 5.

### **REFERENCE BOOKS:**

1. M. Srinivasan: Web Programming Building Internet Applications, 3<sup>rd</sup>Edition, Wiley India, 2009.
2. Jeffrey C. Jackson: Web Technologies-A Computer Science Perspective, Pearson Education, 7<sup>th</sup>Impression,2012.
3. Chris Bates: Web Technology Theory and Practice, Pearson Education, 2012.
4. Raj Kamal: Internet and Web Technologies, McGraw Hill Education.

## COURSE OUTCOMES:

On the successful completion of the course, students will be able to,

CO1	Design dynamic web pages using Javascript, JQuery and Angular Java script	K1	LO
CO2	Develop Web pages using HTML, CSS and XML	K2	IO
CO3	Create web application using PHP and MySQL	K3, K4	HO
CO4	To design dynamic web pages using Angular javascript	K2,K3	HO
CO5	Develop interactive web pages using JQuery	K4,K5	HO

**K1- Remember, K2- Understand, K3- Apply, K4- Analyze, K5-Evaluate, K6- Create**

## MAPPING WITH PROGRAMME OUTCOMES

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	S	S	S	S	M	M	S	M	M	S	S
CO2	S	S	M	S	S	S	M	S	S	S	S	S
CO3	S	S	S	M	S	S	M	M	S	M	M	S
CO4	S	S	S	M	S	M	M	S	S	M	S	M
CO5	S	S	S	M	S	S	M	S	M	S	S	M

**S- STRONG; M-MEDIUM; L-LOW**

## Advanced Machine Learning Techniques

### Course Objectives

- To understand the concepts of Machine Learning.
- To understand the theoretical and practical aspects of types of machine learning
- To teach and get familiarized with supervised learning and their applications.
- To teach and get familiarized with the concepts and algorithms of unsupervised learning.
- To appreciate the concepts and algorithms of deep learning.

### Unit I:

**Introducing Machine Learning:** The Origins of Machine Learning, Uses and Abuses of Machine Learning \_ Basics of Machine Learning Algorithm Model Works - Steps to apply Machine Learning - Choosing a Machine Learning Algorithm - Using Machine Learning concepts.

**Managing and Understanding Data:** Data Structures, Vectors And Factors: Lists, Data frames, Matrixes and arrays - Managing Data - Exploring and Understanding Data: Exploring the Structure of Data, Exploring Numeric variables - Exploring Categorical Variables- Exploring Relationships between Variables.

### Unit II:

Lazy Learning – **Classification Using Nearest Neighbors:** The kNN Algorithm- Diagnosing Breast Cancer with the kNN Algorithm- Probabilistic Learning – Classification Using Naive Bayes: Basic concepts of Bayesian Methods- The Naïve Bayes Algorithm- Example – filtering Mobile Phone Spam with the Naive Bayes Algorithm.

Divide and Conquer – **Classification Using Decision Trees and Rules:** Understanding Decision Trees- Example – Identifying Risky Bank Loans using C5.0 Decision Trees- Understanding Classification Rules- Example – Identifying Poisonous Mushrooms with Rule Learners.

### Unit III:

Forecasting Numeric Data – **Regression Methods:** Understanding Regression- Example – Predicting Medical Expenses using Linear Regression- Understanding Regression Trees and Model Trees- Example – Estimating the Quality of Wines with Regression Trees and Model Trees.

Black Box Methods Neural Networks and Support Vector Machines: Understanding Neural Networks, from Biological to Artificial Neurons, Activation Functions, Network Topology, Training Neural Networks with Backpropagation - Modeling the Strength of Concrete with ANNs- Understanding Support Vector Machines- Performing OCR with SVMs- Finding Patterns – Market Basket Analysis Using Association Rules: Understanding Association Rules- Example – Identifying Frequently Purchased Groceries with Association Rules.

#### **Unit IV:**

Finding Groups of Data – **Clustering with K-Means:** Understanding Clustering- The k-means Algorithm for clustering- Finding teen market segments using k-means Clustering- Evaluating Model Performance: Measuring Performance for Classification- Beyond Accuracy – other Measures of Performance, Visualizing Performance Tradeoffs.

Improving Model Performance: Tuning Stock Models for Better Performance- Using Caret for Automated Parameter Tuning- Creating a simple Tuned Model- Customizing the Tuning Process- Improving Model Performance with meta-learning- Understanding Ensembles- Bagging- Boosting- Random forests.

#### **Unit V:**

**Introduction to Deep Learning:** Introduction to Deep Learning, Single Layer Perceptron Model (SLP), Multilayer Perceptron Model (MLP), Convolutional Neural Networks (CNNs), Recurrent Neural Networks (RNNs), Restricted Boltzmann Machines (RBMs).

**Convolutional Neural Networks (CNNs):** Structure and Properties of CNNs - Components of CNN Architectures- Convolutional Layer, Pooling Layer, Rectified Linear Units (ReLU) Layer, Fully Connected (FC) Layer, Loss Layer - Tuning Parameters ,Notable CNN Architectures, Regularization- Recurrent Neural Networks (RNNs): Fully Recurrent Networks, Training RNNs with Back-Propagation Through Time (BPPT)- Elman Neural Networks, Neural History Compressor, Long Short-Term Memory (LSTM), Traditional and Training LSTMs - Structural Damping Within RNNs, Tuning Parameter Update Algorithm.

### **Text Books:**

1. Brett Lantz, "Machine Learning with R", Addison-Wesley Packt Publishing, 2013.
2. TawehBeysolow, "Introduction to Deep Learning Using R: A Step-by-Step Guide to Learning and Implementing Deep Learning Models Using R", San Francisco, California, USA, 2017.

### **Reference Books:**

1. Daniel T. Larose, Chantal D. Larose, "Data mining and Predictive analytics", Second Ed., Wiley Publication, 2015.
2. Bertt Lantz, "Machine Learning with R: Expert techniques for predictive modeling", 3rd Edition, April 15,2019.
3. Jason Bell, "Machine Learning: Hands-On for Developers and Technical Professionals", Wiley Publication,2015.

### **Course Outcomes**

**On the successful completion of the course, students will be able to,**

CO1	To understand, impart and analyze the concepts and of Machine Learning Techniques and types of data	<b>K1-K6</b>
CO2	To comprehend, apply and evaluate the classification techniques for real-world applications	<b>K1-K6</b>
CO3	To understand, use and perform evaluation of Regression methods	<b>K1-K6</b>
CO4	To recognize, implement and analyse the unsupervised techniques for real-world applications	<b>K1-K6</b>
CO5	To understand, identify, implement and review the deep learning techniques for real-time applications	<b>K1-K6</b>

**K1- Remember, K2- Understand, K3- Apply, K4- Analyze, K5- Evaluate, K6- Create**

## Mapping with Programme Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
C01	S	S	-	-	S	L	-	S	-	-	-	-
C02	S	S	M	-	S	L	-	S	-	-	-	-
C03	S	S	S	-	S	L	-	S	-	S	S	S
C04	S	S	M	-	S	L	-	S	-	-	-	-
C05	S	S	S	-	S	L	-	S	-	S	S	S

**S- Strong; M-Medium; L-Low**



## Advanced Java Programming Lab

### COURSE OBJECTIVES:

- To implement object-oriented concepts in JAVA.
- Develop the program using concepts Network programme.
- Learn how to create a program in java beans.
- Learn how to connect a relational database to Java.
- Develop the program using concepts Applet.

### List of Experiments:

1. Implementation of and Exception handling concepts with different type of Exception.
2. Build a Swing application to implement metric conversion.
3. Use Grid Layout to design a calculator and simulate the functions of a simple calculator.
4. Create a Color palette with a matrix of buttons using Applet.
5. To invoke a servlet from HTML forms.
6. To invoke servlet from Applets.
7. To invoke servlet from JSP.
8. Implement message communication using Network Programming.
9. Write a program to connect databases using JDBC.
10. Implementation of Java Beans.

### Course Outcomes

**On the successful completion of the course, students will be able to,**

CO1:	Implement classes, objects, members of a class and the relationships among them needed for a finding the solution to specific problem	K1, K2	LO
CO2:	Apply Applets and Swing programs	K3	IO
CO3:	Develop Servlets and JSP for creating Web based applications using JDBC	K4, K5	HO

**K1- Remember, K2- Understand, K3- Apply, K4- Analyze, K5- Evaluate, K6- Create**

## Mapping with Programme Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	M	S	S	S	M	M	S	M	-	-
CO2	S	S	S	S	S	S	S	M	S	S	-	-
CO3	S	S	S	S	S	S	S	S	S	S	-	-
CO4	S	S	S	S	S	S	S	S	S	S	-	-

**S- Strong; M-Medium; L-Low**

## **Web Technologies Lab**

### **COURSE OBJECTIVES:**

#### **At the end of the course, the student should be able to do:**

- Learn how to create web pages using HTML, CSS and Javascript.
- Implement dynamic web pages using Javascript, JQuery and Angular Java script.
- To create web applications using PHP and MySQL.
- Create web pages using XML and Cascading Style Sheets.
- Create XML documents and Schemas.

### **PROGRAM LIST**

1. Develop a web page to display your education details in a tabular format.
2. Develop a web page to display your CV on a web page.
3. Design a Homepage having three links: About Us, Our Services and Contact Us. Create separate web pages for the three links.
4. Design a web page to demonstrate the usage of inline CSS, internal CSS and external CSS.
5. Design an XML document and create a style sheet in CSS & display the document in the browser.
6. Develop a web page to Create image maps.
7. Design a web page to perform input validation using Angular Javascript.
8. Develop a web page in PHP to fetch details from the database.
9. Design a web page to hide paragraph using JQuery
10. Create a web page and add Javascript to handle mouse events and form events

## COURSE OUTCOMES:

On the successful completion of the course, students will be able,

<b>CO1</b>	Design dynamic web pages using JavaScript, JQuery and Angular Java script	K1	L O
<b>CO2</b>	Develop Web pages using HTML, CSS and XML	K2	IO
<b>CO3</b>	Create web application using PHP and MySQL	K3, K4	H O
<b>CO4</b>	Develop interactive web pages using JQuery	K2,K3	H O
<b>CO5</b>	To design dynamic web pages using Angular javascript	K4,K5	H O

**K1- Remember, K2- Understand, K3- Apply, K4- Analyze, K5-Evaluate, K6- Create**

## MAPPING WITH PROGRAMME OUTCOMES

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	S	S	S	S	M	M	S	M	M	S	M
CO2	S	S	M	S	S	S	M	S	S	S	M	S
CO3	S	S	S	M	M	S	M	M	S	M	M	S
CO4	S	M	S	M	S	M	M	S	S	M	S	M
CO5	M	M	S	M	S	S	M	S	M	M	S	M

**S- STRONG; M-MEDIUM; L-LOW**

## **Web Application Development and Hosting Lab**

### **COURSE OBJECTIVES:**

#### **At the end of the course, the student should be able to do:**

- Able to design a web page using HTML tags.
- To enable the students to use Frame sets, hyperlinks, and different formatting features of HTML tags.
- Enable the students to use Forms & other controls on a webpage.
- To create interactive applications using PHP.

### **PROGRAM LIST**

1. Develop a website for your college using advanced tags of HTML.
2. Write names of several countries in a paragraph and store it as an HTML document, world.html. Each country's name must be a hot text. When you click India (for example), it must open india.html and it should provide a brief introduction about India.
3. Develop a HTML document to i) display Text with Bullets / Numbers - Using Lists ii) to display the Table Format Data
4. Develop a Complete Web Page using Frames and Framesets which gives the Information about a Hospital using HTML.
5. Write an HTML document to print your Biodata in a neat form using several components.
6. Develop an HTML document to display a Registration Form for an inter-collegiate function.

7. Using HTML form accept Customer details like Name, City, Pin code, Phone number and Email address and validate the data and display appropriate messages for violations using PHP.  
(Eg. Name is Mandatory field; Pin code must be 6 digits, etc.).
8. Write a program to accept two numbers n1 and n2 using HTML form and display the Prime Numbers between n and n2 using PHP.

**COURSE OUTCOMES:**

**On the successful completion of the course, students will be able,**

<b>CO1</b>	Understand & implement the basic HTML tags to create static web pages	K1,K2
<b>CO2</b>	Capable of using hyperlinks, frames, images, tables,...in a web page	K2,K3
<b>CO3</b>	Able to write dynamic web applications using HTML forms	K4,K5
<b>CO4</b>	Must be able to write dynamic web applications in PHP & HTML tags using XAMPP.	K5,K6

**K1- Remember, K2- Understand, K3- Apply, K4- Analyze, K5-Evaluate, K6- Create**

### **MAPPING WITH PROGRAMME OUTCOMES**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	M	S	S	S	M	M	S	S	-	-
CO2	S	S	S	S	S	S	S	M	S	S	-	-
CO3	S	S	S	S	S	S	S	M	S	S	-	-
CO4	S	S	S	S	S	S	S	M	S	S	-	-

**S- STRONG; M-MEDIUM; L-LOW**

## **Advanced Machine Learning Techniques Lab**

### **Course Objectives**

- To formulate machine learning problems corresponding to different applications.
- To understand a range of machine learning algorithms along with their strengths and weaknesses.
- To apply machine learning algorithms to solve problems of moderate complexity.
- To apply CNN to solve problems of moderate complexity.
- To apply LSTM and RNN to solve problems.

### **List of Programs**

- 1.** Write a python program to compute the Central Tendency Measures: Mean, Median, Mode, Measure of Dispersion: Variance, Standard Deviation.
- 2.** Implement a Linear Regression and Multiple Linear Regression with a Real Dataset.
- 3.** Implementation of Logistic Regression using sklearn.
- 4.** Implement a binary classification model.
- 5.** Classification with Nearest Neighbours and NavieBaye Algorithm.
- 6.** Implementation Decision tree for classification using sklearn and its parameter tuning.
- 7.** Implement the k-means algorithm.
- 8.** Implement an Image Classifier using CNN in TensorFlow/Keras.
- 9.** Implement an Autoencoder in TensorFlow/Keras.
- 10.** Implement a SimpleLSTM using TensorFlow/Keras.



## Course Outcomes

On the successful completion of the course, students will be able to

<b>CO1</b>	To understand and implement the mathematical and statistical prospective of machine learning algorithms through python programming	<b>K1-K6</b>
<b>CO2</b>	To recognize and develop the machine learning models through python in built functions	<b>K1-K6</b>
<b>CO3</b>	To understand, impart and develop the machine learning models for real-time dataset	<b>K1-K6</b>
<b>CO4</b>	To comprehend, impart and implement the deep learning models for real-time applications	<b>K1-K6</b>
<b>CO5</b>	To identify and evaluate the performance machine learning models for real-time dataset	<b>K1-K6</b>

**K1- Remember, K2- Understand, K3-Apply, K4-Analyze, K5- Evaluate, K6- Create**

### Mapping with Programme Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	S	-	S	-	-	-	M	-	-	-
CO2	S	S	S	-	S	-	-	-	M	-	-	-
CO3	S	S	S	-	S	-	-	-	M	S	S	S
CO4	S	S	S	-	S	-	-	-	M	-	-	-
CO5	S	S	S	-	S	-	-	-	M	S	S	S

**S- Strong; M-Medium; L-Low**

## **Social Networking Lab**

### **Course Objectives**

- To familiarize the tools required to manage social network applications
- To analyze social networks like Facebook, LinkedIn, Google+, GitHub
- To teach the fundamental techniques and principles in achieving social networking environment.
- To enable students to have skills that will help them to solve real time applications.
- To explore in the Github API.

### **List of Programs**

1. Creating and Exploring Twitter's API
2. To analyzing and visualizing tweets and tweet entities with frequency analysis
3. Creating and Exploring Facebook's Social Graph API
4. To analyzing the Facebook's Social Graph connections
5. Creating and Exploring LinkedIn API
6. To downloading LinkedIn connections as a CSV file
7. Creating and Exploring Google+ API
8. To create and querying Human Language Data with TF-IDF
9. Creating and Exploring GitHub's API
10. To analyzing GitHub interest graph

## Course Outcomes

On the successful completion of the course, students will be able to

CO1:	To understand, implement and review the fundamental techniques and principles for social networks.	K1-K6
CO2:	To design and develop the programs using the tools required to develop and manage social network like Facebook, LinkedIn, Google+, GitHub	K1-K6
CO3:	To create and explore the functionality of social networking tools such as GitHub	K1-K6
CO4	To understand, implement and review the fundamental principles for social network graph.	K1-K6
CO5	To comprehend and critically analyze the existing API for social networks	K1-K6

**K1- Remember, K2- Understand, K3- Apply , K4- Analyze, K5- Evaluate, K6- Create**

## Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	M		M	S	-	-	-	S	-	-
CO2	S	M	S	S	S	M	-	-	-	S	-	-
CO3	S	S	S	S	S	S	-	-	-	S	S	S
CO4	S	M	S	S	S	M	-	-	-	S	-	-
CO5	S	S	S	S	S	S	-	-	-	S	S	S

**S- Strong; M-Medium; L-Low**

Course code		INTERNSHIP	L	T	P	C
Core/Elective/ Supportive		Core				2
Pre-requisite		Knowledge of Industrial Work Culture and Etiquette				
<b>Course Objectives :</b>						
The main objectives of this course are to :						
<ol style="list-style-type: none"> <li>1. Introduce the Working Ambience, Attitude, Adaptability, Problem Solving Ability, Ability to work with Supervisor, Ability to take Directions, etc.,</li> <li>2. Expose on the different phases of Developing a Computer Solution with Team Spirit.</li> <li>3. Learn about Problem Solving Skills, Soft Skills and other related Skills required for the Industry.</li> </ol>						
<b>Expected Course Outcomes :</b>						
<b>On the successful completion of the course, student will be able to :</b>						
1	Find the specific areas of interest, refine their skills and abilities					K1
2	Show a greater sense of self-awareness and appreciation for others					K2
3	Develop work habits and attitudes that are essential to succeed in the workplace					K3
4	Discover the importance of communication, interpersonal and other critical skills					K4
5	Choose and prioritize employment contacts leading directly to a full-time job immediately after graduation from college.					K5 & K6
<b>K1-Remember; K2-Understand; K3-Apply; K4-Analyze; K5-Evaluate; K6-Create</b>						

## **REGULATIONS**

1. The Candidates have to undergo a Minimum of 40 Hours of Internship Programme in the Industry during the holidays of the Second Semester of the Course of Study.
2. The Candidates need to get a Project, Analyze, learn the various stages of Developing a solution, Test, Validate and carryout the other related requirements.
3. During the course of Third Semester, the Candidates need to refine the work carried out during the Internship at the Industry, progress towards developing a better Solution as per the standards of the Industry and by carrying out the constructive comments received from the Industry and / or Institution during the Reviews.
  - Then the Candidates have to prepare and submit the manuscript of the Internship experience as a Report as per the requirements of the Institution / Department for Evaluation.
  - The submission of the Internship Report will be done at the end of the Third Semester for Presentation and Viva-Voce during the Practical Examinations of the Semester.
  - The Passing Minimum for Internship is 50%.
  - If the Candidate fails to score 50% in the Internship, the Candidate has to improve it during the next attempt.
  - A Faculty Member from the Department will act as a Guide to Supervise and Monitor the progress of the Candidates during the course of Internship.
  - The Faculty Member will act as the Internal Examiner during the course of Internship as well as at the time of conducting the Viva-Voce Examination.
10. The Internal Marks for the Internship will be awarded by the concerned Guide / Internal Examiner.
11. The Internal and External Examiners shall both evaluate the Internship Report, Presentation and conduct the Viva-Voce Examination.

**INTERNAL MARKS AWARDED FOR THE INTERNSHIP – 40 Marks**

1. Learning the Work Culture leading towards Performance, Organizations Skills and Relationship with Team Members – **10 Marks**
2. Internship Review 1 (During the beginning of the Semester) – **10 Marks**
3. Internship Review 2 (During the end of the Semester) – **10 Marks**
4. Progress of the Internship by the Candidate's active Participation – **10 Marks**

**EXTERNAL MARKS AWARDED FOR THE INTERNSHIP – 60 Marks**

1. Evaluation of the Internship Report - **20 Marks**
2. Presentation – **20 Marks**
3. Viva-Voce Examination – **20 Marks**

**Total – 100 Marks**

# High Performance Computing

## Course Objectives:

- To get a clear idea of High-Performance Computing concept.
- To get brief knowledge about how to function the HPC systems.
- To get idea of what techniques used in HPC models.
- To understand a Parallel computing concepts.
- To get familiar with OpenMP technology that is widely used in HPC technology.

## Unit-I

**Modern processors:** Stored-program computer architecture-General purpose cache-based microprocessor architecture-Memory Hierarchies-Multicore processors-Multithreaded processors-Vector processors. **Basic optimization techniques for serial code:** Scalar Profiling-Common sense optimizations-Simple measures, large impact-The role of compilers-C++ optimizations.

## Unit-II

**Data access optimization:** Balance analysis and light speed estimates-Storage order-Algorithm classification and access optimizations-The Jacobi algorithm-Algorithm classification and access optimizations-Sparse matrix-vector multiply. **Parallel computers:** Taxonomy of parallel computing paradigms-Shared-memory computers-Distributed memory computers-Hierarchical systems-Networks.

## Unit-III

**Basics of parallelization:** Introduction to Parallelism -Parallel scalability. **Shared memory parallel programming with OpenMP:** Short introduction to OpenMP-OpenMP-parallel Jacobi algorithm.

## Unit-IV

**Efficient OpenMP programming:** Profiling OpenMP programs-Performance pitfalls-Parallel sparse matrix-vector multiply. **Locality optimizations on ccNUMA architectures:** Locality of access on ccNUMA-ccNUMA optimization of sparse MVM-Placement pitfalls-ccNUMA issues with C++.

## Unit-V

**Distributed-memory parallel programming with MPI:** Message passing-A short introduction to MPI-MPI parallelization of a Jacobi solver.

**Efficient MPI programming:** MPI performance tools-Communication parameters-Synchronization, serialization, contention-Reducing communication overhead-Understanding intranode point-to-point communication.

**Text book:**

1. Georg Hager, Gerhard Wellein "Introduction to High Performance Computing for Scientists and Engineers", CRC Press, 2011. **Chapters:** 1 to 10.

**Reference books:**

1. Michael W. Berry, Kyle A. Gallivan, Efstratios Gallopoulos, Ananth Grama, Bernard Philippe, Yousef Saad, Faisal Saied, "High-performance scientific computing: algorithms and applications", Springer, 2012.
2. Victor Eijkhout, "Introduction to High Performance Scientific Computing", MIT Press, 2011.

**Course Outcome:**

**On the successful completion of the course, students will be able to,**

CO1	Understand of the HPC and ccNUMA concepts	K1 - K6
CO2	Design and develop a parallel programming with modern C, C++ and new version of FORTRAN	
CO3	Apply with parallel computing	
CO4	Develop an efficient OpenMP programming	
CO5	Evaluate an efficient MPI programming	

**K1-Remember, K2-Understand, K3-Apply, K4-Analyze, K5-Evaluate, K6-Create**



**Mapping with Programme Outcomes:**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	L	M	L	L	L	S	S	S	S	M	L
CO2	S	M	L	M	M	L	S	L	S	L	S	L
CO3	S	S	S	M	M	L	M	L	M	L	S	L
CO4	S	S	S	M	S	L	M	L	M	S	S	S
CO5	S	S	S	M	M	L	M	M	M	M	S	L

**L - Low, M- Medium, S - Strong**

## Big Data Analytics

### Course Objectives

- To introduce big data tools & Information Standard formats.
- To understand the basic concepts of big data.
- To learn Hadoop, HDFS and Map Reduce concepts.
- To teach the importance of NoSQL.
- To explore big data tools such as Hive, HBase and Pig.

### UNIT I

**Big Data and Analytics:** Classification of Digital Data: Structured Data- Semi Structured Data and Unstructured Data.

**Introduction to Big Data:** Characteristics – Evolution – Definition - Challenges with Big Data - Other Characteristics of Data - Big Data - Traditional Business Intelligence versus Big Data - Data Warehouse and Hadoop.

**Environment Big Data Analytics:** Classification of Analytics – Challenges - Big Data Analytics important - Data Science - Data Scientist - Terminologies used in Big Data Environments – Basically Available Soft State Eventual Consistency - Top Analytics Tools.

### UNIT II

**Technology Landscape:** NoSQL, Comparison of SQL and NoSQL, Hadoop - RDBMS Versus Hadoop - Distributed Computing Challenges – Hadoop Overview - Hadoop Distributed File System - Processing Data with Hadoop - Managing Resources and Applications with Hadoop YARN - Interacting with Hadoop Ecosystem

### UNIT III

**Mongodb and MapReduce Programming:** MongoDB: Mongo DB - Terms used in RDBMS and Mongo DB - Data Types - MongoDB Query Language.

MapReduce: Mapper – Reducer – Combiner – Partitioner – Searching – Sorting – Compression

### UNIT IV

**Hive:** Introduction – Architecture - Data Types - File Formats - Hive Query Language Statements – Partitions – Bucketing – Views - Sub- Query – Joins – Aggregations - Group by and Having – RCFile - Implementation - Hive User Defined Function - Serialization and Deserialization.

### UNIT V

**Pig:** Introduction - Anatomy – Features – Philosophy - Use Case for Pig - Pig Latin Overview - Pig Primitive Data Types - Running Pig - Execution Modes of Pig - HDFS Commands - Relational Operators - Eval Function - Complex Data Types - Piggy Bank - User-Defined Functions - Parameter Substitution – Diagnostic Operator - Word Count Example using Pig - Pig at Yahoo! - Pig Versus Hive

**Text Book:**

1. Seema Acharya, Subhashini Chellappan, "Big Data and Analytics", Wiley Publications, First Edition, 2015.

**Reference Book:**

1. Judith Huruwitz, Alan Nugent, Fern Halper, Marcia Kaufman, "Big data for dummies", John Wiley & Sons, Inc. (2013).
2. Tom White, "Hadoop The Definitive Guide", O'Reilly Publications, Fourth Edition, 2015.
3. Dirk Deroos, Paul C.Zikopoulos, Roman B.Melnky, Bruce Brown, Rafael Coss, "Hadoop For Dummies", Wiley Publications, 2014.
4. Robert D.Schneider, "Hadoop For Dummies", John Wiley & Sons, Inc. (2012).
5. Paul Zikopoulos, "Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data, McGraw Hill, 2012 Chuck Lam, "Hadoop In Action", Dreamtech Publications, 2010

## Course Outcomes

On the successful completion of the course, students will be able to,

CO1:	To understand, illustrate and evaluate the concepts and techniques of Data Science, Big Data Analytics and its tools	K1-K6
CO2:	To collaborate, apply and review the computing for big data in Hadoop, and NoSQL environment.	K1-K6
CO3:	To comprehend, implement and review the concepts of data science and big data analytics projects using MapReduce, and MongoDB	K1-K6
CO4:	To understand, use and analyze the concepts of big data analytics projects using HIVE database.	K1-K6
CO5:	To illustrate, develop and review the concepts of PIG database in Hadoop environment.	K1-K6

**K1- Remember, K2- Understand, K3- Apply, K4- Analyze, K5-Evaluate, K6- Create**

## Mapping with Programme Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	-	-	-	-	L	-	-	-	-	-	-
CO2	S	-	M	-	M	L	-	-	-	-	-	-
CO3	S	-	S	-	S	L	-	-	-	S	S	S
CO4	S	-	S	-	S	L	-	-	-	S	S	S
CO5	S	-	S	-	S	L	-	-	-	S	S	S

**S- Strong; M-Medium; L-Low**

Course code		<b>PROJECT WORK AND VIVA-VOCE</b>	L	T	P	C
<b>Core/Elective/Supportive</b>		<b>Core</b>			10	7
<b>Pre-requisite</b>		Knowledge of Software Development Phases				
<b>Course Objectives :</b>						
The main objectives of this course are to :						
<ol style="list-style-type: none"> <li>1. Expose to the various phases of Software Development Life Cycle.</li> <li>2. Learn to apply the Skills and Knowledge in Design, Coding and Testing with appropriate Technological Tools and Procedures.</li> <li>3. Learn to Develop Applications with Personal, Societal and Professional Ethical Standards.</li> </ol>						
<b>Expected Course Outcomes :</b>						
<b>On the successful completion of the course, students will be able to :</b>						
1	Show Leadership Skills and Learn Time Management					K1
2	Identify various Tools to be applied to a specific Problem					K2
3	Evaluate the Reports					K3
4	Involve in the Team and Manage it to deliver the excellent Outcomes					K4
5	Assess and Develop the Individual Skills to Present and Organize the Projects					K5 & K6
<b>K1-Remember; K2-Understand; K3-Apply; K4-Analyze; K5-Evaluate; K6-Create</b>						
<b>REGULATIONS</b>						
<ol style="list-style-type: none"> <li>1. The Candidates have to undergo a Minimum of 150 Hours of Project Work during the Course of Study either in an IT Industry / Public or Private Sector Organization / Research Institutes / Institution itself.</li> <li>2. The Candidates need to identify and analyze real world problems on the selected project domain.</li> <li>3. During the course of study, the Candidates need to Develop, Design, Test, etc., the Applications as per the directions by the Guide.</li> <li>4. Then the Candidates have to prepare and submit the manuscript of the Project Work as a Report as per the requirements of the Institution / Department for Evaluation.</li> <li>5. The submission of the Project Report will be done at the end of the Semester for Presentation and Viva-Voce during the Practical</li> </ol>						

Examinations of the Semester.

- The Passing Minimum for Project Work is 50%.
  - If the Candidate fails to score 50% in the Project Work, the Candidate has to improve it during the next attempt.
  - A Faculty Member from the Department will act as a Guide to Supervise and Monitor the progress of the Candidates during the course of Project Work.
  - The Faculty Member will act as the Internal Examiner during the course of Project Work as well as at the time of conducting the Viva-Voce Examination.
10. The Internal Marks for the Project Work will be awarded by the concerned Guide / Internal Examiner.
11. The Internal and External Examiners shall both evaluate the Project Report, Presentation and conduct the Viva-Voce Examination.

**INTERNAL MARKS AWARDED FOR THE PROJECT WORK – 80 Marks**

1. Plan of the Project – **15 Marks**
2. Execution of the Plan – **15 Marks**
3. Individual Initiative – **10 Marks**
4. Review 1 – **20 Marks**
5. Review 2 – **20 Marks**

**EXTERNAL MARKS AWARDED FOR THE PROJECT WORK – 120 Marks**

1. Evaluation of the Project Report - **50 Marks**
2. Presentation – **30 Marks**
3. Viva-Voce Examination – **40 Marks**

**Total – 200 Marks**

## **High Performance Computing Lab**

### **Course Objectives:**

- To understand concepts of High-Performance Computing.
- To get brief knowledge about PB and Slurm.
- To understand techniques of OpenMP and OpenMPI.
- To understand Parallel computing concepts.
- To get familiar with CUDA.

### **(Implemented either PB, Slurm, OpenMP, OpenMPI, and CUDA)**

1. Demo: - Access and best practices on HPC.
2. Matrix multiplication with Job scheduling (PB or Slurm).
3. Vectors add with malloc shared.
4. Vector add program with MPI.
5. Hello world task for Multithreading with openMP.
6. openMP shared memory on Host and Device.
7. openMP Matrix Multiplication with parallelism and Barrier.
8. openMP with Reduction on operands and aggregate functionality.
9. Vector and Matrix multiplication on CUDA.
10. Feed forward computing on CUDA.

**Course Outcome:****On the successful completion of the course, students will be able to,**

CO1	Apply and Evaluate the HPC Programs	K1 - K6
CO2	Design and Develop a MPI Programs	
CO3	Design and develop a different programming concepts of OpenMP	
CO4	Develop an efficient PB and Slurm programming	
CO5	Evaluate an efficient CUDA programming	

**K1-Remember, K2-Understand, K3-Apply, K4-Analyze, K5-Evaluate, K6 -Create****Mapping with Programme Outcomes:**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	L	M	L	L	L	S	S	S	S	M	L
CO2	S	M	L	M	M	L	S	L	S	L	S	L
CO3	S	S	S	M	M	L	M	L	M	L	S	L
CO4	S	S	S	M	S	L	M	L	M	S	S	S
CO5	S	S	S	M	M	L	M	M	M	M	S	L

**L - Low, M- Medium, S - Strong**



## **Big Data Analytics Lab**

### **Course Objectives**

- To teach the fundamental techniques for handling big data tools.
- To familiarize the tools required to manage big data.
- To analyze big data using Hadoop, MapReduce, Hive, and Pig.
- To teach the fundamental principles in achieving big data analytics with scalability and streaming capability.
- To enable students to have skills that will help them to solve complex.

### **List of Programs**

1. Implement File System Shell Commands for HDFS in Hadoop Environment.
2. Write a Mapreduce program using single reduce function for finding Maximum and Minimum Number.
3. Write a Mapreduce program using multiple reduce function for Word Count in an given Text document.
4. Implement the following using Pig Latin Input and Output Operations Relational Operations.
5. Implement the following using Pig Latin User Defined Functions Advanced Relational Operations.
6. Write a Word Count program using Pig Latin Script.
7. Write a program to find a maximum temperature using Pig Latin Script.
8. Implement the following using Hive commands Handling the Database Creating and Manipulating table.
9. Implement Simple Queries for database using Mongo.
10. Implement Simple Queries for collections using Mongo.

## Course Outcomes

On the successful completion of the course, students will be able to,

CO1:	Understand and develop conceptually how Big Data is stored and implement it using different tools	K1-K6
CO2:	Comprehend and implement programs for data storage in HDFS and table manipulation using Big Data tools in Hadoop environment	K1-K6
CO3:	Understand and critically analyze existing Big Data datasets and implementations the solutions for it using MongoDB	K1- K6
CO4:	Understand and examine existing Big Data datasets and implementations the solutions using HIVE database	K1- K6
CO5:	Comprehend and review existing datasets and implementations the solutions to handle it using PIG	K1- K6

**K1-Remember, K2-Understand, K3-Apply, K4-Analyze, K5-Evaluate, K6-Create**

## Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	M		M	S	-	-	-	-	-	-
CO2	S	M	S	S	S	M	-	-	-	-	-	-
CO3	S	S	S	S	S	S	-	-	-	-	-	-
CO4	S	M	S	S	S	M	-	-	-	-	-	-
CO5	S	S	S	S	S	S	-	-	-	-	-	-

**S- Strong; M-Medium; L-Low**

## **Soft Skill Development Lab**

### **Course Objectives**

This course enables the students:

- To enable students to gain basic communication skills in professional and social contexts effectively.
- To acquire useful words and apply them in situational context.
- To develop listening and reading skills through comprehension passages.
- To enrich leadership qualities and interpersonal communication.
- To enhance essential characteristics in writing.

### **Exercises**

1. Characteristics of Technical Writing
2. Development of Employability Skills
3. Vocabulary Development
4. Sentence Completion
5. Error Spotting
6. Interpretation of Verbal Analogy
7. Interpretation of Reading (Comprehension -Conception)
8. Interpretation of Reading (Comprehension -Reasoning)
9. Practice for writing E-mails/Technical Blogs/Forums
10. PPT Preparation / Demonstration of Technical Presentation
11. Preparation of Resume
12. Preparation for Job Interviews / Mock Interview Section
13. Group Discussion Skills
14. Developing Listening Skill (Comprehension)
15. Practice for Short Speeches / Situational Conversation
16. English through Mass Media
17. Essential Grammar
18. Communicating and collaborating with peer members
19. Team Empowerment
20. Persuasive Communication

## **Text Books**

- 1.** Uma Narula, "Development Communication: Theory and Practice", Revised Edition, Har-Aanad Publication, 2019.
- 2.** Annette Capel and Wendy Sharp, "Cambridge English: Objective First", Fourth Edition, Cambridge University Press, 2013.
- 3.** Emma Sue-Prince, "The Advantage: The 7 Soft Skills You Need to Stay One Step Ahead", First Edition, FT Press, 2013.
- 4.** Guy Brook-Hart, "Cambridge English: Business Benchmark", Second Edition, Cambridge University Press, 2014.
- 5.** Norman Lewis, "How to Read Better & Faster", Binny Publishing House, New Delhi, 1978.

## **Reference Books**

- 1.** Michael McCarthy and Felicity O'Dell, "English Vocabulary in Use: 100 Units of Vocabulary Reference and Practice", Cambridge University Press, 1996.
- 2.** Murphy, Raymond, "Intermediate English Grammar", Second Edition, Cambridge University Press, 1999.

## **Data Visualization Lab**

### **Course Objectives**

- To learn the basic functions and operations of Excel and tableau.
- To explore to design, build, and deploy various charts for applications,
- To comprehend, design and deploy the label and heat map.
- To understand and deploy dashboard.
- To understand the functions of tableau for data process.

### **List of Programs**

#### **Note: Use the following Dataset**

[http://www.tableau.com/sites/default/files/training/global\\_superstore.zip](http://www.tableau.com/sites/default/files/training/global_superstore.zip)

#### **Implement the following using Excel.**

1. Create Pie chart for Sales and Sales % by Country (sorted in descending order).
2. Create Bar chart for Sales by Country by Year (rounded to nearest thousand and sorted by Grand Total).
3. Create Line char for Sales by Ship Mode (First Class, Same Day, Second Class and Standard Class).
4. Create Scatter chart for Sales by Ship Mode by Country (rounded to the nearest dollar and sorted by First Class).
5. Create heat map for Sales by Category by Sub-Category (in thousands and sorted by sales value in descending order).
6. Design and create the label for vendor list.
7. Design and create the dashboard.

#### **Implement the following using Tableau.**

8. Sales by Ship Mode (First Class, Same Day, Second Class and Standard Class).
9. Sales by Ship Mode by Country (rounded to the nearest dollar and sorted by First Class).
10. Sales by Category by Sub-Category (in thousands and sorted by sales value in descending order).

## Course Outcomes

On the successful completion of the course, students will be able to,

CO1:	Enable to create and apply Spread sheet and Tableau for various data processing	K1-K6
CO2:	Gains knowledge to create and design various visualization tools in Excel and Tableau.	K1-K6
CO3:	Comprehend, create and deploy labels and heat map.	K1-K6
CO4:	Enable to create and apply dashboard for various data processing	K1-K6
CO5:	Illustrate and apply data visualization tool for any data set	K1-K6

**K1-Remember, K2-Understand, K3-Apply, K4-Analyze, K5-Evaluate and K6-Create**

**Mapping with Programme Outcomes:**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	M	L	M	S	-	-	-	-	-	-
CO2	S	M	S	S	S	M	-	-	-	-	-	-
CO3	S	S	S	S	S	S	-	-	-	-	-	-
CO4	S	M	M	S	M	L	-	-	-	-	-	-
CO5	M	S	M	L	S	M	-	-	-	-	-	-

**S – Strong, M – Medium, L - Low**

## **GUIDELINES FOR EXTENSION ACTIVITY**

1. All the candidates who have enrolled for Post Graduate course in the affiliated colleges of Thiruvalluvar University must become a Member of any one the Extension Activities that is offered in the Institution / College, namely, National Service Scheme (NSS), Youth Red Cross (YRC), Red Ribbon Club (RRC), Eco Club, Rovers and Rangers, etc., that serves the people of the neighbourhood through its various activities.
2. The department must facilitate the Candidates to register any one of the Extension Activity Club / Forum that are functioning in the Institution / College.
3. The Candidates are then expected to actively participate in the various activities organized by the above Clubs / Forum and complete the same within the Stipulated time.
4. The Club / Forum shall declare the Candidates successful at the end of the Semester / Year if they complete the activities and earn 1 credit or certificate from the Club / Forum.
5. The Department shall take necessary efforts to convey the Credit / Certification received from the Successful Candidates of the Club / Forum to the University through the Institution along with a copy of the Certificate issued to the Candidates and ensure that the Candidate's Credit is transferred to the University.
6. In case of the Unsuccessful Candidates in the Certification, the Candidates themselves have to re-register for the same.

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