



Scheme of Instructions & Syllabi  
of

**Bachelor of Computer Applications  
(Cloud Computing)  
1<sup>st</sup> Year**

(with Effective from session 2023-24)

**Total Credit of the Program**

Semester	I	II	III	IV	V	VI	Total
Credits	23	24	25	22	22	24	<b>140</b>

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**STUDY AND EVALUATION SCHEME**  
**Bachelor of Computer Applications (Cloud Computing)**  
 (with Effective from session 2023-24)

**SEMESTER I, YEAR I**

S.No	Course Code	Course Title	L+T+P	CA	EE	Total	Credit
1	BCAI101	English-I	2+1+0	25	50	75	3
2	BCAI102	Theory of Mathematics	2+1+0	25	50	75	3
3	BCAI104	Programming in C	2+1+0	25	50	75	3
4	BCAI105	Client Side Scripting	2+1+0	25	50	75	3
5	IOT1	Introduction to IIOT Foundation	3+1+0	30	70	100	4
<b>PRACTICAL / PROJECTS</b>							
6	BCAI106	Office Automation Lab	0+0+4	10	15	25	1
7	BCAI107	Programming in C Lab	0+0+2	15	35	50	2
8	BCAI108	Client Side Scripting Lab	0+0+4	15	35	50	2
9	BCAI109	Effective Communication Skills	0+0+4	15	35	50	2
<b>TOTAL</b>			<b>11+5+14</b>	<b>185</b>	<b>390</b>	<b>575</b>	<b>23</b>

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**SEMESTER II, YEAR I**

S.No	Course Code	Course Title	L+T+P	CA	EE	Total	Credit
1	BCAI202	Linux Shell Scripting	2+1+0	25	50	75	3
2	BCAI204	Operating Systems	2+1+0	25	50	75	3
3	BCAI205	Data Structures using C	2+1+0	25	50	75	3
4	BCAI206	Environmental Studies	2+1+0	25	50	75	3
5	BCAI211	Python Programming	2+1+0	25	50	75	3
6	IHOT2	Communication and Standard Interfaces	3+1+0	30	70	100	4
<b>PRACTICAL / PROJECTS</b>							
7	BCAI207	Data Structures using C Lab	0+0+4	15	35	50	2
8	BCAI208	Linux Shell Scripting Lab	0+0+2	10	15	25	1
9	BCAI212	Python Programming Lab	0+0+4	15	35	50	2
<b>TOTAL</b>			<b>13+6+10</b>	<b>195</b>	<b>405</b>	<b>600</b>	<b>24</b>

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**SEMESTER III, YEAR II**

S.No	Course Code	Course Title	L+T+P	CA	EE	Total	Credit
1	BCAI301	DBMS	2+1+0	25	50	75	3
2	BCAI302	Computer Networks	2+1+0	25	50	75	3
3	BCAI305	Object Oriented Programming Using Java	2+1+0	25	50	75	3
4	BCAICT303	Cloud Computing	2+1+0	25	50	75	3
5		Elective-I	2+1+0	25	50	75	3
6	IOT3	Introduction to Data Analytics	3+1+0	30	70	100	4
<b>PRACTICAL / PROJECTS</b>							
7	BCAI303	DBMS Lab	0+0+4	15	35	50	2
8	BCAI306	Object Oriented Programming Using Java Lab	0+0+4	15	35	50	2
9	BCAI304	Business communication and Presentation Skills	0+0+4	15	35	50	2
<b>TOTAL</b>			<b>13+6+12</b>	<b>200</b>	<b>425</b>	<b>625</b>	<b>25</b>

<b>Elective I</b>		
S.No	Course Code	Program Elective-I
1	BCAICT301	Information Security
2	BCAICT 304	Server Administration
3	BCAICT 305	Linux Administration

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**SEMESTER IV, YEAR II**

S.No	Course Code	Course Title	L+T+P	CA	EE	Total	Credit
1	BCAI408	Principles of Virtualization	1+1+0	15	35	50	2
2	BCAICT402	Cloud Web services	2+1+0	25	50	75	3
3	BCAICT403	Ethical Hacking	2+1+0	25	50	75	3
4		Elective-II	2+1+0	25	50	75	3
5	BCAI403	Logical Reasoning and Thinking	3+1+0	15	35	50	2
6	IHOT4	Machine Learning	3+1+0	30	70	100	4
<b>PRACTICAL / PROJECTS</b>							
7	BCAI409	Principles of Virtualization Lab	0+0+2	10	15	25	1
8	BCAICT407	Cloud Web Services Lab	0+0+4	15	35	50	2
9	BCAICT406	Ethical Hacking Lab	0+0+4	15	35	50	2
<b>TOTAL</b>			<b>13+6+10</b>	<b>175</b>	<b>375</b>	<b>550</b>	<b>22</b>

<b>Elective II</b>		
S.No	Course Code	Program Elective-II
1	BCAICT401	Storage and Datacenter
2	BCAICT404	Network Security
3	BCAICT405	Database security fundamentals

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**SEMESTER V, YEAR III**

S.No	Course Code	Course Title	L+T+P	CA	EE	Total	Credit
1	BCAICT501	Digital Forensics and Investigation	2+1+0	25	50	75	3
2	BCAICT502	Cloud Migration	2+1+0	25	50	75	3
3		Elective –III	2+1+0	25	50	75	3
4		Elective – IV	2+1+0	25	50	75	3
5		Generic Elective – I	2+1+0	25	50	75	3
6	IIoT5	Deep Learning	3+1+0	30	70	100	4
<b>PRACTICAL / PROJECTS</b>							
7	BCAICT511	Digital Forensics and Investigation Lab	0+0+4	15	35	50	2
8		Elective – III Lab	0+0+2	10	15	25	1
<b>TOTAL</b>			<b>13+6+6</b>	<b>180</b>	<b>370</b>	<b>550</b>	<b>22</b>

Elective III		
S.No	Course Code	Program Elective-III
1	BCAICT503	PowerShell Scripting
2	BCAICT504	Infrastructure Automation

Elective III Lab		
S.No	Course Code	Program Elective-III Lab
1	BCAICT512	PowerShell Scripting Lab
2	BCAICT513	Infrastructure Automation Lab

Elective IV		
S.No	Course Code	Program Elective-IV
1	BCAICT505	Cloud Security
2	BCAICT506	Application and Web Security

Generic Elective-I		
S.No	Course Code	Generic Elective-I
1	BCAICT507	IT Governance, Risk, & Information Security Management
2	BCAICT508	Infrastructure Solutions on Cloud

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**SEMESTER VI, YEAR III**

S.No	Course Code	Course Title	L+T+P	CA	EE	Total	Credit
<b>PRACTICAL / PROJECTS</b>							
1	BCAI601	Major Project / Internship	0+0+40	180	420	600	24
<b>TOTAL</b>			<b>0+0+40</b>	<b>180</b>	<b>420</b>	<b>600</b>	<b>24</b>

# Syllabus

# Semester: I



## Course Objective:

1. To train students in how to be effective communicators by practicing various skills and also help them in becoming well-groomed individuals in terms of both verbal and non-verbal communication

## Unit I: Communication Process

What is communication? The communication model, elements of communication, Importance of effective communication skills in the business world, Components of Communication Process, practicing effective communication, good communication Vs effective communication, styles of communication, intercultural communication skills- need for attitude change and benefits

## Unit II: Types of Communication & Barriers to communication

Verbal Communication, Non Verbal Communication, Written Communication, Do's and don'ts of each type, barriers to effective communication and how to overcome them, interaction of verbal and non-verbal communication, talents of a corporate communicator, silence- merits and limitations of each type

## Unit III: Listening Skills & Reading Skills

What is listening, various types of listening – Active, passive, selective, listening and note taking, listening and comprehending, listening to speak, principles of good listening Techniques to develop effective listening skills, Reading Skills- skimming, scanning and inferring- common reading techniques, practicing smart reading.

## Unit IV: Conversation Skills

Importance of conversation skills, features of a good conversation, Tips to improve Conversation skills, importance of questioning skills, techniques to ask right questions- role play situations to practice the same, discussing issues (social, political and cultural), formal and informal conversation

## Unit V: Telephone Etiquette

Basic rules of telephone etiquette- formal vs. informal; tone, pitch and vocabulary related to formal ways of speaking over the phone, leaving voice messages; practice sessions (role plays)

Persuasive communication: What is persuasive communication, different techniques of persuasive communication, How to negotiate using persuasive communication, the act of negotiation, negotiation style and their contexts, fundamentals of negotiation, common hurdles in negotiation and how to overcome them

## Text Books:

1. “Active Listening 101: How to Turn Down Your Volume to Turn Up Your Communication Skills, by Emilia Hardman, 2012
2. The Power of Communication: Skills to Build Trust, Inspire Loyalty, and Lead Effectively, by Helio Fred Garcia, 2012

## Reference Books:

1. Power Listening: Mastering the Most Critical Business Skill of All, by Bernard T. Ferrari, 2012
2. Fitly Spoken: Developing Effective Communication and Social Skills, by Greg S. Baker, 2011
3. The Secrets of Successful Communication: A Simple Guide to Effective Encounters in Business (Big Brain vs. Little Brain Communication), by Kevin T. McCartney, 2011.

## Course Outcomes:

1. In the end of the course, students will be able to channelize areas of communication in which they need to improve and use communication more effectively to get their messages across to people more clearly.

## BCAI-102: Theory of Mathematics

L=1, T=1, P=0, C=3

MM 75

### Course Objective:

1. To develop the skills in the areas of Matrices, Sets, relations and functions, Differentiation and Integration.
2. Mathematics concepts serves as a pre-requisite for post graduate courses, specialized studies and research.

### Unit I: Sets, relations and functions

Definition of Set, Type of Sets, Operations on Sets, Venn diagram, Cartesian Product, Relations, Functions, Types of function, Some elementary functions with their graphs (Exponential, logarithmic, modulus), Limit & continuity of a function (Simple Problems).

### Unit II: Matrices and Determinants

Types of Matrices, Operations of addition, Scalar Multiplication and Multiplication of Matrices, Determinant of a Square Matrix, Minors and Cofactors, Transpose, adjoint and inverse of a matrix, solving system of linear equations, in two or three variables using inverse of a matrix.

### Unit III: Limits, Continuity and Differentiation

Limit at a Point, Properties of Limit, Computation of Limits of Various Types of Functions, Continuity at a Point, Continuity Over an Interval, Intermediate Value Theorem, Type of Discontinuities. Derivative, Derivatives of Sum, Differences, Product & Quotients, Chain Rule, Derivatives of Composite Functions

### Unit IV: Coordinate Geometry

2D Cartesian Co-ordinate system, Straight line: (Equation & Slope of a line), Circle: Equation of Circle, Equation to Tangent, Conic Sections: Focus, Eccentricity, Directrix, Axis of a conic section, Parabola & Ellipse: (Definitions, equations and shape of curve only)

### Unit V: Statistics and Probability

Introduction, definition, terminologies in statistics and probability, measure of central tendency and dispersion, probability distribution – continuous and discrete, Bayes theorem, testing of hypothesis, basics of ANOVA, Correlation and Regression Analysis.

### Text Book:

1. Mathematics for BCA by G. C. Sharma & Madhu Jain, Oscar Publication
2. Mathematics Vol-2 by R. D. Sharma, Dhalpat Raj & Sons

### Reference Books:

The Elements of Co-ordinate Geometry Part-I by S. L. Loney, Book Palace, New Delhi.

### Course Outcome:

After completion of the course the student will be able:

1. To know and define the use of basic concepts of Matrices.
2. To apply the concept of set relation and functions in functions.
3. To know the methods and rules of calculus.
4. To understand the basics 2D Cartesian Co-ordinate system, Straight line.
5. To know the basics of statistics and probability for computer science.

# BCAI-104: Programming in C

L=1, T=1, P=2, C=3

MM 75

## Course Objective:

1. Even with the introduction of several high level languages and frameworks, the development of procedural codes is important in several commercial app developments.
2. The object oriented platforms and event driven systems use procedural languages for coding integral command content. C is an important procedural language and was developed initially to write the UNIX operating system.
3. UNIX operating system, C compiler and all UNIX application programs are written in C. C is popular because, it is easy to learn, produces efficient programs, can handle low-level activities, and can be compiled on a variety of platforms.
4. This course focuses on all the basic concepts, syntax and constructs of the C language. For students, who are new to programming, this unit can be considered as the starting point before taking up any other programming oriented units.
5. The students will be implementing the concepts explained here to create simple to complex programs.

## Unit I: Introduction to Programming:

Problem Solving Using Computers: Language Classification, Problem Analysis, Algorithm and Flowchart design. Algorithms: Steps in developing algorithms, advantages and disadvantages. Flowcharts: Symbols used in developing flowcharts, advantages and disadvantages. Coding, testing, debugging, Documentation and maintenance. Program development and modular design.

## Unit II: Fundamentals of C programming and Control Structures:

History, Structure of a C program, C Conventions, Character Set, Identifiers, Keywords, Simple Data types, Modifiers, Variables, Constants, Operators (Arithmetic operator, relational operator, logical operator, ternary operator, unary operator, shorthand operator, bit-wise operator and arithmetic operator) Operator precedence. Input and Output operation: Single character input and output, formatted input and output, Buffered input. Control Structures: Introduction, Conditional statement, if statement, if-else statement, nested if statement, else-if statement and switch statement. Goto statement. Looping statement, while statement, do-while statement, for statement, break and continue, nested for statement

## Unit III: Arrays and Functions:

Arrays: Introduction (One and multi-dimensional), Declaration of arrays, Initialization of arrays, processing with arrays. String manipulation, declaration of string arrays, string operations. Functions: Introduction, advantages of subprograms, Function definition, function call, Actual and formal arguments, local and global variables, function prototypes, types of functions, recursive functions, arrays and functions.

## Unit IV: Storage Classes, Structures, Unions and Pointers:

Storage Classes, Structures and Unions: Introduction, types of storage classes, Introduction to structures, Advantages of structures, accessing elements of a structure, nested structures, array of structures, functions and structures, Unions, bit-fields, enumerated data types. Pointers: Introduction, pointer variable, pointer operator, pointer arithmetic, pointers and arrays, pointers and strings, array pointers, dynamic allocation

## Unit V: Files, Preprocessor, standard library and header files:

Files: Introduction, File data type, opening and closing a file, file functions (getc, putc, getw, putw, fscanf, fprintf, fread, fwrite, fgets, fputs, feof). Preprocessor: #define, #include, #undef, Conditional compilation directives, C standard library and header files: Header files, string functions, mathematical functions, Date and Time functions

**Text Book:**

1. Forouzon A Behrouz, Gilberg F Richard, A Structured Programming Approach using C - 3rd Illustrated Edition, 2009.
2. Kanetkar, Yashavant: "Let Us C", 6th Edition. BPB Publications.
3. Balagurusamy, E: "Programming in ANSI C" 3rd Edition. Tata McGraw-Hill

**Reference Books:**

1. The C programming Language by Richie and Kernighan, 2004, BPB Publication
2. Gottfried, Byron S: "Programming with C", 1996. Tata McGraw-Hill
3. Deitel, H M and Deitel P J: "C How to Program", 2nd Edition. Prentice-Hall

**Course Outcome:**

After completion of the course the student will be able:

1. To be able to use the basic concepts of Computer components.
2. To be able to design, implement, test, debug and document programs in C.
3. To be able to use functions, and functions with parameters passing option.
4. To be able to use pointers and arrays, perform pointer arithmetic.
5. To be able to understand the advance topics in C like file handling functions and the concept of Standard C library.
6. To be able to learn the concept of C preprocessor and its application in program development.

## BCAI-105: Client Side Scripting

L=1, T=1, P=0, C=3

MM 75

### Course Objective:

1. To introduce students to web technologies such as HTML, CSS, XML, Java Script teach them to create static and simple dynamic web pages or applications using these technologies and to understand web application deployment and software architectures.
2. Students will learn basic web application design, development and testing skills.
3. On completion of this course the learner should be able to design and implement a variety of dynamic Website

### Unit I: Introduction to the Internet and the World Wide Web

Introduction, History of internet, Internet Design Principles, Internet Protocols - FTP, TCP/IP, SMTP, Telnet, etc., Client Server Communication, Web System architecture

Evolution of the Web, Web architectures, Web clients and servers, Static and Dynamic Web Applications, Front end and back end web development. HTML, CSS, JS, XML; HTTP, secure HTTP, etc.; URL, Web Services – SOAP, REST.

### Unit II: HTML, CSS & JavaScript

Introduction to Html, Html Document structure, Html Editors, Html element/tag & attributes, designing simple page - Html tag, Head tag, Body tag; More Html tags - Anchor tag, Image tag, Table tag, List tag, Frame tag, div tag; Html forms - Input type, Text area, Select, Button, Images. Introduction to CSS, Syntax, Selectors, Embedding CSS to Html, Formatting fonts, Text & background color, Inline styles, External and Internal Style Sheets, Borders & boxing. Introduction to JavaScript: Data types, variables, operators, expressions, statements, functions, objects, arrays, date, math, error handling, flow control, loops

### Unit III: XML and HTML5, CSS3

Introduction to XML, Difference b/w Html & XML, XML editors, XML Elements & Attributes XML DTD, XML Schema, XML Parser, Document Object Model (DOM), XML DOM. Introduction to HTML5, CSS3, New features, Local storage, Web Sockets, Server events, Canvas, Audio & Video, Geolocation, Microdata, Drag and Drop. Browser life cycle and browser rendering stages. Service workers.

### Unit IV: Practical website development

Commonly used Web Servers and browsers, Setting up a server and domain name, website types and structures, web authoring tools, Web hosting, website maintenance, generating traffic to your website.

### Unit V: PHP Server side scripting

Introduction to PHP, Basic Syntax, Variables, constants and operators, Loops, Arrays and Strings, Environment & environment variables, responding to HTTP requests, Files, Cookies, Sessions, Examples.

### Text Books:

1. Practical Web Design for Absolute Beginners, Adrian W. West. Apress 2016
2. Introducing Web Development, Jorg Krause. Apress 2017.
3. HTML & CSS: The Complete Reference, Thomas Powell. McGraw Hill, Fifth Edition, 2010
4. Creating a Website: The Missing Manual, 3rd Edition, Mathew Macdonald. O'Reilly
5. Web Technologies - HTML, JavaScript, PHP, Java, JSP, ASP.NET, XML and Ajax Black, Kogen Learning Systems (Dreamtech Press), 5th Edition 2009.

**Reference Books:**

1. HTML, XHTML & CSS Bible, Brian Pfaffenberger, Steven M.Schafer, Charles White, Bill Karow- Wiley Publishing Inc, 2010
2. HTML5 & CSS3 for the Real World, 2 Edition, Alexis Goldstein, Estelle Weyl, Louis Lazaris. Apress 2015.
3. HTML5 & CSS3 for Dummies, Andy Harris. Wiley 2014.
4. Learning PHP A Gentle Introduction to the Web's Most Popular Language, David Sklar. O'Reilly 2016.
5. Build Your Own Database Driven Web Site Using PHP & MySQL, Kevin Yank. Sitepoint , 4th Edition, 2009.

**Course Outcome:**

Students will gain the knowledge and skills required to develop Simple Web Applications. They should be able to:

1. Explain basic Client-Server web architecture
2. Understand working of web protocols like HTTP, TCP/IP, DNS as well as IP and web address resolution schemes such as URIs/URLs and DNS
3. Use and recognize commonly used HTTP request and response messages
4. Differentiate and create both static and dynamic web applications
5. Understand and use HTML/CSS and XML
6. Create static web pages using HTML & CSS
7. Understand and use PHP for server side scripting
8. Create simple dynamic web pages supporting user interaction using HTML, CSS &Java Script

Program Name- **INTRODUCTION TO IOT FOUNDATION**

Program Hours- **50**

Tentative Credit- **4**

### **OBJECTIVES**

- To learn the concepts of IOT.
- To identify the different technology.
- To learn different applications in IOT.
- To learn different protocols used in IOT.
- To learn the concepts of smart systems with development in IOT.
- To learn how to visualize the real time data in IOT.

### **OUTCOMES**

- Project oriented learning with real time applications.
- End - to - end learning & development with different technologies of IOT System.
- Apply IOT to different applications using Thingworx.
- Application and analysis of protocols used in IOT.
- Design and develop smart things in IIOT using Thingworx.
- Analysis and evaluation of the data received through sensors in IOT using different visualization techniques.

### **SCOPE**

- IIOT Designer
- IIOT Developer
- IIOT Analyst
- IIOT Tester
- Entrepreneurship

### **PROJECTS**

- Smart Home Automation
- Smart washroom
- Smart Kitchen
- Smart Dustbin
- Smart Smoke Detector
- Smart Irrigation
- Smart Street Light
- Thingworx app development



## INTRODUCTION TO IOT FOUNDATION

### Module 1:

**Programming of Microcontroller:** Problem Statement Understanding, Tinker CAD Introduction, Simulation with LEDs & Serial Monitor, Introduction Sensors, Development board and Different Actuators, Basic Electronics Components of IOT, Basic Arduino Programs with Sensors & Actuators, Interfacing LED, Interfacing LCD, Installing Board Packages, Serial Monitor and Debugging Tool, Installing Sensor Libraries.

### Module 2:

**Embedded coding and Debugging of Microcontroller:** Hardware Selection, Interfacing with Development Board, Coding & Testing, Architecture of Microcontroller, Analog & Digital Signals, Basic gates, Timers, Counters, flipflops, Registers, RAM, and ROM (PROMS, EPROMS, EEPROMS), Multiplexers, De-Multiplexers, Encoders, Decoders.

### Module 3:

**IOT Communication Protocols-** IOT Communication Protocols, Wired Protocols Introduction to (Ethernet: Twisted pair, Co-axial cables, Optical Fiber), Wireless Protocols Introduction to (Wi-Fi, Bluetooth, Zigbee, RFID, LoRa), Networking Protocols (OSI Model, TCP/IP, Ethernet), Network Architecture, protocols, and serial monitoring.

### Module 4:

**Interfacing of Sensors:** Interfacing Ultrasonic Sensors, Interfacing Temperature Sensor, Interfacing PIR Sensors, Interfacing MQ Sensors, Interfacing Servo Motor, Interfacing Soil Moisture Sensor, Interfacing Photo Sensor.

### Module 5:

**IoT Web Application Development in Thingworx:** Experiencing IoT Application, Thingworx Composer, Creating Thing, Thing Template, Creating Properties, Creating Alerts, Creating Subscription, Building Mashups, Mapping Thing Model to Mashup, Application Keys, Thingworx REST API, ESP32-GPIO and Environment, Wi-Fi (802.11) Interfacing.

### Reference Books & Materials:

- [The Internet of Things \(The MIT Press Essential Knowledge series\) by Samuel Greengard](#)
- [The Fourth Industrial Revolution Paperback - by Klaus Schwab](#)
- [Introduction to Arduino](#)
- [Programming with Arduino](#)
- [Getting to Know Thingworx Platform](#)



### List of Experiments:

1. Installing Operating Systems and Basic Software
2. **MS Word**
  1. Prepare a document about any tourist destination of your choice with appropriate pictures and editing features.
  2. Prepare a News Paper Layout. Insert appropriate pictures wherever necessary. Use the following Features:
    - Three Column and Four Column setting
    - Set One or Two Advertisements
    - Use Bullets and Numbering.
  3. Create a Document consisting of Bio-data. It includes
    - A table giving your qualification and/or experience of work. Table should be Bordered and Shaded.
    - A Multilevel list giving your areas of interest and further areas of interest. The sub areas should be numbered as
    - 'a', 'b', etc while the areas should be numbered as '1', '2', etc.
    - The information should be divided in “General” and “Academic” sections.
    - The header should contain “BIO-DATA” while the footer should have page numbers in the format Page 1 of 10.
    - Assign a password for the document to protect it from unauthorized access.
  4. Assume that you are coordinating a seminar in your organization. Write a letter to 10 different IT companies asking them to participate in the seminar using mail merge facility.
  5. Prepare a document which contains template of marks card of students. Assume that there are 10 students. The footer for the document should be ' University Name '.
  6. Prepare a document about any topic in mathematics which uses mathematical symbols. (At least 5 mathematical symbols should be used). Assign a password for the document to protect it from unauthorized access. Demonstrate the use of Hyperlink Option. Sets margins to your document, a font of size and double spaced document.
3. **MS – Excel**
  1. Open a new workbook, save it as JavaCoffeeBar.xls. In sheet1 write following sales data for Java Coffee bar to show their first 6 months’ sales.
    - Select cell B4:D4 and change the horizontal alignment to center and text to 90 degrees.
    - All titles should be in bold
    - Format all cells numbers to currency style and adjust width as necessary. •Add border to data.
    - Select the cell range A1:H1, merge and center these cells. Apply same format to A2:H2.
    - Give border, shading and pattern to data in sheet •Apply different font settings for all titles in sheet
    - Apply green color and bold setting to sales above 10000 (use conditional formatting)
    - Rename current worksheet as FirstHalfSales
  2. Prepare a worksheet to maintain student information. The work sheet should Contain Roll Number, Name and marks in 5 subjects. (Max Marks is 100). Validate the marks. Calculate the total marks. Assign the grade according to the following. Assign grade 'A' if the total marks is above 450. From 401 to 449 assign the grade as 'B'. From 351 to 400 assign the Grade as 'C'. From 300 to 350 the grade to be assigned is 'D'. For the total marks less than 300 No grade is assigned. A student is eligible to get a grade only when he gets 40 and above in all the subjects. In such cases the grade is “FAIL”. (Assume that there are 10 students).
  3. Prepare a pay-bill using a worksheet. The work sheet should contain Employee Id, Name, Designation, Experience and Basic Salary and Job ID. If Job Id is 1 then DA is 40% of the

basic salary. HRA is Rs. 4500. If Job Id is 2 then DA is 35% of the basic salary. HRA is Rs. 3500. If Job Id is 3 then DA is 30% of the basic salary. HRA is Rs. 2500. If Job Id is 4 then DA is 25% of the basic salary and HRA is RS.2500. For all the other Job ids DA is 20% of the basic salary and HRA is Rs. 1500. For all the above Job ids PF to be deducted is 4%. For the job ids between 1-4Rs. 100 to be deducted as Professional Tax. Find the net pay.

4. For the above employee worksheet perform the following operations
  - Use filter to display the details of employees whose salary is greater than 10,000.
  - Sort the employees on the basis of their net pay
  - Use advance filter to display the details of employees whose designation is "Programmer" and Net Pay is greater than 20,000 with experience greater than 2 yrs
5. Using Excel project the Product sales for any five products for five years.
  - Compute the total sales of each product in the five years.
  - Compute the total sales of all the products in five years.
  - Compute the total sales of all products for each year.
  - Represent annual sale of all the products using Pie-Chart.
  - Represent annual sales of all products using Bar Chart.
  - Represent sale of a product for five years using Pie-Chart.
  - Label and format the graphs
6. Create a statement of Telephone Bill Charge for a customer.
  - Telephone Calls
  - Up to 150 calls- free
  - 151 to 500 calls- 0.80 per call
  - 501 to 1000 calls- 1.00 per call
  - 1001 to 2000 - 1.25 per call
  - Above 2000- 1.40 per call
7. Perform Following:
  - Using Excel write sales data with columns product, month and sales. Write at least 5 records. Create Pivot Table chart and Report for the data.
  - Create a macro to change the name of worksheet as Macro Example, merge first three columns of first row and write heading as DATA in green color with yellow background
  - Link word document in excel worksheet to show the usage of linking and embedding.

#### 4. MS – PowerPoint

Assume that you are going to give a presentation about Information Technology. (Choose some latest technologies). The presentation should have minimum 10 slides. Insert appropriate images wherever necessary. Use proper formatting, Diagrams and tables. Show the usage of action buttons, hyperlinks, and animations.

## BCAI-107: Programming in C Lab

L=0, T=0, P=2, C=1

MM 50

### Part A

1. Printing the reverse of an integer.
2. Printing the odd and even series of N numbers.
3. Get a string and convert the lowercase to uppercase and vice-versa using getchar() and putchar().
4. Input a string and find the number of each of the vowels appear in the string.
5. Accept N words and make it as a sentence by inserting blank spaces and a full stop at the end.
6. Printing the reverse of a string.

### Part B

1. Searching an element in an array using pointers.
2. Checking whether the given matrix is an identity matrix or not.
3. Finding the first N terms of Fibonacci series.
4. Declare 3 pointer variables to store a character, a character string and an integer respectively. Input values into these variables. Display the address and the contents of each variable.
5. Define a structure with three members and display the same.
6. Declare a union with three members of type integer, char, string and illustrate the use of union.
7. Recursive program to find the factorial of an integer.
8. Finding the maximum of 4 numbers by defining a macro for the maximum of two numbers.
9. Arranging N numbers in ascending and in descending order using bubble sort.
10. Addition and subtraction of two matrices.
11. Multiplication of two matrices.
12. Converting a hexadecimal number into its binary equivalent.
13. Check whether the given string is a palindrome or not.
14. Demonstration of bitwise operations.
15. Applying binary search to a set of N numbers by using a function.
16. Create a sequential file with three fields: empno, empname, empbasic. Print all the details in a neat format by adding 500 to their basic salary.

## BCAI-108: Client Side Scripting Lab

L=0, T=0, P=4, C=2

MM 50

### List of Experiments:

1. Design a simple web page with head, body and footer, with heading tags, image tag
2. Design a web site for book information, home page should contain books list, when particular book is clicked, information of the books should display in the next page.
3. Design a page to display the product information such as name, brand, price and etc with table tag
4. Design a web site for book information using frames, home page should contain two parts, left part should contain books list, and right part should contain book information.
5. Design a web page to capture the user information such as name, gender, mobile number, mail id, city, state, and country using form elements.
6. Design a web page with nice formatting like background image, text colors and border for text using external CSS.
7. Design a web page to perform mathematical calculations such as addition, subtraction, multiplication, and division using form elements and Java Script.
8. Design a web page to capture the user information such as name, gender, mobile number, mail id, city, state, and country using form elements and display them into other pages using Java Script.
9. Design a web page to display timer in the left side of the web page using Java Script.
10. Design a web page to capture the student details such as student number, name, age, marks using Java Script Object.
11. Design a web page to read data from an XML file and display the data in tabular format, take the data as employee information.
12. Design a web site for online purchase using CSS, JS and XML, web site should contain the following web pages.
  - Home page
  - Login page
  - Signup page
  - Product details pageDesign a web site for Student details using PHP, web site should contain the following web pages.
  - Home page
  - Login page
  - Signup page
  - Student details page

## BCAI-109: Effective Communication Skills

L=0, T=0, P=4, C=2

MM 50

### Course Objective:

1. To train students to be comfortable with everyday communication.
2. Training the students in English grammar.

### Unit I: Everyday Conversations

- Introducing self / others
- Weather
- Classroom
- Asking about facilities around
- Describing a person / thing

Points to cover: Vocabulary, grammar, Construction of sentences, listening.

Methodology: Role plays, Videos, Classroom conversation, worksheets.

### Unit II: Asking for.

- Help/ Suggestion/ ideas
- Clarification/ Directions
- Time/ food
- Advice
- Uses

Points to cover: Vocabulary, grammar, Construction of sentences, listening.

Methodology: Role plays, Videos, Classroom conversation, worksheets.

### Unit III: Reporting/ Describing

- Incidences
- Personalities
- Experiences
- Wants/Needs
- Intentions

Points to cover: Vocabulary, grammar, Construction of sentences, listening

Methodology: Role plays, Videos, Classroom conversation, worksheets

### Unit IV: Meeting People

- Greetings
- Starting the Conversation
- Small talks
- Closing the conversation

Points to cover: Vocabulary, grammar, Construction of sentences, listening

Methodology: Role plays, Videos, Classroom conversation, worksheets

### Unit V: Expressing

- Happiness/Displeasure
- Preferences
- Doubts
- Views
- Unawareness

Points to cover: Vocabulary, grammar, Construction of sentences, listening  
Methodology: Role plays, Videos, Classroom conversation, worksheets

**Talking about....**

- Interests
- Different Cultures
- Clothes , cars, institutes, situations
- Schedules, prices

Points to cover: Vocabulary, grammar, Construction of sentences, listening  
Methodology: Role plays, Videos, Classroom conversation, worksheets

**Text Books:**

3. Speak Now Level I & II, Oxford Press
4. Business Benchmark, Level – Upper Intermediate by Cambridge University Press.

**Reference Books:**

5. Practical English Usage by Michel Swan, Oxford University Press
6. Cambridge Grammar for English: A comprehensive Guide for spoken & written English (South Asian edition), Cambridge University Press.

**Course Outcome:**

7. The students will have a better understanding of English grammar.
8. The students will be able to use grammar more effectively in their verbal and written communication.

# Syllabus

## Semester: II

# BCAI- 202: Linux Shell Scripting

L=2, T=1, P=0, C=3

MM 75

## Course Objectives:

1. The course provides an overview of the Linux Operating System, geared toward new users as an exploration tour and getting started guide.
2. This unit provides examples to help the learners get a better understanding of the Linux system. The unit also provides the guidelines for the learners to take up vendor certifications.
3. The unit explores the basics of Linux, the underlying management of the Linux operating system and its network configuration. The complete system services of Linux is explained along with the troubleshooting.

## Unit 1: Introduction to UNIX:

History of UNIX - Unix Components/Architecture - Features of Unix – UNIX Environment and UNIX Structure - Posix and Single Unix specification - The login prompt - UNIX commands – Basic commands - echo, printf, ls, who, date, passwd, cal - Combining commands

Internal and external commands – type, man, more and other commands - the user terminal, displaying its characteristics and setting characteristics - The root login - super user: su command - /etc/passwd and /etc/shadow files - Commands to add, modify and delete users.

## Unit II: UNIX file system:

UNIX File basics - File types and Categories – File Organization – Directories - home directory and the HOME variable - Reaching required files- the PATH variable - Relative and absolute pathnames. Directory commands – pwd, cd, mkdir, rmdir commands. The dot (.) and double dots (..) notations to represent parent directories - File related commands – cat, mv, rm, cp, wc

File inodes and the inode structure. File links – hard and soft links – Head and tail commands

Cut and paste commands - The sort command - Special files /dev/null and /dev/tty - File attributes and permissions - The umask and default file permissions - ls command - Changing file permissions: the relative and absolute permissions changing methods. Recursively changing file permissions. Directory permissions

## Unit III: UNIX Process Management:

The Structure of Processes: Process States and Transitions - Layout of system memory - Context of a process. Process Control: Process Creation – Signals – Process Termination – Invoking other programs – PID & PPID – Shell on a Shell.

## Unit IV: Vi Editor:

Introduction to Text Processing, Command & edit Mode, Invoking vi, deleting & inserting Line, Deleting & Replacing Character, Searching for Strings, Yanking, Running Shell Command Macros, Set Window, Set Auto Indent, Set No. Communicating with Other Users: who, mail, wall, send, msg.

## Unit V: Shell programming:

Introduction – Need for Scripts – Creating and Calling the Script – The Shebang – Different ways of running a script - Using variables in Script – Reading Input – Integer Variables – Arithmetic Expressions – Read-only variables – Exporting variables – Arrays - Control Statements: If, Then, Else, While and Until, Classic For, Break and Continue, Case – Handling Script Parameters: Shift, Getopts – Shell Functions – Handling Conditional expression patterns and Regular expressions in scripts.

## Text Books:

1. Sumitabha Das., UNIX Concepts and Applications. 4th Edition. Tata McGraw Hill, July 2017.
2. Behrouz A. Forouzan, Richard F. Gilberg : UNIX and Shell Programming- Cengage Learning – India Edition. 2009



**Reference Books:**

1. M.G. Venkatesh Murthy: UNIX & Shell Programming, Pearson Education.
2. Richard Blum, Christine Bresnahan: Linux Command Line and Shell Scripting Bible, 2nd Edition , Wiley,2014.

**Course Outcomes**

Students can,

1. To enable the students to have a hands on practical exposure to the Linux Red Hat Enterprise and make them prepared for the RHCE Certification.

# BCAI-204: Operating System

L=2, T=1, P=0, C=3

MM 75

## Course Objective:

1. The operating system is the most important program that runs on a computer. Every general-purpose computer must have an operating system to run other programs.
2. Operating systems perform basic tasks, such as recognizing input from the keyboard, sending output to the display screen, keeping track of files and directories on the disk, and controlling peripheral devices such as disk drives and printers.
3. This course covers the concept of operating system and its applications

## Unit I: Introduction to Operating System

Introduction, Objectives and Functions of OS, Evolution of OS, OS Structures, OS Components, OS Services, System calls, System programs, Virtual Machines.

## Unit II: Process Management

**Processes:** Process concept, Process scheduling, Co-operating processes, Operations on processes, Inter process communication, Communication in client-server systems. **Threads:** Introduction to Threads, Single and Multi-threaded processes and its benefits, User and Kernel threads, Multithreading models, threading issues. **CPU Scheduling:** Basic concepts, Scheduling criteria, Scheduling Algorithms, Multiple Processor Scheduling, Real-time Scheduling, Algorithm Evaluation, Process Scheduling Models. **Process Synchronization:** Mutual Exclusion, Critical – section problem, Synchronization hardware, Semaphores, Classic problems of synchronization, Critical Regions, Monitors, OS Synchronization, Atomic Transactions **Deadlocks:** System Model, Deadlock characterization, Methods for handling Deadlocks, Deadlock prevention, Deadlock Avoidance, Deadlock Detection, Recovery from Deadlock.

## Unit III: Storage Management

**Memory Management:** Logical and physical Address Space, Swapping, Contiguous Memory Allocation, Paging, Segmentation with Paging. **Virtual Management:** Demand paging, Process creation, Page Replacement Algorithms, Allocation of Frames, Thrashing, Operating System Examples, Page size and other considerations, Demand segmentation **File-System Interface:** File concept, Access Methods, Directory structure, File- system Mounting, File sharing, Protection and consistency semantics.

## Unit IV: File-System Implementation:

File-System structure, File-System Implementations, Directory Implementation, Allocation Methods, Free-space Management, Efficiency and Performance, Recovery Disk Management: Disk Structure, Disk Scheduling, Disk Management, Swap-Space Management, Disk Attachment, stable-storage Implementation

## Unit V: Protection and Security

**Protection:** Goals of Protection, Domain of Protection, Access Matrix, and Implementation of Access Matrix, Revocation of Access Rights, Capability- Based Systems, and Language – Based Protection. **Security:** Security Problem, User Authentication, One – Time Password, Program Threats, System Threats, Cryptography, Computer – Security Classifications.

## Text Books:

1. Milan Milonkovic, Operating System Concepts and design, II Edition, McGraw Hill 1992.
2. Tanenbaum, Operation System Concepts, 2nd Edition, Pearson Education.
3. Silberschatz / Galvin / Gagne, Operating System, 6<sup>th</sup> Edition, WSE (WILEY Publication)

**Reference Books:**

1. William Stallings, Operating System, 4th Edition, Pearson Education.
2. H.M.Deitel, Operating systems, 2nd Edition ,Pearson Education
3. Nutt: Operating Systems, 3/e Pearson Education 2004.

**Course Outcome:**

1. After learning the fundamental concepts in Operating system including how OS has evolved over the years and different components of OS, students will continue to more significant functions of OS like Process management, storage and memory management etc.
2. This will provide the necessary information for students to extract maximum benefits out of the OS while developing programs, working with applications and etc.

# BCAI-205: Data Structure Using C

L=3, T=0, P=0, C=3

MM 75

## Course Objective:

1. A data structure is a particular way of storing and organizing data in a computer so that it can be used efficiently.
2. Different kinds of data structures are suited to different kinds of applications and some are highly specialized to specific tasks.
3. This course covers the basic concepts of different data structures which are the basic building blocks of Programming and problem solving.

## Unit I: Introduction to Data structures

Definition, Classification of data structures: primitive and non-primitive, Elementary data organization, Time and space complexity of an algorithm (Examples), String processing. Dynamic memory allocation and pointers: Definition of dynamic memory allocation, Accessing the address of a variable, Declaring and initializing pointers, Accessing a variable through its pointer, Meaning of static and dynamic memory allocation, Memory allocation functions: malloc(), calloc(), free() and realloc(). Recursion: Definition, Recursion in C (advantages), Writing Recursive programs – Binomial coefficient, Fibonacci, GCD.

## Unit II: Searching and Sorting

Basic Search Techniques: Sequential search: Iterative and Recursive methods, Binary search: Iterative and Recursive methods, Comparison between sequential and binary search. Sort: General background and definition, Bubble sort, Selection sort, Insertion sort, Merge sort, Quick sort.

## Unit III: Stack and Queue

Stack – Definition, Array representation of stack, Operations on stack: Infix, prefix and postfix notations, Conversion of an arithmetic expression from Infix to postfix, Applications of stacks. Queue: Definition, Array representation of queue, Types of queue: Simple queue, Circular queue, Double ended queue (deque), Priority queue, Operations on all types of Queues.

## Unit IV: Linked List

Definition, Components of linked list, Representation of linked list, Advantages and Disadvantages of linked list. Types of linked list: Singly linked list, doubly linked list, Circular linked list, Operations on singly linked list: creation, insertion, deletion, search and display.

## Unit V: Tree Graphs and their Applications:

Definition: Tree, Binary tree, Complete binary tree, Binary search tree, Heap Tree  
Terminology: Root, Node, Degree of a node and tree, Terminal nodes, Non-terminal nodes, Siblings, Level, Edge, Path, depth, Parent node, ancestors of a node. Binary tree: Array representation of tree, Creation of binary tree. Traversal of Binary Tree: Preorder, Inorder and postorder. Graphs, Application of Graphs, Depth First search, Breadth First search.

## Text Book

1. Weiss, Data Structures and Algorithm Analysis in C, II Edition, Pearson Education, 2001
2. Lipschutz: Schaum's outline series Data structures Tata McGraw-Hill
3. Robert Kruse Data Structures and program designing using 'C'

**Reference Books:**

1. Trembley and Sorenson Data Structures
2. E. Balaguruswamy Programming in ANSI C.
3. Bandyopadhyay, Data Structures Using C Pearson Education, 1999
4. Tenenbaum, Data Structures Using C. Pearson Education, 200
5. Kamthane: Introduction to Data Structures in C. Pearson Education 2005.
6. Hanumanthappa M., Practical approach to Data Structures, Laxmi Publications, Fire Wall media 2006
7. Langsam, AusensteinMaoshe& M. Tanenbaum Aaron Data Structures using C and C++ Pearson Education

**Course Outcome:**

1. Students will benefit from the knowledge of Data Structures and different operating one can perform on these like searching, sorting, stacking and etc.
2. This forms a very strong foundation for programming in different languages that the students will take up in subsequent semesters or in any other course.

## BCAI-206: Environmental Studies

L=3, T=0, P=0, C=3

MM 75

### Unit I:

Introduction and natural resources: Multidisciplinary nature and public awareness, renewable and non-renewable resources and associated problems, forest, water, mineral, food, energy and land resources. Introduction to natural resources, conservation of natural resources and human role.

### Unit II:

Ecosystem: Ecological concepts, concept of ecosystems, types of ecosystems, ecosystem structure and functioning, energy flow, food chains and food webs, ecological pyramids.

### Unit III:

Biodiversity and Conservation: Definition, genetic species and ecosystem diversity biogeographically, classification of Indian value of biodiversity at national and local levels, India as a mega-diversity nation, treats to biodiversity and endangered and endemic species of India, need for conservation of biodiversity.

### Unit IV:

Environmental pollution: Definition, causes, effect and control of air pollution, water pollution, soil pollution, marine pollution, noise pollution, thermal pollution, electromagnetic pollution, nuclear hazards, human role in prevention of pollution, solid waste management, disaster management, floods, earthquake, cyclone, and landslide

Firework Safety: Combustion of firework and pollution (noise, smoke, fireworks fallout and residue pollution), heavy metal toxicity due to fireworks and associated health effects.

### Unit V:

Social Issue and Environment: Unsuitable to suitable development, urban problem related to energy and water conservation, environment protection act, wild life protection act, forest conservation act, environmental issues, population explosion, and family welfare programme. Environmental and human health HIV, women and child welfare, role of information technology on environment and human health.

Corruption: definition and reasons, details of organizations/agencies working against corruption, role of individual against corruption and mode of action.

Ethics: Meaning, nature, determinants and objectives of ethics, ethics and its relation to values norms and morals, Indian ethos, Swami Vivekananda and ethics.

### Text/Reference Books

1. Fundamentals of Environmental Biology, K. C. Agrawal, Nidhi Publishers (Bikaner).
2. Fundamentals of Ecology, E.P. Odum, W.B. Saunders Co. (USA).
3. Fundamentals of Ecology, E. P. Odum, Natraj Publisher (Dehradun).
4. Ecology: Principles and Applications, J. L. Chapman & , M. J. Reiss, Cambridge University Press.
5. Atmospheric pollution, W. Buch, Tata McGraw Hill (TMH)
6. Professional Ethics and Human Values, M. Govindarajan, PHI Learning Private Limited (Delhi).
7. Corruption and Reform in India, Jennifer Bussell, Cambridge University Press.

## Course Objective:

1. To setup the environment to run the python programs
2. To understand concepts about Data Types and Looping techniques
3. To understand and implement the OOP concepts, Decorators, and Iterators
4. To understand and build the Web Applications
5. Debugging and Troubleshooting Python Programs

## Unit I: Introduction to Python

Introduction: Introduction to Python, setting up the environment, Installing Python, running python program, Python's execution model, Guidelines on how to write good, The Python culture, A note on the IDEs. **Built-in Data Types:** Numbers, Immutable sequences, Mutable sequences, set types, Mapping types – dictionaries, the collections module, Final considerations **Iterating and Making Decisions:** Conditional programming, Looping, Putting this all together.

## Unit II: Advanced Concepts

Functions, the Building Blocks of Code: Use of functions, Scopes and name resolution, input parameters, return values, Recursive functions, Anonymous functions, Function attributes, Built-in functions, importing objects. **Saving Time and Memory:** map, zip, and filter, Comprehensions, Generators, some performance considerations, Name localization, and Generation behavior in built-ins.

**Advanced Concepts:** OOP, Decorators, and Iterators: Decorators, Class and object namespaces, Attribute shadowing, initializing an instance, Accessing a base class, Multiple inheritance, Static and class methods, Private methods and name mangling, The property decorator, Operator overloading, Polymorphism

## Unit III: Web Development

The Edges – GUIs and Scripts: Scripting-The imports, Parsing Arguments, The business logic, GUI application- The import, The layout logic, The business logic, The tkinter.tixmodule, The turtle module, wxPython, PyQt, and PyGTK, The principle of least astonishment, Threading considerations. **Web Development Done Right:** Django design philosophy, The Django URL dispatcher, setting up Django, Adding the Entry model, Customizing the admin panel, Creating the form, Writing the views, tying up URLs and views, Writing the templates, writing a Flask view, Building a JSON quote server in Falcon.

## Unit IV: Cloud Native Python

Building Microservices in Python, Modeling microservices, building microservices, Testing the RESTful API. Building a Web Application in Python: Getting started with applications, working with Observables and AJAX, Binding data for the adduser template, working on Observables with AJAX for the addtweet template, Data binding for the addtweet template, CORS - Cross-Origin Resource Sharing, Session management, Cookies. **Interacting Data Services:** MongoDB terminology, Initializing the MongoDB database, integrating microservices with MongoDB, working with user resources, Working with the tweets resources.

## Unit V: Exception Handling

Testing, Profiling, and Dealing with Exceptions: The anatomy of a test, testing guidelines, Unit testing, Test-driven development, Exceptions, Profiling Python. Debugging and Troubleshooting: Debugging with print, Debugging with a custom function, Inspecting the traceback, Using the Python debugger, Inspecting log files, Other techniques, Troubleshooting guidelines.

**Text Books:**

1. Learn Python Programming, 2nd Edition by Fabrizio Romano
2. Python Cookbook, 3rd Edition by David Beazley (Author), Brian K. Jones (Author)

**Reference Books:**

1. Python Programming: A Step-by-Step Guide For Absolute Beginners by Brian Jenkins and ATS Coding Academy
2. Python and AWS Cookbook: Managing Your Cloud with Python and Boto by Mitch Garnaat
3. Advanced Python Programming: Build high performance, concurrent, and multi-threaded apps with Python using proven design patterns by Dr. Gabriele Lanaro
4. Programming Google App Engine with Python: Build and Run Scalable Python Apps on Google's Infrastructure by Dan Sanderson

**Course Outcome:**

After completion of the course the student will be able to:

1. Install and Run Python Program
2. Write functions and Loops in the python program
3. Implementing OOPs concepts while writing Python Program
4. Developing web applications using Django
5. Build micro services in Python
6. Test, Debug and Troubleshoot Python Programs



Program Name- **INDUSTRIAL COMMUNICATION PROTOCOLS & CONNECTIVITY**

Program Hours- **50**

Tentative Credit - **4**

### **OBJECTIVES**

- Address the real-world problems and find the required solution.
- Study the various communication protocols and networking.
- Study the basic concepts of programming/ hardware/ emulator for ESP Controllers.
- Understanding the real time requirement for Smart System Development.
- Study the various server-based communication models.
- Build and test Smart Genset project successfully.
- Improve the team building, communication, and management skills of the students.

### **OUTCOMES**

- Identify the requirements for the real-world problems.
- Building Mashup and Widgets using Thingworx.
- Study and enhance software/ hardware skills.
- Demonstrate and build the project successfully by hardware, requirements, coding, emulating, and testing.
- To report and present the findings of the study conducted in the preferred task.
- Demonstrate an ability to work in teams and manage the conduct of the research study.

### **SCOPE**

- IIOT Designer
- IIOT Developer
- IIOT Analyst
- IIOT Tester
- Entrepreneurship

### **PROJECTS**

- Smart Genset Monitoring System
- Thingworx App Development

## INDUSTRIAL COMMUNICATION PROTOCOLS & CONNECTIVITY

### Module 1:

**Project Presentation** – Smart GENSET.

**Programming for Smart genset:** Problem Statement Understanding, Hardware Selection, GPIO-ESP32, External Library Importing for Target Board, Interfacing with Development Board, Coding & Testing.

### Module 2:

**Peripherals Interfacing with Communication Protocol for Smart genset:** On board Communication Protocol-SPI, I2C, UART, Display Sensor Data on Serial Monitor, Display Sensor Data on LCD.

### Module 3:

**Introduce ARM Cortex-A72 for Smart genset:** OS installation on ARM, Package installation and purging, GPIO –ARM Cortex-A72 and Interfacing, File handling using Scripting.

### Module 4:

**Applied Python for Smart genset:** Data Type, Keyword, Identifier, Conditional Statement, Iterative statement, Functions, Library Importing using PIP.

### Module 5:

**Interfacing Industrial Sensor:** Interfacing Fuel Level Sensor, Interfacing Temperature Sensor, Interfacing Energy Meter Sensor, Interfacing Vibration Sensor, Interfacing Rotation Counter, Interfacing Smoke Sensor, Data Transmission.

### Module 6:

**Host Communication:** Client and Server, ESP-Now, ESP-MESH, WebSocket's, Kepware.

### Module 7:

**Thingworx Composer with apps Design:** Industrial Mashup Composing, Services and Alerts, Events and Subscriptions, Thingworx apps Design, Fuel Level Sensor Data on Thingworx, Temperature Sensor Data on Thingworx, Energy Meter Sensor Data on Thingworx, Vibration Sensor Data on Thingworx, Tachometer Sensor Data on Thingworx, Smoke Sensor Data on Thingworx, Self-Start Event and Alerts, Data Visualization.

#### Reference Books & Materials:

- [Introduction and History of GENSET's](#)
- [Fundamentals of IoT Communication Technologies by Herrero Rolando](#)
- [Thingworx Design & Development](#)
- [Introduction to HTTP Protocol](#)

## BCAI-207: Data Structures using C Lab

L=0, T=0, P=4, C=2

MM 50

### List of Experiments:

#### Part A

1. Use a recursive function to find GCD of two numbers.
2. Use a recursive function to find the Fibonacci series.
3. Use pointers to find the length of a string and to concatenate two strings.
4. Use pointers to copy a string and to extract a substring from a given a string.
5. Use a recursive function for the towers of Hanoi with three discs.
6. Insert an integer into a given position in an array.
7. Deleting an integer from an array.
8. Write a program to create a linked list and to display it.
9. Write a program to sort N numbers using insertion sort.
10. Write a program to sort N numbers using selection sort.

#### Part B

1. Inserting a node into a singly linked list.
2. Deleting a node from a singly linked list.
3. Pointer implementation of stacks.
4. Pointer implementation of queues.
5. Creating a binary search tree and traversing it using in order, preorder and post order.
6. Sort N numbers using merge sort.

## BCAI-208: Linux Shell Scripting Lab

L=0, T=0, P=2, C=1

MM 25

1. Use of Basic UNIX Shell Commands: ls, mkdir, rmdir, cd, cat, touch, file, wc, sort, cut, grep, dd, dfspace, du, ulimit.
2. Commands related to inode, I/O redirection and piping, process control commands, mails.
3. Shell Programming: Shell script exercises based on following:
  - (i) Interactive shell scripts
  - (ii) Positional parameters
  - (iii) Arithmetic
  - (iv) if-then-fi, if-then- else-fi, nested if-else
  - (v) Logical operators
  - (vi) else + if equals elif, case structure
  - (vii) while, until, for loops, use of break.
4. Write a shell script to create a file. Follow the instructions
  - (i) Input a page profile to yourself, copy it into other existing file;
  - (ii) Start printing file at certain line
  - (iii) Print all the difference between two file, copy the two files.
  - (iv) Print lines matching certain word pattern.
5. Write shell script for-
  - (i) Showing the count of users logged in,
  - (ii) Printing Column list of files in your home directory
  - (iii) Listing your job with below normal priority
  - (iv) Continue running your job after logging out.
6. Write a shell script to change data format. Show the time taken in execution of this script.
7. Write a shell script to print files names in a directory showing date of creation & serial number of the file.
8. Write a shell script to count lines, words and characters in its input.
9. Write a shell script to print end of a Glossary file in reverse order using Array.
10. Write a shell script to check whether Ram logged in, continue checking further after every 30 seconds till success.
11. Write a shell script to compute GCD & LCM & of two numbers. Use the basic function to find GCD & LCM of N numbers.
12. Write a shell script to find whether a given number is prime. Take a large number such as 15 digits or higher and use a proper algorithm.
13. Write a shell script to reverse a given integer.
14. Write a shell script to list the files arranged in descending order of their size.
15. Write a shell script to check whether the given string is palindrome or not.

## BCAI-212: Python Programming Lab

L=0, T=0, P=2, C=1

MM 50

1. Write a python code to find given number is prime or not
2. Write a python code to find LCM and GCM of a given list
3. Write a python code to find mean and standard deviation of a given list of numbers
4. Write a python code to add and delete element from a dictionary using functions
5. Write a python code to print 10 student details using class and lists
6. Write a python code to find student from a given list using class
7. Write a python code to inherit employee class to student class
8. Write a python code to build simple GUI calculator
9. Write a python code to build web page with student registration form
10. Write a python code to build web pages with sign-in and sing-up forms
11. Write a python code to build Rest API for product
12. Write a python code to build Ajax enabled web application for product

# Syllabus

## Semester: III

## Course Objective:

1. A database management system (DBMS) is collection of software meant to manage a Database. Many popular databases currently in use are based on the relational database model.
2. RDBMSs have become a predominant choice for the storage of information in new databases used for financial records, manufacturing and logistical information, personnel data and much more.
3. The course covers the basic concepts of databases in general with an emphasis on relational databases, modeling techniques and writing queries. Normalization techniques, Transaction processing, Concurrency Control techniques and Recovery of databases against crashes are also covered.

## Unit I: Introduction

Purpose of Database System -- Views of data – Data Models – Database Languages — Database System Architecture – Database users and Administrator – Entity– Relationship model (E-R model ) – E-R Diagrams -- Introduction to relational databases

## Unit II: Relational Model

The relational Model – The catalog- Types– Keys - Relational Algebra – Domain Relational Calculus – Tuple Relational Calculus - Fundamental operations – Additional Operations- SQL fundamentals, Oracle data types, Data Constraints, Column level & table Level Constraints, working with Tables, Defining different constraints on the table, Defining Integrity Constraints in the ALTER TABLE Command, Select Command, Logical Operator, Range Searching, Pattern Matching, Oracle Function, Grouping data from Tables in SQL, Manipulation Data in SQL.

## Unit III: SQL

Joining Multiple Tables (Equi Joins), Joining a Table to itself (self Joins), Sub queries Union, intersect & Minus Clause, creating view, Renaming the Column of a view, Granting Permissions, - Updating, Selection, destroying view Creating Indexes, Creating and managing User, Integrity – Triggers - Security – Advanced SQL features –Embedded SQL– Dynamic SQL- Missing Information– Views – Introduction to Distributed Databases and Client/Server Databases

## Unit IV: Database Design

Functional Dependencies – Non-loss Decomposition – Functional Dependencies – First, Second, Third Normal Forms, Dependency Preservation – Boyce/Codd Normal Form-Multi-Valued Dependencies and Fourth Normal Form – Join Dependencies and Fifth Normal Form

## Unit V: Transactions

Transaction Concepts - Transaction Recovery – ACID Properties – System Recovery – Media Recovery – Two Phase Commit - Save Points – SQL Facilities for recovery –Concurrency – Need for Concurrency – Locking Protocols – Two Phase Locking – Intent Locking – Deadlock-Serializability – Recovery Isolation Levels – SQL Facilities for Concurrency.

## Text Book:

1. Abraham Silberschatz, Henry F. Korth, S. Sudharshan, “Database System Concepts”, Fifth Edition, Tata McGraw Hill, 2006.
2. RamezElmasri, Shamkant B. Navathe, “Fundamentals of Database Systems”, Fourth Edition, Pearson/Addison Wesley, 2007.

**Reference Books:**

1. Abraham Silberschatz, Henry F. Korth, S. Sudharshan, “Database System Concepts”, Fifth Edition, Tata McGraw Hill, 2006
2. RamezElmasri, Shamkant B. Navathe, “Fundamentals of Database Systems”, Fourth Edition, Pearson/Addision Wesley, 2007.
3. Raghu Ramakrishnan, “Database Management Systems”, Third Edition, McGraw Hill, 2003.

**Course Outcome**

After completion of the course the student will be able to:

1. Understand the Purpose of Database System
2. Understand the relational model
3. Describe Integrity Constraints
4. Describe SQL fundamentals
5. Understand Functional Dependencies
6. Describe the concepts of transaction
7. Understand ACID properties



## BCAI-302: Computer Networks

L=3, T=0, P=0, C=3

MM 75

### Course Objective:

1. To understand the basics of networking and its underlying principles. This course enables learners to understand computer networking concepts, how they work, operate, communicate with ports and Protocols. Standards and models associated with networking technology and their troubleshooting mechanisms.

### Unit I: Networking Fundamentals

Basics of Network & Networking, Advantages of Networking, Types of Networks, Types of Network Architecture, Workgroup vs. Domain. Network Topologies, Types of Topologies, Logical and physical topologies, selecting the Right Topology, Types of Transmission Media, Communication Modes, Wiring Standards and Cabling, media connectors, Introduction of OSI model, Functions of the seven layers, Introduction of TCP/IP Model, Comparison between OSI model & TCP/IP model.

### Unit II: Basics of Network Devices

Network Devices- NIC- functions of NIC, installing NIC, Hub, Switch, Bridge, Router, Gateways, And Other Networking Devices, Repeater, CSU/DSU, Modem, Ethernet standards, Ethernet Components, Point-to-Point Protocol, Address Resolution Protocol, Message format, transactions, Benefits of Wireless Technology, Types of Wireless Networks, Wireless network Components, wireless LAN standards, wireless security Protocols.

### Unit III: Basics of Network, Transport and Application Layers

Network Layer: Internet Protocol (IP), IP standards, versions, functions, The IPv4 and IPv6 Datagram Format, IPv4 addressing, IPv4 Subnetting, CIDR and VLSM, IPv6 Addressing, , Internet Control Message Protocol , Internet Group Management Protocol ,Introduction to Routing and Switching concepts, Transport Layer: Transmission Control Protocol(TCP), User Datagram Protocol (UDP), Overview of Ports & Sockets, Application Layer Protocols

### Unit IV: WAN Technology

Introduction to WAN, WAN Switching techniques, connecting to the Internet, Satellite-Based Services, Cellular Technologies, Technologies used for Connecting LANs, Remote Access Connections and technologies, Authentication and Authorization, Tunnelling and Encryption Protocols, Security Appliances and Security Threats.

### Unit V: Troubleshooting Network

Trouble Shooting Networks: Command-Line Interface Tools, Network and Internet Troubleshooting, Troubleshooting Model, identify the affected area, probable cause, implement a solution, test the result, recognize the potential effects of the solution, document the solution, Using Network Utilities: ping, traceroute, tracert, ipconfig, arp, nslookup, netstat, nbtstat, Hardware trouble shooting tools, system monitoring tools.

### Text Book:

1. CCNA Cisco Certified Network Associate: Study Guide (With CD) 7th Edition (Paperback), Wiley India, 2011
2. CCENT/CCNA ICND1 640-822 Official Cert Guide 3 Edition (Paperback), Pearson, 2013

**Reference Books:**

1. Routing Protocols and Concepts CCNA Exploration Companion Guide (With CD) (Paperback), Pearson, 2008
2. CCNA Exploration Course Booklet: Routing Protocols and Concepts, Version 4.0 (Paperback), Pearson, 2010

**Course Outcome:**

After completion of the course the student will be able to:

1. Explain the types of Network and its architecture
2. Identify the function of each layer in OSI and TCP/IP Models
3. Describe the Ethernet and wireless standards
4. Discuss the functionality of Networking devices
5. Demonstrate the IPv4 and IPv6 addressing types
6. List the WAN Technologies
7. Practice Network troubleshooting.

# BCAI-305: Object Oriented Programming Using Java

L=2, T=1, P=0, C=2

MM 75

## Course Objective:

1. Object oriented programming is the most proven technique for developing reliable programs. It helps in increased productivity, reusability of code, decrease in the development time, and reduces cost of production to an extent.
2. The cost of maintaining such systems have also considerably decreased. There are many languages which used the object oriented concepts and techniques. Some of them are C++, Java, Smalltalk, Objective-C, etc.
3. Java is a purely object oriented language. Systems/applications created using java programming language reduces the need for developing and maintain complex and space consuming applications. Java has a lot of advantages of being simple, robust, platform independent, etc. Nowadays java is also found in the mobile phones.

## Unit I: Introduction

History and Overview of Java, Object Oriented Programming, Control statements- if and for loop. Using Blocks of codes, Lexical issues - White space, identifiers, Literals, comments, separators, Java Key words, Data types - Integers, Floating point, characters, Boolean, a closer look at Literals, Variables, Type conversion and casting. Automatic type promotion in Expressions Arrays. Operators - Arithmetic operators, Bit wise operators, Relational Operators, Boolean Logical operators, Assignment Operator, Operator Precedence. Control Statements – Selection Statements - if, Switch, Iteration Statements - While, Do-while, for Nested loops, Jump statements.

## Unit II: Classes

Class Fundamentals, Declaring objects, Assigning object reference variables. Methods - constructors, “this” keyword, finalize ( ) method A stack class, Over loading methods. Using objects as parameters, Argument passing, Returning objects. Recursion, Access control, Introducing final, understanding static. Introducing Nested and Inner classes. Using command line arguments. Inheritance – Basics, Using super, method overriding, and Dynamic method Dispatch, Using abstract classes and final with Inheritance.

## Unit III: Packages

Definition. Access protection importing packages. Interfaces: Definition and implementation. Exception Handling – Fundamentals, types, Using try and catch and Multiple catch clauses, Nested try Statements, throw, throws, finally. Java’s built-in exception, using Exceptions.

## Unit IV: Multithreaded Programming:

Java thread model – main thread, creating single and multiple thread. Is alive ( ) and join ( ). Thread – Priorities, Synchronization, Inter thread communication, suspending, resuming and stopping threads, using multi-threading. I / O basics – Reading control input, writing control output, Reading and Writing files. Applet Fundamentals – AWT package, AWT Event handling concepts, the transient and volatile modifiers. Using instance of using assert.

## Unit V: JAVA Database Connectivity (JDBC)

Database connectivity – JDBC architecture and Drivers. JDBC API - loading a driver, connecting to a database, creating and executing JDBC statements, handling SQL exceptions. Accessing result sets: types and methods. An example - JDBC application to query a database. .

**Text Books:**

1. The complete reference Java –2: V Edition by Herbert Schildt Pub. TMH.
2. SAMS teach yourself Java – 2: 3rd Edition by Rogers Cedenhead and Leura Lemay Pub. Pearson Education.

**Course Outcome:**

1. Read and understand Java-based software code of medium-to-high complexity.
2. Use standard and third party Java's API's when writing applications.
3. Understand the basic principles of creating Java applications with graphical user interface (GUI).
4. Understand the fundamental concepts of computer science: structure of the computational process, algorithms and complexity of computation.
5. Understand the basic approaches to the design of software applications.
6. Apply the above to design, implement, appropriately document and test a Java application of medium complexity, consisting of multiple classes

## BCAICT-303: Cloud Computing

L=3, T=0, P=0, C=3

MM 75

### Course Objective:

1. To provide students with the fundamentals and essentials of Cloud Computing.
2. To provide students a sound foundation of the Cloud computing so that they are able to identify the vendors and assess the risk involved in cloud migration.
3. To enable students be aware of the various governance issues in cloud and how to manage the same.

### Unit I: Fundamentals of Cloud Computing

Cloud Computing Basics – History of Cloud Computing, Characteristics of Cloud Computing, Need for Cloud computing, Advantages and Possible Disadvantages of cloud computing, Cloud Deployment Models – Public, Private, Hybrid, Community, Other deployment Models. Evolving Data Center into Private Cloud, Datacenter Components, Extracting Business value in Cloud Computing – Cloud Security, Cloud Scalability, Time to Market, Distribution over the Internet, Cloud Computing Case Studies.

### Unit II: Cloud Delivery Models

Introduction to Cloud Services, Infrastructure as a Service (IAAS) – Overview, Virtualization, Container, Pricing Models, Service Level Agreements, Migrating to the Cloud, IaaS Networking options, Virtual Private Cloud(VPC), IAAS Storage – File and Object storage, Data Protection, IaaS security, Benefits, Risks and Examples of IaaS. Platform as a Service (PAAS) – Overview, IAAS v/s PAAS, PAAS Examples, benefits and risks. Software as a Service (SAAS) – Introducing SaaS, SaaS Examples – Office 365, Google G Suite, Salesforce.com , Evaluating SaaS – user and vendor perspective, Impact of SaaS, Benefits and risks of SaaS. Other Services on Cloud, Cloud Delivery Models Considerations

### Unit III: Cloud Platforms

Introducing Cloud Platforms, Evaluating cloud platforms, Cloud Platform technologies – Amazon Web Services, Microsoft Azure, Google Cloud Platform, Salesforce.com, and Impact of Cloud platforms. Private Cloud Platforms – Introducing Private clouds – Microsoft Azure stack, Open stack, AWS Greengrass, Impact of Private clouds

Cloud Migration: Delivering Business Processes from the Cloud: Business process examples, Broad Approaches to Migrating into the Cloud, The Seven-Step Model of Migration into a Cloud, Efficient Steps for migrating to cloud., Risks: Measuring and assessment of risks, Company concerns Risk Mitigation methodology for Cloud computing, Case Studies

### Unit IV: Cloud Computing - Challenges, Risk and Mitigation

Cloud Storage, Application performance, Data Integration, Security. Ensuring Successful Cloud Adoption: Designing a Cloud Proof of Concept, Vendor roles and capabilities, moving to the Cloud. Impact of Cloud on IT Service Management.

Risks and Consequences of Cloud Computing – Legal Issues, Compliance Issues, Privacy and Security.

### Unit V: Managing the Cloud

Managing and Securing Cloud Services, Virtualization and the Cloud, Managing Desktops and devices on the cloud, SOA and Cloud computing, Managing the Cloud environment, Planning for the Cloud – Economic Cost Model and Leveraging the Cloud, Cloud computing resources, Cloud Dos and Don'ts.

**Text Books:**

1. Kirk Hausman, Susan L. Cook, TelmoSampaio, “CLOUD ESSENTIALS CompTIA® Authorized Courseware for Exam CLO-001”, John Wiley & Sons Inc., 2013
2. Judith Hurwitz , Robin Bloor , Marcia Kaufman , Fern Halper, “Cloud Computing for Dummies”, Wiley Publishing Inc., 2010

**Reference Books:**

1. Erl,” Cloud Computing: Concepts, Technology & Architecture”, Pearson Education, 2014
2. Srinivasan, “Cloud Computing: A Practical Approach for Learning and Implementation “Pearson Education, 2014

**Course Outcome:**

After completion of the course the student will be able to:

1. Analyze the Cloud computing setup with its vulnerabilities and applications using different architecture
2. Analyze the risks involved in migrating the existing infrastructure to cloud.
3. Assess various cloud service providers and generate effective cloud infrastructure by optimizing the cost involved.
4. Broadly educate to know the impact of engineering on legal and societal issues involved in addressing the security issues of cloud computing.

## **BCAICT-301 (Elective-I): Information Security**

**L=3, T=0, P=0, C=3**

**MM 75**

### **Course Objective:**

1. To help students understand foundational concepts of information security
2. To make it possible for students to appreciate the need for securing information from threats and risks
3. To facilitate students to gain knowledge on how network infrastructure and connectivity can be secured

### **Unit I: Introduction**

Security Definition, Why Security, Security and its need, Current Trends and Statistics, Basic Terminology, The C I A of Security the Relation: Security functionality and Ease of Use Triangle

### **Unit II: User Identity and Access Management**

User identity and Access Management: Authentication, Account Authorization, Validation, Access Control and Privilege management. Hashing and Cryptography- Encryption and Decryption

### **Unit III: System and Server Security**

System Security, Desktop & Server Security, Firewalls, Password cracking Techniques, Key-logger, viruses and worms, Malwares & Spy wares, Windows Registry

### **Unit IV: Internet Security**

Internet Security: LAN Security, Email Security, Hacking attacks, preventive measures.

### **Unit V: Risk Assessment and Cyber Laws**

Vulnerability Assessment, Penetration Testing, Risk Assessment, Threat, Vulnerability, Cyber Laws – Indian Context

### **Text Book:**

1. Information Systems Security: Security Management, Metrics, Frameworks and Best Practices - Nina Godbole, ISC2 Press, 2010
2. Mark Stamp's Information Security: Principles and Practice (WIND) Paperback – 2009 by Deven N. Shah, Wiley (2009)
3. Information Security Risk Analysis - Thomas R. Peltier, Third Edition, Pub: Auerbach, 2012
4. Information Security: The Complete Reference by Mark Rhodes-Ousley, McGraw Hill Education; Second edition (1 May 2013)
5. Cyber Security by Nina Godbole, SunitBelapure, Wiley, 2011

### **Reference Books:**

1. Principles of Information Security by Michael E. Whitman, Cengage Learning India Private Limited; 5<sup>th</sup> Edition (2015)
2. Information Security Management Handbook, Volume 4 - Micki Krause, ISC2 Press,

### **Couse Outcome:**

After completion of the course the student will be able to:

1. To enable students to understand the concepts of IT security, Threats, Vulnerabilities, Impact and control measures
2. Apply their understanding of Information security in identifying common issues and propose suitable solutions
3. Describe various algorithms and processes used in cryptography for authenticating users, securing information and communication

## **BCAICT-304 (Elective-I): Server Administration**

L=3, T=0, P=0, C=3

MM 75

### **Course Objective:**

1. To recognize and explore various services provided the windows server 2012
2. To analyze and apply centralized services with client nodes of the network
3. To recognize the importance of active directory and dynamic access control services while applying the same in the server network infrastructure
4. To justify the minimal management and attain improved performance with Hyper v client.

### **Unit I: Installing and Configuring Windows Server 2012**

Introduction, Selecting a Windows Server 2012 Edition, Supporting Server Roles and Features, Server Licensing, Installing Windows Server 2012: System Requirement, Performing a Clean Installation, Working with Installation Partitions, Server Core Defaults, Server Core Capabilities, Completing Post-Installation Tasks, Converting Between GUI and Server Core, Upgrade paths, Installing Windows Server Migration Tools, Configuring NIC Teaming, Configuring local storage, Configuring WDS to install OS through networking.

### **Unit II: Securing Files and Disks.**

How to Securing Files, Encryption files with EFS, Configuring EFS, Using the Cipher Command, Sharing Files Protected with EFS with others, Configuring EFS with Group Policies, Configuring EFS Recovery Agent, Managing EFS Certificates, Encrypting Files with BitLocker, Configuring BitLocker Encryption, configuring BitLocker to Go, Configuring BitLocker Policies, Managing BitLocker Certificates.

### **Unit III: Configuring File and Share Access Permissions**

Designing a File-Sharing Strategy, Arranging Shares, Controlling Access, Mapping Drives, Creating Folder Shares, Assigning Permissions, Understanding the windows Permission Architecture and Basic, Advanced Permissions, Allowing and Denying Permissions, Inheriting, Permissions, Understanding Effective Access, Setting Share Permissions, Understanding NTFS Authorization, Assigning Basic NTFS Permissions, Understanding Resource Ownership, Combining Share and NTFS Permissions, Installing File Server Resource Manager, Using, creating, changing Quotas, Managing Files with File Screening, Creating File Groups, Creating a File Screen, Creating a File Screen Exception, Creating a File screen Template. Storage Reports Management.

### **Unit VI: Configuring DNS Zones and Records**

Understanding DNS, Understanding DNS Names and Zones, Understanding the Address Resolution Mechanism, configuring and Managing DNS Zones, Installing DNS, Configuring Primary and Secondary Zones, Configuring Active Directory-Integrated Zones, configuring Zone Delegation, configuring Stub Zones, configuring Caching-Only Servers, Configuring Forwarding and Conditional Forwarding, Configuring DNS Record types, creating and Configuring DNS Resource Records, Start of Authority(SOA) Records, Name Server(NS) Records, Host(A and AAAA) Records, Canonical Name(CNAME) Records, Pointer(PTR) Records..

### **Unit V: Implementing Patch Management and Monitoring Server Performance**

Understanding windows Updates and Automatic Updates, Deploying Windows Server Update Services(WSUS), How to Install and Configure WSUS, Configuring WSUS Synchronization, Configuring WSUS Computer Groups, Configuring Group Policies for Updates, Configuring Client-Side Targeting, Approving Updates, Viewing Reports, Administrating WSUS with Commands, Troubleshooting Problems with Installing Updates. Introducing the Microsoft Management Console(MMC), Server Manager, Event Viewer, Understanding Logs and Events, Adding and Filtering



Events, Managing Performance, Task Manager, Resource Monitor, Configuring Data Collector Sets (DCS), Monitoring the Network using Netstat and protocol analyzers.

**Text Books:**

1. Windows Server 2012: A Handbook for Professionals by Aditya Raj (Author)
2. Administering Windows Server 2012 (Certification Guide) by Orin Thomas

**Reference Book:**

1. Administering Windows Server 2012 by Patrick Regan
2. Mastering Windows Server 2012 R2 by Mark Minasi, Kevin Greene, Christian Booth, and Robert Butler.

**Course Outcomes**

After completion of the course the student will be able to:

1. Recognize the various services of Server 2012
2. Configuration of Active directory and manage the domains
3. Administrate and manage the AD domains in server 2012
4. Maintain and manage the group policies.

## BCAICT-305 (Elective-I): Linux Administration

L=3, T=0, P=0, C=3

MM 75

### Course Objective:

1. RHEL is a high performing operating system that. RHEL 6 is the sixth generation of the long term and predictable operating platform.
2. With the flexibility to deploy on physical hardware, as a virtual host, as a virtual guest or in the cloud, Red hat Enterprise Linux 6 is the ideal foundation for next-generation datacenters.
3. The fresh system administrators need to have a strong functional knowledge of RHEL 6 in any current IT work environment. The unit explores the security and network access controls in Linux, organizing network system and Mail Services, Securing Data and Account Management.

### Unit I: Introduction to Linux

Introduction to Operating system, Types of Operating system, Multi user operating system, Open source licensing, History of Linux, Unix Vs Linux, Flavors of Linux, Benefits and characteristics of Linux, Installation of Linux, Linux booting process, Log in and switch users in multiuser run levels, Shell and bash features, Linux kernel, sudo, Date and time configuration, Linux run levels.

**Directories and files:** Directory structure, System directory, Absolute path and relative path, Creating and removing directory, changing directory path, Creating, removing, copying and moving files, File Permissions, Links, hard link and soft link, Input and output redirection, Filters and pipes, Locate, read, and use system documentation including man page

### Unit II: Package, User and group Management

RPM, YUM, Archive, Compress, unpack and un-compress files using tar, star, gzip, and bzip2, Create, delete, and modify local user accounts, Change passwords for local user accounts, Create, delete, and modify local groups and group memberships, Changing owner and modes.

### Unit III: Configuring local storage and Files System

List, create, delete, and partition type for primary, extended, and logical partitions, Create and remove physical volumes, assign physical volumes to volume groups, Create and delete logical Volumes., Create, mount, unmount, ext2, ext3, and ext4 file systems, Mount, unmount, and LUKS, encrypted file systems, Access control list.

### Unit VI: Managing system and infrastructure services

Managing system services, shutting down, suspending and hibernating the system, controlling systemd on remote machine, Creating and modifying systemd unit files, DHCP Configuration, HTTP server Configuration, FTP server Configuration, Mail server Configuration, Samba server Configuration, NTP server Configuration, NFS server Configuration

### Unit V: OpenSSH and Linux security

OPENSSH - The SSH Protocol - Configuring OpenSSH and Starting an OpenSSH Server Key-Based Authentication in OpenSSH - OpenSSH Clients - Using the ssh Utility - scp Utility and sftp Utility - Configure firewall settings using system-config-firewall or iptables - Set enforcing and permissive modes for SELinux - List and identify SELinux file and process context.

### Text Books:

1. Orsaria, Jang, "RHCSA/RHCE Red Hat Linux Certification Study Guide Exams EX200 & EX300", McGraw-Hill Education, July 2017.

### Reference Book:

1. Sander Van Vugt, "Red Hat RHCSA/RHCE 7 Cert Guide: Red Hat Enterprise Linux 7 (EX200 and EX300)", Phi Learning Pvt Ltd, 2009.

**Course Outcome:**

After completion of the course the student will be able to:

1. Students will attain skills required to manage and administer systems and servers using Linux Operating System.
2. The operating system used for this unit is Red hat Enterprise Linux 6 (RHEL 6).
3. Students may also appear for RED HAT Certification exam in Linux Administration after the completion of this course.
4. Be able to start a highly scalable MySQL or Oracle database in the cloud with multiple read-replica databases (for scalability of database)
5. Be able to setup a load-balancer in the cloud.

Program Name- **INTRODUCTION TO DATA ANALYTICS**

Program Hours- **50**

Tentative Credit - **4**

### **OBJECTIVES**

- This course will serve as a comprehensive introduction to various topics in Data Analytics.
- Conceptualization and summarization of data pre-processing and data wrangling.
- Representation of data and visualization of data with different techniques.
- Descriptive analytics for industrial data.
- Study the various Python libraries.

### **OUTCOMES**

- At the end of the course the students should be able to design and implement machine learning solutions to classification, regression, and clustering problems, and be able to evaluate and interpret the results of the algorithms.
- Ability to identify the characteristics of datasets and compare the trivial data and big data for various applications.
- Ability to select and implement Data analytics techniques and computing environment that are suitable for the applications under consideration.
- Ability to solve problems associated with batch learning and online learning, and the big data characteristics such as high dimensionality, dynamically growing data and in particular scalability issues.

### **SCOPE**

- Business Analyst
- Product Analyst
- Machine Learning Engineer
- Data Scientist

### **PROJECTS**

- Smart Transportation
- Motor Anomaly Detection-Temp, Vibration, RPM, Load
- Quality of Road Analytics
- Battery Management system analytics (BMS)
- Lidar based Driving Skill Analytics

## INTRODUCTION TO DATA ANALYTICS

### Module 1:

**Project Presentation** - Smart Electric Vehicle

**Language** - Keyword, Data Types, Data Type Operations, Statistics -Conditional Statements, Loops, exception handling, Function, Scope, File Handling, OOPS, Statistical Analysis, NumPy, Pandas, data set creation, libraries, and framework, Identifying invalid values.

### Module 2:

**Data Preprocessing:** Data cleansing, series & data frame, functions on data frame, feature scaling, dimensionality reduction.

### Module 3:

**Custom Filtering and Selection:** Sorting, group by split-apply-combine, handling missing data (missing imputation), indexing & selecting data, selection by level, selection by position, merging of data frame (concat and merge), reshaping: stack, unstack, pivot.

### Module 4:

**Exploratory Data Analysis:** Finding the best attributes, principal component analysis, data normalization, time/date components, parsing & manipulating data, period & period index.

### Module 5:

**Data Visualization:** Scatter Plots, Line Graphs, Bar Plots, Matplotlib, Seaborn, X And Y Ticks and Rotations, Histograms, Box Plot.

### Module 6:

**Data Scarping:** Introduction to Web Scraping, Libraries - RE, REQUESTS, OS, BeautifulSoup, Data Collection & Filtering.

#### Reference Books & Materials:

- [Introduction and History of Electric Vehicles](#)
- Data Analytics : [Data Analytics Tutorial for Beginners: A \[Step-By-Step\] Guide \(simplilearn.com\)](#)
- Pandas - [User Guide – pandas 1.4.4 documentation \(pydata.org\)](#)
- NumPy - [NumPy user guide – NumPy v1.23 Manual](#)
- Matplotlib - [Tutorials – Matplotlib 3.5.3 documentation](#)
- Seaborn - [User guide and tutorial – seaborn 0.11.2 documentation \(pydata.org\)](#)

**List of Experiments:**

1. Perform following actions using SQL statements
  - a. Create a new user with name “shiva” and password “kumar@1”
  - b. Assign the following privileges
    - i. Create and drop tables
    - ii. Create and drop users
    - iii. Allow to assign above privileges to new users
    - iv. List all tables in the database
    - v. List all users in the database
    - vi. Logout from current user and log in as “shiva”
2. Create following tables and insert minimum 10 rows in to each table
  - a. Department table with following columns with appropriate data types
    - i. DeptId
    - ii. DeptName
    - iii. DeptLoc
  - b. Employee table with following columns with appropriate data types
    - i. EmpId
    - ii. EmpName
    - iii. DOB
    - iv. DOJ
    - v. Job
    - vi. Salary
  - c. Product table with following columns with appropriate data types
    - i. ProdId
    - ii. ProdName
    - iii. Price
  - d. Sales table with following columns with appropriate data types
    - i. SalesId
    - ii. Date
    - iii. Quantity
3. Update above tables with following features using SQL statements
  - a. Make DeptId in Department table as Primary Key
  - b. Make EmpId in Employee table as Primary Key
  - c. Add DeptId column to the Employee table and make it foreign key from Department table and update the values
  - d. Add EmpId and ProdId to the Sales table and make them foreign key from Employee and Product table and update the values
  - e. Update all columns in all tables with appropriate constraint such as not null, check and so on
4. Perform the following SQL statements
  - a. Create a view “EmpDeptView” from Employee and Department table which contains following columns
    - i. EmpName
    - ii. DOB
    - iii. Salary
    - iv. DeptId
    - v. DeptName
    - vi. Loc

- b. Retrieve all employees whose salary between 25,000 to 30,000
- c. Retrieve all employees who is working in Accounts department (If it is not there add this row to Department table)
- d. Retrieve all employees who is working other than Accounts department
- e. Retrieve all employee who is working in Sales department and Bangalore location
- f. Retrieve all employees who completed minimum 5 years
- g. Retrieve all employees who completed minimum 5 years and salary less than 30,000
5. Perform the following SQL statements
  - a. Retrieve all employees whose salary more than 30,000
  - b. Retrieve employee details who is getting maximum salary
  - c. Retrieve employee details who is getting minimum salary
  - d. Retrieve employee details who is getting 3rd maximum salary
  - e. Retrieve employee details who is getting 5th minimum salary
  - f. Retrieve total number of employees in each department in Bangalore location
  - g. Retrieve total number of employees in each location
  - h. Retrieve total number of employees in each location in Accounts department
  - i. Retrieve total number of employees who complete more than 10 years in each department
6. Write a PL/SQL Procedure to find prime number from 1 to n, n is a user input or parameter
7. Write a PL/SQL Functions to return number of days an employee working using EmpId
8. Write a PL/SQL Procedure to find sum of salaries of all employee working in a particular location
9. Write a PL/SQL Function to return sum of sales by ProdId
10. Write a PL/SQL Function to return sum of sales by EmpId
11. Write a PL/SQL Procedure to generate Employee Report department wise as follows:  

DeptName	EmpName	Job	Location	Salary	Cumulative_Salary
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12. Write a PL/SQL Trigger to insert row into OldEmployee table when a employee deleted from Employee table (Create OldEmployee table)
13. Write a PL/SQL Trigger not to delete more than 2 employees at a time
14. Write a PL/SQL Trigger not to update employee salary if it cross 67000
15. Write a PL/SQL Package with following procedures and functions
  - a. Procedures
    - i. Print Total Quantity Sales Summary Report (SalesId, Date, Quantity and Total Quantity)
    - ii. Print Total Quantity Sales Summary Report by Date wise
  - b. Functions
    - i. Return employee name who made maximum sales till date
    - ii. Return product name soled maximum quantity till date

## **BCAI-306: Object Oriented Programming Using Java Lab**

**L=0, T=0, P=4, C=2**

**MM 50**

### **List of Experiments:**

#### **Part A**

1. Write a program to check whether two strings are equal or not.
2. Write a program to display reverse string.
3. Write a program to find the sum of digits of a given number.
4. Write a program to display a multiplication table.
5. Write a program to display all prime numbers between 1 to 10000.
6. Write a program to insert element in existing array.
7. Write a program to sort existing array.
8. Write a program to create object for Tree Set and Stack and use all methods.
9. Write a program to check all math class functions.
10. Write a program to execute any Windows 95 application (Like notepad, calculator etc)
11. Write a program to find out total memory, free memory and free memory after executing garbage Collector (gc).

#### **Part B**

1. Write a program to copy a file to another file using Java to package classes. Get the file names at run time and if the target file is existed then ask confirmation to overwrite and take necessary actions.
2. Write a program to get file name at runtime and display number of lines and words in that file.
3. Write a program to list files in the current working directory depending upon a given pattern.
4. Create a textfield that allows only numeric value and in specified length.
5. Create a Frame with 2 labels, at runtime display x and y coordinate of mouse pointer in the labels.



## **BCAI-304: Business Communication & Presentation Skills**

L=0, T=0, P=4, C=2

MM 50

### **Course Objective:**

1. To train students in how to be effective communicators by practicing various skills and also help those in becoming well-groomed individuals in terms of both verbal and non-verbal communication.

### **Unit I: Principles of Effective written communication**

7 C's of Business communication: Clarity, Completeness, Conciseness, Consideration, Courtesy, Correctness, and Concreteness. Practice sessions for business writing.

### **Unit II: Letter writing**

Structure & Planning, Types of Letter: Leave letter, Cover Letter, Application Letter.  
Persuasive Writing: AIDA; practice sessions on letter writing.

### **Unit III: Email & Memo writing**

Importance of Email & Memo writing in the business world, Format of Email & Memo, Structure of Email & Memo, practice sessions on email and memo writing

### **Unit IV: Precise Writing & Report Writing**

Techniques of Precise writing, qualities of a good precise. Different types of Report – sales report, Annual report, Technical report, Components of a good report focusing on how to write short reports, practice sessions on report writing

### **Unit V: Resume writing**

Components of a good resume, different formats of resume, resume writing practice  
Different Types of meetings: Conducting Effective Meetings, Business meetings, Review meetings, Preparation for the meeting– Writing Agenda, MOM.  
Presentation Skills: Planning & developing effective Presentation, Do's & don'ts of a good presentation, use of Effective visual aids in a presentation

### **Text Book:**

1. Matthukutty M Monippally, Business Communication Strategies, Tata McGraw-Hill.
2. Chaturvedi P.D. et al, Business Communication; Concepts, Cases, & Applications, Pearson Education.

### **Reference Books:**

1. Shirley Taylor, Communication for Business, Pearson Education.
2. Lesiicar and Flatley, Basic Business Communication, Tata McGraw-Hill.
3. Courtan L. Bovee et al., Business Communication Today, Pearson Education.
4. Meenakshi Raman & Prakash Singh, Business communication, Oxford University Press

### **Course Outcome:**

After completion of the course the student will be able to:

1. Students will be able to overcome nervousness and stage fear at the end of the course.

# Syllabus

## Semester: IV

# BCAI-408: Principles of Virtualization

L=1, T=1, P=0, C=2

MM 50

## Course Objective:

1. To understand the virtualization and Cloud Computing
2. Implementing Virtualization using Hypervisors
3. To understand the vSphere components and its features.
4. Understanding and implementing the Storage Virtualization
5. Implementing Network virtualization using VMware NSX
6. How to Secure the ESXi and vCenter Servers
7. Monitoring the performance of resources used in SDDC

## Unit I: Introduction

Introduction to Virtualization, Types of virtualization, Difference between cloud and virtualization, Physical infrastructure and virtual infrastructure, Virtualization approaches, Partitioning, Hosting, Isolation, Hardware independence, Virtual machine, Hypervisor, Types of hypervisor, Virtual machine manager, Introduction to datacenter virtualization Esxi, Difference between Esxi and Esx, Versions of Esxi, Installation and configuration of Esxi 6.0, vSphere 6.0

## Unit II: Components of vSphere 6.0

Components of VMware vSphere, vSphere 6.0: Overview and Architecture, Topology of vSphere 6.0 Data Center, vSphere 6.0 Configuration MaximumsvCenter Server, vCenter Server Features, Certificate Management, Alarms and Alerts, Monitoring Features, Template Management, Linked Mode Deployment, Storage Features in vSphere, Shared Storage, Storage Protocols, Datastores, Virtual SAN, Virtual Volumes, Networking Features in vSphere, Virtual Networking, Virtual Switches and its types

## Unit III: Features of vSphere and NSX

vSphere Resource Management Features, vMotion, Distributed Resource Scheduler (DRS), Distributed Power Management (DPM), Storage vMotion, Storage DRS, Storage I/O Control, Network I/O Control, vSphere Availability Features, vSphere Data Protection, High Availability, Fault Tolerance, vSphere Replication, Introduction to NSX.

## Unit VI:

VSphere Solutions to Data Center Challenges and vSphere Security Challenges, Availability Challenges, Scalability Challenges, Management Challenges, Optimization Challenges, Application Upgrade Challenges, Cloud Challenges, Security, Describe the features and benefits of VMware Platform Services Controller, Configure ESXi host access and authorization, Secure ESXi, vCenter Server, and virtual machines, Upgrade ESXi and vCenter Server instances

## Unit V: Resource optimization and resource management

Network Optimization, Configure and manage vSphere distributed switches, Migrate virtual machines from standard switches to distributed switches, Explain distributed switch features such as port mirroring, LACP, QoS tagging, and NetFlow, CPU Optimization, Explain the CPU scheduler operation, NUMA support, and other features that affect CPU performance, Monitor key CPU performance metrics, Memory Optimization, Explain ballooning, memory compression, and host swapping techniques for memory reclamation when memory is overcommitted, Monitor key memory performance metrics, Storage Optimization, Diagnose storage access problems, Configure VMware vSphere Flash Read Cache, Monitor key storage performance metrics

**Text Books:**

1. Virtualization Essentials Paperback – 26 Apr 2012 by Matthew Portnoy - wiley publications
2. VMware Cookbook Paperback – 17 Jul 2012 by Troy - Shroff/O'Reilly; Second edition (17 July 2012).

**Reference Book:**

1. Mastering VMware vSphere 5.5 (SYBEX) Paperback – 2014 by Scott Lowe, Nick Marshall, Forbes Guthrie, Matt Liebowitz , Josh Atwell - Wiley (2014) edition.

**Course Outcome:**

After completion of the course the student will be able to:

1. Installing and configuring the SDDC using VMware products.
2. Implementing Fault tolerance and High availability for the Virtual machines
3. Securing the Virtual environment.
4. Resource Optimization and monitoring.

## BCAICT-402: Cloud Web Services

L=3, T=0, P=0, C=3

MM 75

### Course Objective:

1. Introducing cloud computing and Amazon web services.
2. Understanding and using EC2 instances.
3. Deploying and managing applications on AWS cloud.
4. Using AWS security services.
5. Implementing the networking concepts on AWS cloud.

### Unit I: Introduction to Cloud Computing and Amazon Web Services

Introduction to Cloud Computing, Cloud Service Delivery Models (IAAS, PAAS, SAAS), Cloud Deployment Models (Private, Public, Hybrid and Community), Cloud Computing Security, Case Study Introduction to Amazon Web Services, Why Amazon? Use Cases, AWS Storage Options, AWS Compute Options, AWS Database Options, AWS Workflow Automation and Orchestration Options, AWS Systems Management and Monitoring Options, AWS Virtual Private Cloud Introduction, Pricing Concepts

### Unit II: Introduction to EC2

Introduction to EC2, Instance Types and Uses, Auto scaling Instances, Amazon Machine Images (AMIS), Modifying Existing Images, Creating New Images of Running Instances, Converting An Instance Store AMI To An EBS AMI, Instances Backed By Storage Types, Elastic IPS, Elastic Load Balancing

### Unit III: Web Applications and Security

Introduction to Elastic Beanstalk, Deploying Scalable Application On AWS, Selecting and Launching An Application Environment, Provisioning Application Resources with Cloud formation, Introduction to CloudWatch, Describe Amazon Cloud Watch metrics and alarms, AWS Messaging Services (SNS, SQS, SES). Introduction to AWS Security, Describe Amazon Identity and Access Management (IAM), AWS Directory Service, AWS Key Management Service, Securing Data at Rest and In Motion,

### Unit IV: AWS Storage

Amazon Storage, S3 Storage Basics, Buckets and Objects, Creating A Web Server Using S3 Endpoints, Managing Voluminous Information with EBS, Glacier Storage Service, Describe Amazon Dynamo, understand key aspects of Amazon RDS, Launch an Amazon RDS instance,

### Unit V: AWS Networking

Introduction to AWS Networking , Access Control Lists (ACLs), Setting Up a Security Group, Setting Up VPC And Internet Gateway, Setting Up A VPN, Setting Up A Customer Gateway For VPN, Setting Up Dedicated Hardware For VPC, Scenario 1:VPC With A Public Subnet Only (Standalone Web), Scenario 2: VPC with Public And Private Subnets (3 Tier App), Scenario 3:VPC With Public And Private Subnets And Hardware VPN Access (Web On The Cloud, Database and App On Prem) Scenario 4: VPC With A Private Subnet Only And Hardware VPN Access. (Extension of Your Corporate Network), Route53 for DNS System, Cloud front, Case Study.

### Text Book:

1. Joe Baron, Hisham Baz , Tim Bixler , Biff Gaut , Kevin E. Kelly , Sean Senior , John Stamper , “AWS Certified Solutions Architect Official Study Guide: Associate Exam, John Wiley and Sons Publications, 2017

**Reference Book:**

1. Yohan Wadia , “AWS Certified Solutions Architect Official Study Guide: Associate Exam, John Packt Publishing, 2016
2. Bernald Golden, “Amazon Web Services for Dummies”, John Wiley & Sons, 2013

**Course Outcome:**

After completion of the course the student will be able to:

1. To gain fundamental understanding of AWS cloud technologies
2. Be able to start a Windows or Linux server in the cloud with its own private address
3. Be able to start up a CRM / Word Press / etc. website hosted in cloud
4. Be able to start a highly scalable MySQL or Oracle database in the cloud with multiple read-replica databases (for scalability of database)
5. Be able to setup a load-balancer in the cloud.

## BCAICT-403: Ethical Hacking

L=3, T=0, P=0, C=3

MM 75

### Course Objective:

1. To help students understand how ethical hacking is used as a method to prevent hacking.
2. To make it possible for students to learn the process of identifying vulnerabilities and exploits of the technological ecosystem comprising of various hardware, software, network, OS and applications and identify suitable countermeasures.
3. To facilitate students, appreciate the need for understanding non-technology aspects of ethical hacking such as legal frameworks, documentation and report writing.

### Unit I: Introduction to Ethical Hacking:

Hacking Methodology, Process of Malicious Hacking, and Foot printing and scanning: Foot printing, scanning. Enumeration: Enumeration. System Hacking and Trojans: System Hacking, Trojans and Black Box Vs. White Box Techniques.

### Unit II: Hacking Methodology:

Denial of Service, Sniffers, Session Hijacking and Hacking Web Servers: Session Hijacking, Hacking Web Servers. Web Application Vulnerabilities and Web Techniques Based Password Cracking: Web Application Vulnerabilities, Web Based Password Cracking Techniques.

### Unit III: Web and Network Hacking

SQL Injection, Hacking Wireless Networking, Viruses, Worms and Physical Security: Viruses and Worms, Physical Security. Linux Hacking: Linux Hacking. Evading IDS and Firewalls: Evading IDS and Firewalls.

### Unit IV: Report writing & Mitigation

Introduction to Report Writing & Mitigation, requirements for low level reporting & high level reporting of Penetration testing results, Demonstration of vulnerabilities and Mitigation of issues identified including tracking

### Unit V: Ethical Hacking and Legal System

Overview of India's Information Technology Amendment Act 2008 (IT Act 2008), hacker vs cracker, liabilities – civil and penal, cyber theft and IPC sec 378, IT Act 2008 – sections 43, 65 and 66, how to file a complaint of suspected hacking, Case Studies, understanding how hacking is legally dealt with among BRICS countries.

### Text Books:

1. Gray Hat Hacking The Ethical Hackers Handbook, 3rd Edition Paperback – 1 Jul 2017 by Allen Harper, Shon Harris, Jonathan Ness, Chris Eagle, McGraw Hill Education; 3 ed (1 July 2017)
2. CEH v9: Certified Ethical Hacker Version 9 Study Guide by Sean-Philip Oriyano, Sybex; Stg edition (17 June 2016).
3. Hacking for Beginners: Ultimate 7 Hour Hacking Course for Beginners. Learn Wireless Hacking, Basic Security, Penetration Testing by Anthony Reynolds, CreateSpace Independent Publishing Platform (10 April 2017).
4. An Ethical Guide To WI-FI Hacking and Security by SwaroopYermalkar, BecomeShakespeare.com; First edition (15 August 2014).
5. Hands-On Ethical Hacking and Network Defense by Michael T. Simpson | Kent Backman | James Corley, Cengage India 1st edition (2016).

**Reference Books:**

1. The Basics of Hacking and Penetration Testing: Ethical Hacking and Penetration Testing Made Easy by Patrick Engebretson, Syngress; 2 edition (12 September 2013).
2. Hacking With Python: The Complete Guide to Ethical Hacking, Basic Security, Botnet Attack, Python hacking and Penetration Testing Kindle Edition by John C. Smalls.

**Course Outcome:**

After completion of the course the student will be able to:

1. Explain the importance of ethical hacking in achieving the goals of information security.
2. Differentiate the processes of vulnerability assessment and ethical hacking from penetration testing.
3. Comprehend the importance of appropriate countermeasures for managing vulnerabilities
4. Justify the need for meticulous documentation in writing reports for consumption of both technical and management audiences.
5. Articulate the rationale for having an adequate legal framework for dealing with hacking and ethical hacking.



## **BCAICT-401 (Elective-II): Storage and Datacenter**

L=3, T=0, P=0, C=3

MM 75

### **Course Objective:**

1. To impart the basic concepts of Storage systems and Datacenter environment.
2. To understand concepts about RAID techniques.
3. To understand basic concepts about NAS and SAN.
4. To understanding about taking backup and restoring the data with the help of Business Continuity and Disaster Recovery concepts and tools.
5. To understand about Data Center Consolidation and Clustering.

### **Unit I: Introduction to Storage System**

Introduction to Information Storage: Information Storage, Evolution of Storage Architecture, Data Center Infrastructure, Virtualization and Cloud Computing Data Center Environment: Application, Database Management System (DBMS), Host (Compute), Connectivity, Storage, Host Access to Data, Direct-Attached Storage, Storage Design Based on Application Data Protection (RAID): RAID Implementation Methods, RAID Array Components, RAID Techniques, RAID Levels, RAID Impact on Disk Performance, RAID Comparison.

### **Unit II: Storage Networking Technologies**

Network-Attached Storage: General-Purpose Servers versus NAS Devices, Benefits of NAS, File Systems and Network File Sharing, Components of NAS, NAS I/O Operation, NAS Implementations, NAS File-Sharing Protocols, Factors Affecting NAS Performance, File-Level Virtualization. Fibre Channel Storage Area Networks: Fibre Channel Overview, The SAN and Its Evolution, Components of FC SAN, FC Connectivity, Switched Fabric Ports, Fibre Channel Architecture, Fabric Services, Switched Fabric Login Types, Zoning, FC SAN Topologies, Virtualization in SAN. IP SAN and FCoE: iSCSI, FCIP, FCoE RAID and Storage Networking Technologies: Implementation of RAID - Software RAID- Hardware RAID -RAID Array Component -RAID Levels - Striping -Mirroring - RAID Impact on Disk-Performance - Introduction to Direct Attached Storage – Types of DAS – Introduction to SAN – Components of SAN – FC connectivity – FC topologies – Introduction to NAS – NAS components – NAS Implementation – NAS File sharing.

### **Unit III: Backup and Disaster Recovery**

Introduction to Business Continuity: Information Availability, BC Terminology, BC Planning Life Cycle, Failure Analysis, Business Impact Analysis, BC Technology Solutions. Backup and Archive: Backup Purpose, Backup Considerations, Backup Granularity, Recovery Considerations, Backup Methods, Backup Architecture, Backup and Restore Operations, Backup Topologies, Backup in NAS Environments, Backup Targets, Data Deduplication for Backup, Backup in Virtualized Environments, Data Archive, Archiving Solution Architecture.

### **Unit IV: Data Center Consolidation**

Reasons for Data Center Consolidation: Reasons for Data Center Consolidation, Consolidation Opportunities. Data Center Consolidation Phases: Phase 1: Study and Document the Current Environment, Phase 2: Architect the Target Consolidated Environment, Phase 3: Implement the New Architecture, Phase 4: Control and Administer the Consolidated. Best Practices in IT: Defining Best Practices, Deploying Best Practices, Benefits of Best Practices, Systems Management Best Practices, Server Cluster Best Practices, Data Storage Best Practices, Network Management Best Practices, Documentation Best Practices, Network Diagram Documentation, Documentation Formats.

### **Unit V: Data Center Clusters**

Cluster Architecture: Asymmetric Two-Node Clusters, Symmetric Two-Node Clusters, Complex Cluster Configurations, Failover Policies, Best Practices. Cluster Requirements: Required Hardware

Cluster Components, Cluster Software Requirements, What Happens During Service Failover, Cluster Installation Checklist. Designing Cluster-Friendly Applications: Automating Operations, Controlling Application Failover Time, Reducing Data Loss During Failover, Minimizing Application Failures, Designing Node-Independent Applications, Minimizing Planned Downtime, Restoring Client Connections.

**Text Books:**

1. Information Storage and Management (Storing Managing, and Protecting Digital Information in Classic, Virtualized, and Cloud Environments) 2nd Edition by Somasundaram Gnanasundaram Alok Shrivastava.
2. Administering Data Centers: Servers, Storage, and Voice over IP By KailashJayaswal ISBN-13: 978-0471771838.

**Reference Books:**

1. Storage Networks Explained: Basics and Application of Fibre Channel SAN, NAS, ISCSI, INFINIB and FOCE by Ulf Troppens.
2. Storage Management in Data Centers: Understanding, Exploiting, Tuning, and Troubleshooting Veritas Storage Foundation by Volker Herminghaus and Albrecht Scriba.
3. Blade Servers and Virtualization: Transforming Enterprise Computing While Cutting Costs by Barb Goldworm and Anne Skamarock.

**Course Outcome:**

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

1. Analyze Storage devices and technologies.
2. Summarize the advantages and functionality of NAS and SAN.
3. Appreciate knowledge on Backups and Disaster Recovery.
4. Describe Data Center Consolidation and its phases.
5. Appreciate knowledge on design and analysis of Cluster Architecture.

## **BCAICT-404 (Elective-II): Network Security**

L=3, T=0, P=0, C=3

MM 75

### **Course Objective:**

1. To help students understand various characteristics of network security, threats and risks to securing network
2. To make it possible for students to learn important network security protocols and means of achieving an effective network security
3. To facilitate students, gain hands-on experience of identifying and providing solutions for common network security challenges using various security tools and techniques.

### **Unit I: Introduction to Network Security**

Perimeter Security – Overview of Network Security, Access Control, Device Security, Security features on Switches, Firewall, Types of firewall, Access Management, Multifactor Authentication, Wireless LAN (WLAN) Security and Network Admission Control (NAC)

### **Unit II: Threats, Vulnerabilities and Attacks**

Threat; Vulnerabilities; Attacks – Application Attack, Network Attack and Mitigating & Deterring Attacks; Network Security – Security through network devices, Security through Network Technologies and Security through Network Design Elements, Administering a Secure Network

### **Unit III: Network Security Management**

Secure Socket Layer (SSL) – Introduction to SSL, Open SSL basics, Problems with SSL, Cryptography, Message Digests Algorithms, Digital Signature and Public Key Infrastructure (PKI); Data Privacy – IPsec VPN, Dynamic Multipoint VPN (DMVPN), Group Encrypted Transport VPN (GET VPN), Secure Sockets Layer VPN (SSL VPN) and Multiprotocol Label Switching VPN (MPLS VPN)

### **Unit VI: Network Security Controls**

Network Intrusion Prevention – Overview of Intrusion Prevention System (IPS), Intrusion Detection System (IDS), Deploying IPS and IPS high Availability; host Intrusion Prevention; Anomaly Detection and Mitigation.

### **Unit V: Network Management**

Security Monitoring and correlation; Security Management - Security and Policy Management and Security Framework and Regulatory Compliance; Best Practices Framework, Case Studies

### **Text Books:**

1. Network Security Bible by Eric Cole, Wiley; Second edition (2009)
2. Network Security: Private Communication in a Public World by Charlie Kaufman, Radia Perlman, Mike Speciner, Pearson Education; Second edition (15 September 2016)
3. Network Security and Administration by Adesh K. Pandey, S.K. Kataria & Sons; Reprint 2013 edition (2013)
4. Network Security: A Beginners Guide by Eric Maiwald, McGraw Hill Education; Third edition (1 November 2012)
5. Information Security: The Complete Reference by Mark Rhodes-Ousley, McGraw Hill Education; Second edition (1 May 2013)
6. Information Systems Security: Security Management, Metrics, Frameworks and Best Practices by Nina Godbole, Wiley, 1st ed; 2008.

**Reference Book:**

1. Network Security. Principles And Practice. Fifth Edition. William Stallings. Prentice Hall.
2. Cryptography and Network Security Principles and Practices, Fourth Edition. By William Stallings. Publisher: Prentice Hall
3. Network Security Assessment: Know Your Network by Chris McNab, Shroff/O'Reilly; Third edition (1 December 2017)
4. Hacking Exposed 7: Network Security Secrets and Solutions by Stuart McClure, Joel Scambray, George Kurtz, McGraw Hill Education; 7 edition (16 March 2012)
5. Applied Network Security Monitoring: Collection, Detection, and Analysis by Chris Sanders, Jason Smith, Syngress (20 January 2014)
6. The Network Security Test Lab: A Step-by-Step Guide by Michael Gregg, John Wiley & Sons (9 October 2015)

**Course Outcome:**

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

1. Relate fundamental concepts of information security with network and connectivity
2. Apply their understanding of network security in identifying common issues and propose suitable solutions
3. Articulate the importance of managing the network using policies, processes and framework for effective and efficient security

## **BCAICT-405 (Elective-II): Database Security Fundamentals**

L=3, T=0, P=0, C=3

MM 75

### **Course Objective:**

1. To help students relate concepts of information security with databases
2. To make it possible for students to learn how important principles of Security are implemented in securing the database

### **Unit I: Concepts of Database Security Management System**

Database security concept, Importance of data, Levels of data security, Authorization in databases, Issues in database security, Concept of Least Privilege in User ID for databases. Perimeter security, firewalls, intrusion detection, and intrusion prevention

### **Unit II: Concepts of NoSQL**

No SQL databases introduction, Differences from classical DBMS concepts with NoSQL, Advantages of NoSQL like Elastic Scaling, Big Data, Goodbye DBAs', Economics/Cost, Flexible Data models. Non/ partial applicability of ACID (Atomicity, Consistency, Isolation, Durability), BASE Properties, CAP theorem, comparison to traditional RDBMS databases. Horizontal scalability, Benefits of NoSQL Databases compared to traditional Databases. Concept of UnSQL or Unstructured Query Language, Concept of Key Value & Tuple Store Databases, Concept of Graph Databases, Concept of Multimodel Databases

### **Unit III: Encryption and Permissions in SQL Server 2012**

Understanding permissions, Creating and using database roles, using schemas for security, configuring cross-database security. Code and Data Encryption- Using service and database master keys, creating and using symmetric and asymmetric keys, creating and storing hash values, Authenticating stored procedure by signature

### **Unit IV: Security of SQL Server 2012**

User authorization, authentication and security, protecting data using permissions, roles, schemas, SQL firewall, web application firewall, securing dynamic SQL from injections, protecting SQL server from DoS and injection attacks.

### **Unit V: SQL Server Auditing**

Auditing – Using the profiler to audit SQL server access, using DML trigger for auditing data modification, Using DDL triggers for auditing structure modification, configuring SQL server auditing, auditing and tracing user configurable events, policy based management, system centre advisor to analyze instances

### **Text Books:**

1. Information Systems Security: Security Management, Metrics, Frameworks and Best Practices by Nina Godbole, Wiley, 1st ed; 2008
2. Database security by SilvanaCastano, 2nd Edition, Pub: Addison-Wesley Professional, 2008
3. Microsoft SQL server 2012 Security Cookbook by Rudi Bruchez, Pub: PACKT publishing, 1st ed; 2012

**Reference Books:**

1. Handbook of database security: Applications and Trends Michael Gertz, SushilJajodia, Pub: Springer, 1st ed; 2008
2. Implementing database security and auditing, Ron Ben-Natan, Pub: Digital Press, 1st ed; 2005

**Course Outcome:**

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

1. Explain how security is ensured in database
2. Justify the need for securing database in mitigating important vulnerabilities.

## **BCAI-403: Logical Reasoning and Thinking**

L=0, T=0, P=4, C=2

MM 50

### **Course Objective:**

1. To help students learn the techniques of enhancing and sharpening their aptitude skills related to verbal ability, quantitative aptitude, logical reasoning and data presentation.

### **Unit I: Verbal ability**

Synonyms, Antonyms and One word substitutes

### **Unit II: Basic quantitative aptitude**

Speed, Time and Distance, Time and Work, Linear Equations, Progressions (Sequences & Series), Permutation and Combination, Probability, Functions, Set Theory, Number Systems, LCM and HCF, Percentages, Collection and Scrutiny of data: Primary data, questionnaire and schedule; secondary data, their major sources including some government publications.

### **Unit III: Logical Reasoning - I**

Number and Letter Series, Calendars, Clocks, Cubes, Venn Diagrams, Binary Logic, Seating Arrangement, Logical Sequence, Logical Matching, Logical Connectives, Syllogism, Blood Relations; concept of a statistical population and sample from a population; qualitative and quantitative data

### **Unit IV: Measures of Central Tendency**

Objective of averaging, characteristics of good average, types of average, arithmetic mean of grouped and ungrouped data, correcting incorrect values, weighted arithmetic mean Median - median of grouped and ungrouped data merit and limitation of median, computation of quartile, decile and percentile Mode - calculation of mode of grouped and ungrouped data, merits and limitation of mode, relationship between mean, median and mode. Geometric mean and Harmonic mean.

### **Unit V: Presentation of Data**

Construction of tables with one or more factors of classification; Diagrammatic and Graphical representation of non-frequency data; Frequency distribution, cumulative frequency distribution and their graphical representation - histogram, Column Graphs, Bar Graphs, Line Charts, Pie Chart, Data Interpretation – Introduction and approaches

### **Text Books:**

1. Richard I Levin, David S. Rubin: Statistics for Management, Pearson Prentice Hall Education Inc. Ltd, NewDelhi, 5th Ed. 2007
2. Bajpai, N. Business Statistics, Pearson, 2010.

### **Reference Books:**

1. Sharma J.K., Business Statistics, Pearson Education India, 2010.
2. Anderson; David R, Dennis J. Sweeney and Thomas A. Williams, Quantitative Methods for Business, Prentice-Hall, West Publishing Company, 1996.
3. CAT Complete course, UPKAR publications.

### **Course Outcome:**

1. By the end of this course, students will be able to use their logical reasoning and thinking skills more effectively; hence making them ready to clear written aptitude tests in industries and get placed easily.

Program Name- **MACHINE LEARNING**

Program Hours- **50**

Tentative Credit - **4**

### **OBJECTIVES**

- To provide big data computing environment: To analyze and Configure a Predictive Maintenance that can be implemented into a production environment to apply the predictive data model to streaming data.
- To provide Machine learning techniques: Three phases of machine learning. types of learning support vector machine. decision trees and random forests.
- To provide Scaling up machine learning: Dimensionality reduction techniques like principal component analysis and feature hashing.

### **OUTCOMES**

- Ability to understand and apply scaling up machine learning techniques and associated computing techniques and technologies.
- Ability to recognize and implement various ways of selecting suitable model parameters for different machine learning techniques.
- Ability to integrate machine learning libraries and mathematical and statistical tools with modern technologies.

### **SCOPE**

- Business Analyst
- Product Analyst
- Machine Learning Engineer
- Data Scientist

### **PROJECTS**

- Heart Attack Prediction
- Rain prediction
- Sensex prediction
- Engine health prediction Vibration
- Movie Recommendation System
- Auto Correct Keyboard -NLP
- Match prediction Sports Data
- Gold price Prediction



## **MACHINE LEARNING**

### **Module 1:**

**Introduction to Machine Learning:** Introduction to Multi-Dimensional Data- tensor, Different Algorithms and applications, Regression, Classification, Clustering and Association Rule Learning.

### **Module 2:**

**Supervised learning:** Regression, Simple & Multiple Linear Regression, Interaction Terms, Nonlinear Transformations, Dummy variable regression, K-fold Cross Validation, Subset selection methods.

### **Module 3:**

**Supervised learning:** Support Vector Machines, Optimization Objective, The Maximal Margin Classifier, Kernel Method, and Nonlinear Decision Boundaries, one versus One Classification, one versus All Classification, Character recognition using SVM Using Support Vector for Regression.

### **Module 4:**

**Supervised learning:** Random Forests & Decision Trees, Application of Random Forest, Ensembles of Estimators: Random Forests, Bagging and boosting, Feature training and testing, classification.

### **Module 5:**

**Supervised learning:** Introduction to Logistic Regression, Logistic Model cost function, Estimating the Coefficients, Making Predictions, Odds-Ratio, Performance Evaluation Matrices, Sensitivity/Specificity/PPV/NPV, Precision, ROC curve etc., Regularized Logistic Regression.

### **Module 6:**

**Supervised learning:** KNN (K-Nearest Neighbor), Background of KNN, Application of KNN, create a document retrieval system using k-nearest neighbors, identify various similarity metrics for text data, reduce computations in k-nearest neighbor search by using KD trees.

#### **Reference Books & Materials:**

- Machine learning basics – [Machine Learning – GeeksforGeeks](#)
- sklearn – [1. Supervised learning – scikit-learn 1.1.2 documentation](#)
- [Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow: Concepts, Tools, and Techniques to Build Intelligent Systems By Aurélien Géron](#)
- [Machine Learning Engineering Paperback – by Andriy Burkov](#)

## BCAI-409: Principles of Virtualization Lab

L=0, T=0, P=2, C=1

MM 25

### List of Experiments:

#### Hardware:

1. CPU: i3/i5
2. Network Card: 100Mbps/1Gbps
3. Memory: 8 GB
4. Storage: 256 GB/500GB

#### Software Requirements:

ESXi 5.5/6.0[Hypervisor]

vSphere Client

Google Chrome/ IE with Flash Player installed.

The infrastructure required to complete the lab exercises from Lab2 to Lab10 are as follows:

Windows 7/8/10

Internet Speed: 2Mbps

Web link for Online VMware Labs:

<http://labs.hol.vmware.com/HOL/catalogs/catalog/681>

Web link for HOL lab Manuals:

<http://docs.hol.vmware.com/>

S.No	Name of Lab Exercise		
1	Installing and configuring ESXi 5.5/6.0 Server [On Premise]		
2	HOL-1810-01-SDC	Virtualization 101	Introduction to Management with Virtualization vCenter Server Introduction to vSphere Networking And Security
3	HOL-1810-01-SDC	Virtualization 101	Introduction to vSphere Storage
4	HOL-1808-01-HCI - vSAN v6.6 - Getting Started	vSAN v6.6 - Getting Started	vSAN 6.6 Setup and Enablement vSAN Scale Out with Configuration Assist vSAN All Flash Capabilities
5	HOL-1808-01-HCI - vSAN v6.6 - Getting Started	vSAN v6.6 - Getting Started	vSANiSCSI Target vSAN Encryption
6	HOL-1808-01-HCI - vSAN v6.6 - Getting Started	vSAN v6.6 - Getting Started	vSANPowerCLI and ESXCLI vSAN Stretched Cluster

7	HOL-1803-01-NET - VMware NSX - Getting Started	VMware NSX	NSX Manager Installation and Configuration Logical Switching
8	HOL-1803-01-NET - VMware NSX - Getting Started	VMware NSX	Logical Routing Edge Services Gateway
9	HOL-1811-04-SDC - vSphere Security - Getting Started	vSphere Security	Automating Password Complexity for ESXi Users Forensic Security with vRealize Log Insight
10	HOL-1811-04-SDC - vSphere Security - Getting Started	vSphere Security	VM Encryption and Encrypted vMotion Secure Boot for Hosts and VMs No-Cryptography Administrator Roles and Permissions

## BCAICT-406: Ethical Hacking Lab

L=0, T=0, P=4, C=2

MM 50

### List of Experiments:

#### Hardware:

- I3/ I5 processor; 8GB RAM; 250GB HDD.

#### Software:

- VM Player; Windows server; Windows 7/ 10; Kali Linux; All-in-one keylogger; DELmE virus maker.

### Experiments:

1. Perform network scan to revile active hosts, open ports and services running.
2. Perform privilege escalation attack on Client operating system and gain control of a Client operating system and write a short note on its mitigation strategy.
3. Demonstrate ARP Poisoning and detect ARP Poisoning in switch-based network.
4. Perform man-in-the-middle attack and hijack an established session of a user. Write a report on the same with mitigation strategy.
5. Crack FTP credentials using dictionary attack and write a report of possible suggestion on hardening the login services.
6. Perform user system surveillance and write a mitigation report on the same.
7. Exploiting NetBIOS vulnerability and password revelation from browsers and social networking application using Key Logger and Trojan.
8. Perform denial service attack on a server operating system and write a report on the same with mitigation strategy.

## **BCAICT-407: Cloud Web Services Lab**

**L=0, T=0, P=2, C=1**

**MM 50**

1. Introduction to Amazon Simple Storage Service (S3)
2. Introduction to Amazon Cloud Front
3. Introduction to AWS Key Management Service
4. Introduction to Amazon Elastic Search Service
5. Introduction to Amazon Dynamo DB
6. Introduction to Amazon API Gateway
7. Introduction to Amazon Redshift
8. Introduction to Amazon Aurora
9. Introduction to Amazon Machine Learning
10. Introduction to AWS Database Migration Service
11. Introduction to AWS Lambda
12. Introduction to AWS Internet-of-Things (IoT)
13. Introduction to AWS Device Farm
14. Introduction to Amazon Kinesis Firehose
15. Introduction to Amazon Route 53
16. Introduction to Amazon Elastic File System (EFS)

# Syllabus

## Semester: V

# BCAICT501: Digital Forensic & Investigation

L=3, T=0, P=0, C=3

MM 75

## Course Objectives:

1. To understand the basic digital forensics and techniques for conducting the forensic examination on different digital devices.
2. To understand how to examine digital evidences such as the data acquisition, identification analysis.

## Unit I: Introduction

Computer forensics fundamentals, Benefits of forensics, computer crimes, computer forensics evidence and courts, legal concerns and private issues.

## Unit II: Understanding Computing Investigations

Procedure for corporate High-Tech investigations, understanding data recovery work station and software, conducting and investigations.

## Unit III: Data acquisition

Understanding storage formats and digital evidence, determining the best acquisition method, acquisition tools, validating data acquisitions, performing RAID data acquisitions, remote network acquisition tools, other forensics acquisitions tools.

## Unit IV:

Processing crimes and incident scenes, securing a computer incident or crime, seizing digital evidence at scene, storing digital evidence, obtaining digital hash, reviewing case.

## Unit V: Current computer forensics tools

Software, hardware tools, validating and testing forensic software, addressing data-hiding techniques, performing remote acquisitions, E-Mail investigations- investigating email crime and violations, understanding E-Mail servers, specialized E-Mail forensics tool.

## Text Books:

1. Warren G. Kruse II and Jay G. Heiser, “Computer Forensics: Incident Response Essentials”, Addison Wesley, 2002.
2. Nelson, B, Phillips, A, Enfinger, F, Stuart, C., “Guide to Computer Forensics and Investigations, 2nd ed., Thomson Course Technology, 2006, ISBN: 0-619-21706-5.

## Reference Books:

1. Vacca, J, Computer Forensics, Computer Crime Scene Investigation, 2nd Ed, Charles River Media, 2005, ISBN: 1-58450-389.

## Course Outcomes:

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

1. CO1: Know how to apply forensic analysis tools to recover important evidence for identifying computer crime.
2. CO2: To be well-trained as next-generation computer crime investigators.

## BCAICT502: Cloud Migration

L=3, T=0, P=0, C=3

MM 75

### Objectives:

1. This course aims to provide students with a comprehensive understanding of cloud migration techniques and strategies.
2. Students will learn how to plan, execute, and manage the migration of on-premises applications and data to cloud environments.
3. The course will cover various aspects of cloud migration, including assessing migration readiness, selecting appropriate cloud services, ensuring data security, and optimizing performance.
4. Practical hands-on exercises and real-world case studies will help students develop the skills necessary for successful cloud migration.

### UNIT- I: Introduction to Cloud Computing and Migration

Overview of cloud computing and its benefits, Introduction to cloud migration and its importance, Challenges and considerations in cloud migration, Cloud Migration Strategies and Planning, Lift and shift migration approach, Re-platforming and refactoring strategies, Migration planning process and best practices, Assessing application compatibility and dependencies

### UNIT- II: Cloud Service Selection and Configuration

Evaluation of cloud service providers, Selection criteria for choosing cloud services, Configuring and provisioning cloud resources, Integration of existing systems with cloud services, Data Migration to the Cloud, Data migration strategies and techniques, ensuring data integrity and security during migration, Data transfer methods and tools, Database migration to cloud-based solutions

### UNIT- III: Application Migration to the Cloud

Application assessment and readiness for migration, Containerization and orchestration for cloud deployment, Application migration patterns and practices, Testing and validation of migrated applications

### UNIT- IV: Cloud Migration Project Management

Project planning and resource allocation, Risk assessment and mitigation strategies, Change management and communication during migration, Monitoring and optimization of migrated systems

### UNIT- V: Performance and Scalability Considerations

Performance testing and optimization in the cloud, scaling applications and resources in the cloud, Load balancing and auto-scaling techniques, Cost optimization and resource utilization monitoring

### UNIT- VI: Security and Compliance in Cloud Migration

Data privacy and protection in the cloud, Identity and access management for cloud services, Compliance regulations and cloud governance, Cloud security best practices and threat mitigation, Case Studies and Real-world Examples, Analysis of real-world cloud migration projects, Case studies highlighting successful cloud migration strategies, Lessons learned and best practices from industry examples

### Text Books:

1. The Great Cloud Migration: Your Roadmap to Cloud Computing, Big Data and Linked Data, Michael Daconta
2. A Practical Guide to Cloud Migration by Kieran Broadfoot, O'Reilly Media, Inc.



**Reference Books:**

1. "Cloud Migration: A Hands-On Guide to Migrating to the Cloud" by Jeff McWherter and Aaron Wright
2. "Cloud Computing: From Beginning to End" by Ray J. Rafaels
3. "Cloud Computing: Principles and Paradigms" by Rajkumar Buyya, James Broberg, and Andrzej Goscinski

**Course Outcomes:**

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

1. Gain knowledge of different cloud migration strategies and approaches.
2. Evaluate the readiness of applications and data for migration to the cloud.
3. Select appropriate cloud services and providers based on specific requirements and considerations.
4. Plan and execute a cloud migration project, including assessing risks and addressing challenges.

## BCAICT503 (Elective III) - PowerShell Scripting

L=3, T=0, P=0, C=3

MM 75

### Course Objectives:

1. Understand how to write and run scripts.
2. Use variables and parameters to make your scripts flexible.
3. Apply flow-control logic to make intelligent decisions.
4. Add robustness to your scripts by adding error management.

### Unit I: Introduction to PowerShell

What is PowerShell and its importance, Basic PowerShell commands and syntax, PowerShell variables and datatypes, PowerShell operators and expressions.

### Unit II: Control Structures

PowerShell conditional statements (if/else/else-if), PowerShell loops (for/foreach/while/do-while), PowerShell Switch Statements.

### Unit III: Functions

Creating and using Functions in PowerShell, Parameters in PowerShell Functions, Returning values from PowerShell functions.

### Unit IV: Modules and PowerShell Scripting

PowerShell Modules and their importance, creating and importing PowerShell modules, PowerShell scripting best practices, Writing and executing PowerShell scripts.

### Unit V: Advanced PowerShell

PowerShell Remoting, PowerShell security best practices, PowerShell Desired State Configuration (DSC), PowerShell workflows, PowerShell debugging techniques.

### Text Books:

1. PowerShell Cookbook: Your Complete Guide to Scripting the Ubiquitous Object-Based Shell 4th Edition by Lee Holmes
2. Learn PowerShell in a Month of Lunches, Fourth Edition: Covers Windows, Linux, and macOS 4th Edition by Travis Plunk, James Petty, Tyler Leonhardt

### Reference Books:

1. Windows Server Automation with PowerShell Cookbook: Powerful ways to automate, manage and administrate Windows Server 2022 using PowerShell 7.2, 5th Edition.

### Course Outcomes:

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

1. CO1: Learn PowerShell Scripting to Automate the tasks.
2. CO2 : From very basic to Advance PowerShell Scripting command lets and syntax building Will be learning from zero to build the required help.
3. CO3 : Writing on your own Powershell Automating scripts.
4. CO4 : Writing on your own Powershell Remoting for remote machines and automate the tasks from your local machine to multiple remote machines.

# BCAICT504 (Elective III): Infrastructure Automation

L=3, T=0, P=0, C=3

MM 75

## Objectives:

1. To describe signals mathematically and understand how to perform mathematical operations on automation.
2. It will provide knowledge of Automation tools.
3. To discuss word Cloud infrastructure, CI/CD.

## UNIT- I: Introduction to infrastructure automation

Definition and importance of infrastructure automation Infrastructure as code (IaC) and its benefits  
Overview of infrastructure automation tools Infrastructure testing (e.g., integration testing, acceptance testing)  
Immutable infrastructure Micro services and infrastructure automation

## UNIT- II: Configuration Management

Introduction to configuration management, Configuration management tools (e.g., Ansible, Chef, Puppet)  
Writing and managing configuration files, Best practices for configuration management

## UNIT- III: Continuous Integration/Continuous Deployment (CI/CD)

Introduction to CI/CD Overview of CI/CD tools (e.g., Jenkins, Circle, Travis CI), Writing and managing build scripts  
Best practices for CI/CD

## UNIT - IV: Cloud Infrastructure Provisioning

Introduction to cloud infrastructure provisioning Infrastructure as a Service (IaaS) providers (e.g., AWS, Azure, GCP)  
Writing and managing cloud infrastructure templates (e.g., Cloud Formation, Terra form)  
Best practices for cloud infrastructure provisioning

## UNIT-V: Monitoring and Logging

Introduction to monitoring and logging Monitoring and logging tools (e.g., Prometheus, ELK stack),  
Writing and managing monitoring and logging configurations Best practices for monitoring and logging

## UNIT-VI: Security and Compliance

Introduction to security and compliance in infrastructure automation Infrastructure security tools (e.g., HashiCorp Vault, AWS KMS)  
Compliance frameworks (e.g., HIPAA, PCI-DSS) Best practices for security and compliance in infrastructure automation

## Text Books:

1. The Definitive Guide to AWS Infrastructure Automation: Craft Infrastructure-As-Code Solutions  
1st ed. Edition, Kindle Edition
2. The Definitive Guide to AWS Infrastructure Automation Authors: Bradley Campbell

**References books:**

1. Mastering Infrastructure Automation by Felix Frank, Martin Alfke, Alessandro Franceschi, Jaime Soriano Pastor, Thomas Uphillis
2. Ifeachor and Jervis, “Infrastructure Automation”, Pearson Education India.
3. DeFatta D J, Lucas J G and Hodgkiss W S, “Chef Infrastructure Automation cookbook”, by Matthias Marshal

**Course Outcomes:**

After the completion of the course the student will be able to:

1. Illustrate automation tools, systems and their significance.
2. Analyze the automation testing using various tools.
3. Analyze the Configuration management tools like Ansible, Chef, Puppet.
4. Interpret the Infrastructure security tools like, HashiCorp Vault, AWS KMS

## BCAICT505 (Elective IV): Cloud Security

L=3, T=0, P=0, C=3

MM 75

### Course Objectives:

1. To provide students with the fundamentals and essentials of Cloud Computing.
2. To understand core cloud computing concepts and fundamental principles, including standard delivery models and service designs.
3. To Understand the differences between traditional data security practices and cloud-based data security methodologies
4. Understand how to protect data-at-rest, data-in-transit, and data-in-use within a cloud environment.
5. Understand standard cloud security network designs and architecture models.
6. Understand the regulatory requirements needed to secure data in the cloud and the difficulties in meeting those requirements.

### Unit 1:

Cloud Computing Fundamentals, Definition, Evolution, Essential characteristics, Cloud Deployment Models, Cloud Service Models, Benefits, Cloud Architecture, Virtualization in Cloud, Cloud Data Centre, SLA, Cloud Applications.

### Unit 2:

Cloud Security Challenges, Cloud Information Security Objectives, Cloud Security Services, Secure Cloud Software Requirements, Cloud Security Policy Implementation, Infrastructure Security, Data Security and Storage, Privacy in Cloud.

### Unit 3:

Threats and Vulnerabilities to Infrastructure, Data, and Access Control; Risk Management and Risk Assessment in Cloud, Cloud Service Provider Risks, Virtualization Security Management in the Cloud, Trusted Cloud Computing, Identity Management and Access Control.

### Unit 4:

Cloud Computing and Business Continuity Planning/Disaster Recovery, Cloud Audit and Compliance: Internal Policy Compliance, Regulatory/External Compliance, Cloud Security Alliance.

### Unit 5:

Standards for Security: SAML OAuth, OpenID, SSL/TLS, Encrypting Data and Key Management, Creating a Cloud Security Strategy, The Future of Security in Cloud Computing.

### Text Books:

1. Rittinghouse, John W., and James F. Ransome, —Cloud Computing: Implementation, Management and Security, CRC Press, 2017.
2. Buyya, Christian Vecchiola, S.Thamarai Selvi,—Mastering Cloud Computing, Tata Mcgraw Hill,2013.

**Reference Books:**

1. Ronald L. Krutz, Russell Dean Vines, "Cloud Security: A Comprehensive Guide to Secure Cloud Computing", Wiley Publishing, 2010.
2. Tim Mather, Subra Kumaraswamy, and Shahed Latif, "Cloud Security and Privacy", Published by O'Reilly Media, Inc., 2009

**Course Outcomes:**

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

1. Explain the core concepts of the cloud computing paradigm: how and why this paradigm shift came about, the characteristics, advantages and challenges brought about by the various models and services in cloud computing.
2. Apply fundamental concepts in cloud infrastructures to understand the tradeoffs in power, efficiency and cost, and then study how to leverage and manage single and multiple datacenters to build and deploy cloud applications that are resilient, elastic and cost-efficient.
3. Discuss system, network and storage virtualization and outline their role in enabling the cloud computing system model.
4. Analyze various cloud programming models and apply them to solve problems on the cloud.

## **BCAICT506 (Elective IV): Application and Web Security**

**L=3, T=0, P=0, C=3**

**MM 75**

### **Course Objectives:**

1. Inculcate the fundamental concepts of Web Security
2. Develop the students as a good ability to secure web network
3. Conceive, conceptualize, design and demonstrate innovative ideas using Cyber tools

### **UNIT I:**

Introduction- Introduction to Information Systems, Types of Information Systems, Development of Information Systems, Introduction to Information Security and CIA triad, Need for Web Security, Threats to Information Systems, Information Assurance and Security Risk Analysis, Cyber Security.

### **UNIT II:**

Application Security- (Database, E-mail and Internet), Data Security Considerations-(Backups, Archival Storage and Disposal of Data), Security Technology-(Firewall , VPNs, Intrusion Detection System), Access Control. Security Threats -Viruses, Worms, Trojan Horse, Bombs, Trapdoors, Spoofs, E-mail Viruses, Macro Viruses, Malicious Software, Network and Denial of Services Attack.

### **UNIT III:**

Introduction to E-Commerce, Threats to E-Commerce, Electronic Payment System, e- Cash, Credit/Debit Cards. Digital Signature, Cryptography Developing Secure Information Systems, Application Development Security, Information Security Governance & Risk Management, Security Architecture & Design Security Issues in Hardware, Data Storage & Downloadable Devices, Physical Security of IT Assets.

### **UNIT IV:**

Security Policies- Why policies should be developed, Policy Review Process, Publication and Notification Requirement of policies, Types of policies – WWW policies, Email Security policies, Corporate Policies, Sample Security Policies. Case Study – Corporate Security

### **UNIT V:**

Information Security Standards-ISO, IT Act, Copyright Act, IPR. Cyber Crimes, Cyber Laws in India; IT Act 2000 Provisions, Intellectual Property Law, Copy Right Law , Semiconductor Law and Patent Law , Software Piracy and Software License.

### **Text Books:**

1. "Web Application Security: A Beginner's Guide" by Bryan Sullivan and Vincent Liu
2. "The Web Application Hacker's Handbook: Finding and Exploiting Security Flaws" by Dafydd Stuttard and Marcus Pinto

### **Reference books:**

1. William Stallings, Network Security Essentials: Applications and Standards, Prentice Hall, 4th edition, 2010.
2. Michael T. Goodrich and Roberto Tamassia, Introduction to Computer Security, Addison Wesley, 2011.
3. William Stallings, Network Security Essentials: Applications and Standards, Prentice Hall, 4th edition, 2010.
4. Alfred J. Menezes, Paul C. van Oorschot and Scott A. Vanstone, Handbook of Applied Cryptography, CRC Press, 2001.

**Course Outcomes:**

1. CO 1 Identify and analyze nature & inherent difficulties in the security of the Information System.
2. CO 2 Analyze various threats and attacks, corresponding counter measures and various vulnerability assessment and security techniques in an organization.
3. CO 3 Applications of cyber based policies and use of IPR and patent law for software-based design. Define E-commerce types and threats to E-commerce.
4. CO 4 Explain concepts and theories of networking and apply them to various situations, classifying networks, analyzing performance.
5. CO5 To articulate the well-known cyber-attack incidents, explain the attack scenarios, and explain mitigation techniques.



# **BCAICT-507 (Generic Elective I): IT Governance Risk and Information Security Management**

**L=3, T=0, P=0, C=3**

**MM 75**

## **Course Objectives:**

This course focuses on the models, tools, and techniques for enforcement of security with some emphasis on the use of cryptography. Students will learn security from multiple perspectives.

## **UNIT I:**

Governance, Risk & Compliance GRC–Definitions–Governance Risk, Compliance Risk Threshold, Risk Modeling, Risk Appetite, Governance Standards. Best Practices for IT Governance–ITIL - ISO/IEC 27001 - Control Objectives of Information and Related Technology (COBIT) – The Information Security Management Maturity Model - Capability Maturity Model – latest standards and compliance technologies.

## **UNIT II:**

Information Security Governance -Effective Information Security Governance - Importance of Information Security Governance - Outcomes of Information Security Governance - Strategic alignment – Risk Management - Performance Measurement - Information System Strategy - Strategic Planning - Steering Committee- Policies and Procedures.

## **UNIT III:**

Information Security Management Practices-Personnel Management - Financial Management–Quality Management - Information Security Management - Performance Optimization - Roles and Responsibilities - Auditing IT Governance Structure - Evaluation Criteria & Benchmark - Assessment Tools -Case Study Analysis - Risk Management framework–COSO - The Internal environment - Objective Setting -Event Identification - Risk assessment - Risk Response - Control activities - Information & communication–Monitoring–NIST - Risk Assessment - Risk Mitigation - Evaluation & Assessment - Case Study Analysis.

## **UNIT IV:**

Compliance–Introduction-Information Technology and security - Evolution of Information systems - Roles and responsibilities - Audit, Assessment and review - The Role of the Compliance Officer - The duties and responsibilities of the compliance officer and the function of compliance - Compliance officer activities - The requirements of a Compliance Officer - Drafting compliance reports – Designing an Internal Compliance System -Regulatory principles–Issues - Developing high-level compliance policies - Defining responsibility for compliance- The compliance function - Specific internal compliance control issues–Information System Audit - Scope of System Audit - Audit Planning - Audit Manual - Audit check lists - Audit Reports - Best Practices for IT compliance and Regulatory Requirements.

## **UNIT V:**

Security Policies- Development of Policies, WWW Policies, Email Security Policies, Policy Review Process-Corporate Policies-Sample Security Policies, Publishing and Notification Requirement of the Policies. Evolving Technology Security – Mobile, Cloud, Outsourcing, SCM

## **UNIT VI:**

Information Security Standards-ISO, IT Act, Copyright Act, Patent Law, IPR. Cyber Laws in India; IT Act 2000 Provisions, Intellectual Property Law: Copy Right Law, Software License, Semiconductor Law and Patent Law.

Case Study – Corporate Security

**Text Books:**

1. V.K. Jain, Cryptography and Network Security, Khanna Publishing House, Delhi
2. Anshul Kaushik, Cyber Security, Khanna Publishing House
3. Sarika Gupta & Gaurav Gupta, Information Security and Cyber Laws, Khanna Publishing House

**Reference Books:**

1. Charles P. Pfleeger, Shari Lawerance Pfleeger, "Analysing Computer Security", Pearson Education India.
2. V.K.Pachghare, "Cryptography and information Security", PHI Learning Private Limited, Delhi India.
3. Dr.Surya Prakash Tripathi, Ritendra Goyal, Praveen Kumar Shukla , "Introduction to Information Security and Cyber Law" Willey Dreamtech Press.
4. Michael E.Whitman and Herbert J Mattord "Principle of Information Security" Cengage
5. Mike Chapple and David Seidl "Cyberwarfare: Information operations in a connected world" Jones & Bartlett Learning
6. Schou, Shoemaker, "Information Assurance for the Enterprise", Tata McGraw Hill.
7. CHANDER, HARISH, "Cyber Laws and It Protection", PHI Learning Private Limited, Delhi

**Course Outcomes:**

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

1. Explain the importance of information security governance, risk, and compliance (GRC)
2. Identify key themes in ethics and information security law
3. Differentiate between security program development and enterprise security frameworks
4. Describe the importance of security awareness, training, and education
5. Explain how business impact analysis and business continuity planning apply to risk
6. Describe how an IS risk management program contributes to business success

## **BCAICT-508 (Generic Elective I): Infrastructure Solution and Cloud**

**L=3, T=0, P=0, C=3**

**MM 75**

### **UNIT I:**

Cloud Computing fundamentals: Essential characteristics, Architectural Influences, Technological Influences, and Operational Influences. Cloud Computing Architecture: Cloud Delivery models, The SPI Framework, Cloud Software as a Service (SaaS), Cloud Platform as a Service (PaaS), Cloud Infrastructure as a Service (IaaS), Cloud deployment models, Public Clouds, Community Clouds, Hybrid Clouds, Alternative Deployment models, Expected benefits.

### **UNIT II:**

Cloud Computing Software Security fundamentals: Cloud Information Security Objectives, Confidentiality, Integrity, Availability, Cloud Security Services, Relevant Cloud Security Design Principles, Secure Cloud Software Requirements, Secure Development practices, Approaches to Cloud Software Requirement Engineering, Cloud Security Policy Implementation.

### **UNIT III:**

Cloud Computing Risk Issues: The CIA Triad, Privacy and Compliance Risks, Threats to Infrastructure, Data and Access Control, Cloud Access Control Issues, Cloud Service Provider Risks. Cloud Computing Security challenges: Security Policy Implementation, Policy Types, and Computer Security Incident Response Team (CSIRT).

### **UNIT IV:**

Cloud Computing Security Architecture: Architectural Considerations, General Issues, Trusted Cloud Computing, Secure Execution environments and Communications, Micro architectures, Identity Management and Access Control, Autonomic Security.

### **UNIT V:**

Governance in the Cloud: Industry Standards Organizations and Groups associated with Cloud Computing, need for IT governance in cloud computing, Cloud Governance Solution: Access Controls, Financial Controls, Key Management and Encryption, Logging 9 SUB and Auditing, API integration. Legal Issues: Data Privacy and Security Issues, Cloud Contracting models, Jurisdictional Issues Raised by Virtualization and Data Location, Legal issues in Commercial and Business Considerations

### **Reference Books:**

1. Hausman, K. K., Cook, S. L., & Sampaio, T. (2013).
2. Cloud Essentials: CompTIA Authorized Courseware for Exam CLO-001.
3. John Wiley & Sons. Hurwitz, J. S., & Kirsch, D. (2020).
4. Cloud computing for dummies. John Wiley & Sons. Thomas, E., Zaigham, M., & Ricardo, P. (2013).
5. Cloud Computing Concepts, Technology & Architecture. Srinivasan, A. (2014).
6. Cloud Computing: A practical approach for learning and implementation. Pearson Education India.
7. Ronald L. Krutz, Russell Dean Vines, "Cloud Security: A comprehensive Guide to secure Cloud Computing" Wiley.

Program Name- **DEEP LEARNING**

Program Hours- **50**

Tentative Credit - **4**

#### **OBJECTIVES**

- To create appreciation and understanding of both the achievements of AI and the theory underlying those achievements.
- To introduce the concepts of Computer Vision & Natural Language Processing that can be designed to solve problems.
- To impart basic proficiency in representing difficult real-life problems in a state space representation to solve them using AI techniques.
- To create an understanding of the basic issues of knowledge representation, as well as an understanding of topics such as parallel processing, accelerated computing & GPU etc. that play an important role in AI programs.

#### **OUTCOMES**

- Demonstrate knowledge of the building blocks of AI as presented in terms of intelligent agents.
- Analyze and formalize the problem as a state space, graph, design heuristics and select amongst different searches.
- Develop intelligent algorithms for constraint satisfaction problems and design intelligent systems for Industrial Manufacturing Processes.
- Attain the capability to represent various real life problem domains using logic-based techniques and use this to perform inference or planning.

#### **SCOPE**

- AI Developer and AI Analyst
- Data Scientist

#### **PROJECTS**

- Parallel Processing
- AI Networks Design
- Smart Systems

## DEEP LEARNING

### Module 1:

**Introduction to AI, CV, NLP:** Applications of CV, Applications of NLP, Need for CV, and NLP Engineers Introduction to course. Learning mechanisms – 1: Introduction to types of learning mechanisms, Supervised – regression, classification, SVMs. Introduction to parallel processing: Parallel processing, Accelerated computing & GPUs.

### Module 2:

**Neural networks:** Biological neurons and Perceptrons, Multi-layer Perceptrons, Activation functions, Feed forward networks & Backpropagation, Base optimizers and loss functions, Training multi-layer perceptron.

### Module 3:

**Introduction to image processing:** Image processing libraries, Simple image processing functionalities, Feature extraction. **Building blocks of deep learning Layers:** Activation functions, Network creation and visualization.

### Module 4:

**Computer Vision Level 1 work** – CV Data collection, Data annotation, Classification data – EDA, Data augmentation, Data preprocessing.

**Computer Vision Level 2 work:** Optimizers and Loss functions, Training and Hyper-parameters, Evaluation and Inferencing, Process Monitoring.

**Computer Vision Level 3 work:** Blocks and CNNs, Transfer learning, Multi label image classification.

### Module 5:

**Approach using different libraries:** TensorFlow (+keras), Mxnet, Chainer, Paddle. Computer Vision Level 4 work: Post training optimization, Computer Vision Level 5 work: Peripheral tech integration, Processes, microservices and APIs, Model deployment and hosting.

**Learning mechanisms – 3:** Semi-supervised learning, Unsupervised learning.

#### Reference Books & Materials:

- [Learn AI with Python](#)
- [Starting with Pytorch](#)
- [OpenCV – Tutorial](#)
- [AI Tutorials](#)
- [Natural Language Processing with Python by Steven Bird, Ewan Klein, Edward Loper](#)