

**School of Computer Applications**  
**Bachelor of Computer Applications (Cyber Security & Forensics)**  
**In Collaboration with IBM**

**Eligibility:** Minimum Aggregate of 50% or equivalent in 10+2, relaxation in qualification and reservation will be as per UGC and Government Norms

**Minimum Duration of the Course: 3 Years**

**Maximum Duration of the Course: 5 Years**

**School of Computer Applications**  
**Bachelor of Computer Applications (Cyber Security & Forensics)**  
**In Collaboration with IBM**  
**Evaluation Scheme (w. e. f. Academic Session 2021-22)**

<b>SEMESTER I</b>										
<b>Course Category</b>	<b>Course Code</b>	<b>Course Title</b>	<b>Contact Hours</b>			<b>Evaluation Scheme</b>			<b>Credits</b>	<b>Mode</b>
			<b>L</b>	<b>T</b>	<b>P</b>	<b>CIA</b>	<b>ESE</b>	<b>Course Total</b>		
<b>Theory</b>										
F	BCACS1101	Data Privacy Fundamentals	3	1	0	40	60	100	4	IBM
F	BCACS1102	Fundamentals of Information Technology	3	1	0	40	60	100	4	School
C	BCACS1103	Discrete Mathematics	3	1	0	40	60	100	4	
C	BCACS1104	Introduction to Web Designing	3	1	0	40	60	100	4	
AECC	BSAE2101	Environmental Studies	3	1	0	40	60	100	4	
	BCACS1105	Basic Mathematics	Qualifying						0	
<b>Practical</b>										
F	BCACS1151	Fundamental of Information Technology Lab	0	0	4	40	60	100	2	School
C	BCACS1152	Web Designing Lab	0	0	4	40	60	100	2	
	GP1101	General Proficiency	-	-	-	100	-	100	1	
<b>Total</b>			15	5	8	-		800	25	

**Note:** BCACS1105: Basic Mathematics will be non-credit qualifying for the course

<b>SEMESTER II</b>										
<b>Course Category</b>	<b>Course Code</b>	<b>Course Title</b>	<b>Contact Hours</b>			<b>Evaluation Scheme</b>			<b>Credits</b>	<b>Mode</b>
			<b>L</b>	<b>T</b>	<b>P</b>	<b>CIA</b>	<b>ESE</b>	<b>Course Total</b>		
<b>Theory</b>										
C	BCACS1201	Cyber Security	3	1	0	40	60	100	4	IBM
	BCACS1202	Security and Data Privacy Laws and Standards	3	1	0	40	60	100	2	
AECC	HSAE2201	Communicative English	3	1	0	40	60	100	4	School
C	BCACS1203	Computer Networks and Security	3	1	0	40	60	100	4	
C	BCACS1204	Relational Database Management System using SQL	3	1	0	40	60	100	4	
C	BCACS1205	Digital Security and Forensic Fundamental	3	1	0	40	60	100	4	
	BCACS1206	Human Values and Professional Ethics	Qualifying						0	
<b>Practical</b>										
C	BCACS1251	Computer Networks and Security Lab	0	0	4	40	60	100	2	School
C	BCACS1252	Relational Database Management System using SQL Lab	0	0	4	40	60	100	2	
	GP1201	General Proficiency	-	-	-	100	-	100	1	
<b>Total</b>			18	6	8	-		900	27	

**Note:** BCACS1206: Human Values & Professional Ethics will be non-credit qualifying for the course

<b>SEMESTER III</b>										
<b>Course Category</b>	<b>Course Code</b>	<b>Course Title</b>	<b>Contact Hours</b>			<b>Evaluation Scheme</b>			<b>Credits</b>	<b>Mode</b>
			<b>L</b>	<b>T</b>	<b>P</b>	<b>CIA</b>	<b>ESE</b>	<b>Course Total</b>		
<b>Theory</b>										
C	BCACS1301	Identity Access Management	3	1	0	40	60	100	4	IBM
C	BCA4301	Basics of Design & Analysis of Algorithms	3	1	0	40	60	100	4	School
C	BCACS1302	Basics of Operating System	3	1	0	40	60	100	4	
C	BCACS1303	Introduction to System Security	2	0	0	40	60	100	4	
C	BCACS1304	Basics of Computer Organization & Architecture	3	1	0	40	60	100	4	
<b>Practical</b>										
C	BCACS1351	Basics of Design & Analysis of Algorithm Lab	0	0	4	40	60	100	2	School
C	BCACS1352	Basics of Computer Organization Lab	0	0	4	40	60	100	2	
	GP1301	General Proficiency	-	-	-	100	-	100	1	
<b>Total</b>			14	4	8	-		800	25	

<b>SEMESTER IV</b>										
<b>Course Category</b>	<b>Course Code</b>	<b>Course Title</b>	<b>Contact Hours</b>			<b>Evaluation Scheme</b>			<b>Credits</b>	<b>Mode</b>
			<b>L</b>	<b>T</b>	<b>P</b>	<b>CIA</b>	<b>ESE</b>	<b>Course Total</b>		
<b>Theory</b>										
C	BCACS1401	Apply End to End Security to Cloud Application	3	1	0	40	60	100	4	IBM
C	BCA4401	Basics of Python Programming	3	1	0	40	60	100	4	School
C	BCACS1402	Web Designing Using PHP	3	1	0	40	60	100	4	
C	BCA4404	Data Warehousing & Data Mining	3	1	0	40	60	100	4	
C	BCACS1403	Cryptography & Cyber Security	3	1	0	40	60	100	4	
<b>Practical</b>										
C	BCA4451	Basics of Python Programming Lab	0	0	4	40	60	100	2	School
C	BCACS1452	Web Designing Using PHP Lab	0	0	4	40	60	100	2	
	GP1401	General Proficiency	-	-	-	100	-	100	1	
<b>Total</b>			15	5	8	-		800	25	

<b>SEMESTER V</b>										
<b>Course Category</b>	<b>Course Code</b>	<b>Course Title</b>	<b>Contact Hours</b>			<b>Evaluation Scheme</b>			<b>Credits</b>	<b>Mode</b>
			<b>L</b>	<b>T</b>	<b>P</b>	<b>CIA</b>	<b>ESE</b>	<b>Course Total</b>		
<b>Theory</b>										
C	BCACS1501	Deployment of Private Cloud	3	1	0	40	60	100	4	IBM
C	BCACS1502	Digital Image Processing	3	1	0	40	60	100	4	School
C	BCA4502	Mobile Application Development	3	1	0	40	60	100	4	
OE	–	Open Elective	3	1	0	40	60	100	4	
GE	–	Generic Elective	3	1	0	40	60	100	4	
<b>Practical</b>										
C	BCACS1551	Digital Image Processing Using MATLAB	0	0	4	40	60	100	2	School
C	BCA4552	Mobile Application Development Lab	0	0	4	40	60	100	2	
	GP1501	General Proficiency	-	-	-	100	-	100	1	
<b>Total</b>			15	5	8	-		800	25	

<b>SEMESTER VI</b>										
<b>Course Category</b>	<b>Course Code</b>	<b>Course Title</b>	<b>Contact Hours</b>			<b>Evaluation Scheme</b>			<b>Credits</b>	<b>Mode</b>
			<b>L</b>	<b>T</b>	<b>P</b>	<b>CIA</b>	<b>ESE</b>	<b>Course Total</b>		
<b>Practical</b>										
C	BCACS1651	Project Training	-	-	-	280	420	700	24	School
	GP1601	General Proficiency	-	-	-	100	-	100	1	
<b>Total</b>								800	25	

**Legends:**

- L Number of Lecture Hours per week
- T Number of Tutorial Hours per week
- P Number of Practical Hours per week
- CIA Continuous Internal Assessment
- ESE End Semester Examination

## Credit Summary Chart

Course Category	Semester						Total Credits	%age
	I	II	III	IV	V	VI		
Basic Sciences								
Humanities								
Ability Enhancement Compulsory Course	4	4					8	5.3
Professional Subject - Core	20	22	24	24	16	-	106	69.7
Professional Subject – Generic Elective					4		4	2.6
Professional Subject – Open Elective					4		4	2.6
GP	1	1	1	1	1	1	6	4
Project Work, Seminar and/or Internship in Industry or elsewhere						24	24	15.8
Total	25	27	25	25	25	25	152	100



## Discipline wise Credit Summary Chart

Course Category	Semester						Total Credits	%age
	I	II	III	IV	V	VI		
F	10						10	6.6
C	10	22	24	24	16	24	120	79.0
GE					4		4	2.6
OE					4		4	2.6
AECC	4	4					8	5.3
GP	1	1	1	1	1	1	6	3.9
<b>Total</b>	<b>25</b>	<b>27</b>	<b>25</b>	<b>25</b>	<b>25</b>	<b>25</b>	<b>152</b>	<b>100</b>

### Category of Courses:

F Foundation Course

C Core Course

GE Generic Elective

OE Open Elective

AECC Ability Enhancement Compulsory Course

### **Generic Elective Subjects List**

1. BCACS1511: IT Governance, Risk & Information Security Management
2. BCACS1512: Cyber Law And Indian IT Act
3. BCACS1513: Biometric Security
4. BCACS1514: Distributed Database Management

**BCACS1105: Basic Mathematics****Course Objective:**

1. To introduce the fundamental concepts of Mathematics this will help and guide students to understand and make comprehensive rest of the course.
2. Understand the foundations of mathematics

**Learning Outcome:** Upon successful completion of the course the student will be able to:

1. Understand the concept of Sequence, Matrices and Determinant.
2. Understand the concept of Differentiation and Integration.
3. Develop and maintain problem-solving skills
4. Be able to perform basic computations in higher mathematics

**Course Contents:**

Module	Course Topics	Hours	Credits
I	<b>Finite and Infinite Sequences:</b> Definition, $n^{\text{th}}$ term, Sum of $n$ terms of sequence, Arithmetic Progression, Geometric Progression and Harmonic Progression. <b>Matrices and Determinant:</b> Definition, Types of matrices, multiplication of matrix by scalar, Sum of matrices, difference of matrices, Product of matrices, Transpose of matrix. Determinant: definition and basic properties.	4 Hours	0
II	<b>Differentiation and Integration:</b> Meaning and geometrical interpretation of derivative, derivatives of simple algebraic and trigonometric function, derivatives of sum/difference, product and quotient of function, <b>Integration:</b> Integration as the inverse of differentiation, Integration of algebraic and trigonometric function, Definite Integral.	4 Hours	0

**Suggested Readings:**

1. O.P. Malhotra, S. K. Gupta, "Mathematics", S. Chand, 2000 Edition
2. Shanti Narain, "Textbook of Matrices", S. Chand

## **SEMESTER I**

### **BCACS1101: Data Privacy Fundamentals**

Note: The Course **BCACS1101: Data Privacy Fundamentals** will be conducted by IBM

## BCACS1101: Data Privacy Fundamentals

### Course Objective:

1. Get an outline of data privacy laws.
2. Walk away with some guiding principles for how to stay out of trouble.
3. Knowing how to hack a colleague's password will raise some ethical questions
4. Will review theories of data privacy as well as data privacy in the context of social media and artificial intelligence.

### Learning Outcome: Upon successful completion of the course the student will be able to:

1. Identify foundational understanding of digital age privacy concepts and theories
2. Identify privacy implications of modern digital technology
3. Identify the rules and frameworks for data privacy in the age of technology
4. Learn the various data privacy acts and IT Acts

### Course Contents:

**Note: Number of Modules will depend on the credits. One module is of 1 credit**

Module	Course Topics	Hours	Credits
I	<b>Privacy in the Digital Age:</b> An overview of privacy laws in Canada <b>Case Study:</b> Student loans data breach (Canada) - A breach involving the personal information of about more than half a million clients of Human Resources and Skills Development Canada (HRSDC) and 250 departmental employees. Information and foundational concepts of digital age privacy. You will see some of the history of it and consider the quandary that comes with trying to define privacy. Questions about the realities of securing personal data information will also be considered.	15 Hours	1
II	<b>Risks in Data Privacy :</b> An overview of the Personal Information Protection and Electronic Documents Act (PIPEDA) <b>Case Study:</b> Target Corp. (USA) - A data breach involving information on 40 million payment cards (i.e., credit, debit, and ATM cards) and personally identifiable information (PII) on 70 million customers  Contemplate what threatens our privacy in this digital age and the steps we can we take to protect it. Also, we will take a deep look into the growing influence of smart devices and artificial intelligence and consider whether or not they help or hinder human beings.	15 Hours	1

<p style="text-align: center;"><b>III</b></p>	<p><b>Frameworks of Data Privacy Law :</b>  Dr. Ann Cavoukian's 7 Foundational Principles of 'Privacy by Design'  <b>Case Study:</b> Think W3 (UK) - A data breach involving 1.2 million credit and debit card details  Case Study: Doritex Corp. (USA) - A data breach exposed the social security numbers of over 500 job applicants  Privacy and the law and how it pertains to privacy in the media, in surveillance situations and in protecting personal data information. Finally, we will see how privacy regimes are functioning outside of the United States and make comparisons on approaches to privacy and how it is regulated.</p>	<p style="text-align: center;">15 Hours</p>	<p style="text-align: center;">1</p>
<p style="text-align: center;"><b>IV</b></p>	<p><b>Data breaches and passwords:</b>   <b>Case Study:</b> Home Depot (USA) - A data breach estimated to have put payment card information at risk for approximately 56 million unique payment cards  Class Participation Questionnaire</p>	<p style="text-align: center;">15 Hours</p>	<p style="text-align: center;">1</p>

**Suggested Readings:**

1. Data Privacy and GDPR Handbook
2. Privacy and Data Protection Essentials by Ruben Zeegers and Theo Wanders

## BCACS1102: Fundamentals of Information Technology

### Course Objective:

1. The subject focuses on the fundamental of Computer and its peripherals.
2. Subject introduces basics to computer system along with methodology of programming with concepts of C Programming.

**Learning Outcome:** Upon successful completion of the course the student will be able to:

1. Demonstrate the knowledge of the basic structure of computer, History of Computer, Hardware, Software, Input / Output devices.
2. Describe the concept of computer languages, language translators and construct algorithms to solve problems using programming concepts.
3. Learn various constructs of C Language along with proper syntax.
4. Understand the concept of decision control statements and array.

### Course Contents:

Module	Course Topics	Hours	Credits
I	<b>Introduction to Computers:</b> Introduction to computer, Basics of computers and its operation, History of computer, Capabilities and limitations of computers, Types of computers; <b>Hardware:</b> CPU(Architecture & Related Technology) and Microprocessors; <b>Storage Devices:</b> Primary & Secondary; Auxiliary Storage Devices; Cache Memory; Memory Hierarchy; Buffering and Spooling; <b>Software:</b> Types of software; <b>System Software:</b> Control, Development, Management; <b>Input devices:</b> Keyboard, Mouse, Joystick, Stylus, Tablet, Touchpad, Touch Screen, Data Gloves, Camera Scanner, Microphones, Barcode reader, OCR, OMR, MICR; <b>Output Devices:</b> Display; CRT Plasma, LCD, LED, Printers and Plotters, projectors, Speaker, VR Head; Booting and POST; <b>Operating System:</b> Functions, Types; <b>DOS:</b> Internal and External Commands; Basics of MS Office	15 Hours	1
II	<b>Introduction to Programming Concept:</b> Introduction; History of programming languages; <b>Programming Approach:</b> Top-down Approach, Bottom-up Approach; <b>Concept of Translator:</b> Compiler, Interpreter & Assembler; <b>Types of Languages:</b> Machine Language, Assembly Languages, High level Languages; Loader, Linker, Relationship between Compiler, Loader and Linker; Flowchart; <b>Algorithms:</b> Introduction, Definition, Characteristics, Limitations	15 Hours	1

<b>III</b>	<b>Introduction to C:</b> Introduction; Structure of C Program; Writing the first C Program; File used in C Program; Compiling and Executing C Programs Using Comment; <b>Data Type:</b> Primitive, Derived, User-Defined; <b>Token:</b> Keywords, Literals, Identifiers, Variables, Constants; I/O Statements ; <b>Operators:</b> Types of operators, Precedence and Associativity of operators; Programming Examples; Type Conversion and Type Casting	15 Hours	1
<b>IV</b>	<b>Decision Control and Looping Statements:</b> Introduction to Decision Control Statements: IF, IF-ELSE, Nested IF, IF-ELSE ladder, Switch-case; <b>Iterative Statements:</b> FOR loop, WHILE loop, DO-WHILE loop; <b>Jump Statement:</b> Break and Continue	15 Hours	1

**Suggested Readings:**

3. E. Balagurusamy, "Fundamentals of Computers", McGraw Hill Education.
4. Peter Norton's., "Introduction to Computers", McGraw Hill Education.
5. Raja Raman .V, "Fundamentals of Computers", PHI Publications, 3rd Edition, 2004.
6. Thareja R., "Fundamentals of Computers", Oxford University Press.
7. Yashavant P. Kanetkar, "Let us C", BPB
8. E.Balagurusamy, "Programming in ANSI C", TMH Publications.
9. Reema Thareja, "Programming in C", OXFORD University Press



## BCACS1103: Discrete Mathematics

### Course Objective:

1. Students should be able to distinguish between the notion of discrete and continuous mathematical structures.
2. Students should be able to understand the basic concepts of set theory.
3. Students should be able to apply fundamental counting algorithms to solve applied problems in the area of computer science.
4. Students should be able to prove mathematical statements by means of inductive reasoning.
5. Students should be able to understand the principle of recursion and apply it to the study of sequences and sets.

### Learning Outcomes: On completion of this course students will be able to:

1. Verify the correctness of an argument using propositional and predicate logic and truth tables.
2. Demonstrate the ability to solve problems using counting techniques and combinatorics.
3. Solve problems of recurrence relations and generating functions.
4. Use graphs and trees as tools to visualize and simplify network related problems.
5. Perform operations on discrete structures such as sets, functions, relations, and sequences.
6. Construct proofs using direct proof, proof by contraposition, proof by contradiction, and proof by cases and mathematical induction.

### Course Contents:

Module	Course Topics	Hours	Credits
I	<b>Discrete Numeric Function and Recurrence Relation:</b> Numeric Function; Generating Function; Recurrence Relation: Linear Recurrence Relation with Constant Coefficients, Homogeneous and Particular Solution, Total Solution, Solution by Method of Generating Function.	15 Hours	1
II	<b>Counting Techniques &amp; Probability:</b> Basics of Counting; Sum and Product rules; Pigeonholes Principle; <b>Combinations and Permutations:</b> Generalized Permutations and Combinations; <b>Probability:</b> Some Basic Concepts, Types of Events, Probability of an Event, Conditional Probability.	15 Hours	1
III	<b>Fundamentals of Logics:</b> Introduction, Proposition, First order Logic, Logical Operation, Truth Values, Compound Proposition, Tautologies, Contradiction, Logical Equivalences, De- Morgan's laws, Duality, Predicates, Universal and Existential Quantifiers.	15 Hours	1
IV	<b>Graph:</b> Simple Graph, Multi Graph, Graph Terminology, Bipartite, Regular and Planar Graph, Directed Graph, Euler Graphs, Hamiltonian Path and Circuits, Graph Coloring, Chromatic Number, Weighted Graphs, Shortest Path in Weighted Graphs. <b>Tree:</b> Trivial and Non-Trivial Tree, Rooted Tree, Distance and Centers in a Tree, Path Length in Rooted Tree, Spanning Tree, Minimal Spanning Tree, Kruskal's and Prim's Algorithms.	15 Hours	1

**Suggested Readings:**

1. J. P. Tremblay and R. Manohar, "Discrete Mathematical Structure with Application to Computer Science", TMH, New Delhi, 2000.
2. Kolman, Busby and Ross "Discrete Mathematical Structures" PHI/Pearson., 6<sup>th</sup> Ed., 2009.
3. Kenneth H. Rosen, "Discrete Mathematics & Applications", TMH, 6th Ed., 2007.
4. C. L. Liu, "Elements of Discrete Mathematics", McGraw Hill Book Company, 2nd Ed., 1985.
5. Narsingh Deo, "Graph Theory", PHI, 24th Indian Print, 2003.

## BCACS1104: Introduction to Web Designing

### Course Objective:

1. To focus on the process of Web Designing.
2. To build sound concepts of different languages and tools used in Web Designing.
3. To create a static and dynamic, interactive web pages quickly, confidently and successfully.
4. This course gives you the basic knowledge of Dreamweaver and its applications.

### Learning Outcome: Upon successful completion of the course the student will be able to:

1. Visualize and recognize the basic concept of HTML and application in web designing.
2. Gradually build a static and dynamic website using HTML, DHTML and CSS.
3. Understanding the basic concept of Java Script and its application
4. Use Adobe Dreamweaver to create personal and/or business websites following current professional and/or industry standards.

### Course Contents:

Module	Course Topics	Hours	Credits
I	<b>Basics of Web Designing:</b> Introduction to Web (www), Uniform Resource Locator (URL), Hypertext Transfer Protocol (HTTP), Introduction to Internet, Web Browsers, Web Clients, Web Servers , Introduction to HTML: HTML tags and its attributes; Text Formatting tags; Various types of Lists: Ordered, Unordered, Definition lists ;Table tags: Methods to Create Tables, Attributes of table tag, Col span and Row span; Frame tags and its Attributes; Form tag: Creation of Forms, Textbox, Radio Button, Hidden ,etc; Image, Anchor Tag ; Links to External Documents: Inter-page and Intra-page linking.	15 Hours	1
II	<b>DHTML and CSS Dynamic HTML:</b> Introduction to DHTML: Uses of DHTML, Features of DHTML, Components of Dynamic HTML, Advantages and disadvantage of DHTML; CSS (Cascading Style Sheet): Font Attributes, Color and Background Attributes Text Attributes, Border, Margin related Attributes, List Attributes; Types of Style Sheet-Inline, External and Embedded; CSSP (Cascading Style Sheet Positioning); Document Object Model; JSSS (JavaScript assisted Style Sheet); Browser objects; DHTML Events.	15 Hours	1
III	<b>Scripting languages(JavaScript):</b> Introduction to JavaScript: Basic Programming Techniques: Data Types, Creating Variables and JavaScript Array; Operators and Expressions in JavaScript: Arithmetic , Logical, Comparison , String and Conditional Operators; JavaScript Programming Constructs: Conditional checking, Loops; Functions in JavaScript: Built in Functions and User Defined Functions; Dialog Boxes: Alert , Confirm and Prompt Dialog Box; JavaScript Document Object Model (DOM):Object hierarchy in DOM, Event Handling; Form Object: Form Object's Methods and Properties, Text Element, Button Element; Other Built in Objects in JavaScript, String, Math and Date Object; Writing Client Side Validations from HTML Form Elements.	15 Hours	1

<b>IV</b>	<b>Introduction to Adobe Dreamweaver:</b> Dreamweaver Interface Basics, Defining a Dreamweaver site, Insert Toolbar, Common Tools, Layout Tools, Forms Tool, Spry Tools, Properties Panel, Site Structure, Page Formatting, Creating Links, Working With Images, Working with Tables, Using Snippets panel, Dreamweaver extensions, Template Design in DW, Editable and Non-Editable Regions. Defining the DWT for project, Creating sub pages for project.	15 Hours	1
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**Suggested Readings:**

1. Xavier, C, “Web Technology and Design”, New Age International Publications.
2. Bayross Ivan, ”HTML, DHTML. JavaScript, and PHP”, BPB Publications.
3. Achyut S Godbole and Atul Kahate, “Web Technologies”, Tata McGraw Hill.
4. Ramesh Bangia, “Internet and Web Design”, New Age International.
5. Jason Gerend and Stephen L. Nelson, “New Webmaster's Guide to Dreamweaver 4” Redmond Technology Pr.
6. R. Dharani”Web Design Using Adobe Dreamweaver: Web Designing and Web Development” Kindle Edition.

## **BSAE2101: Environmental Studies**

Note: The Syllabus **BSAE2101: Environmental Studies** will be approved by the Board of Studies of School of Humanities and Social Sciences

**BCACS1151: Fundamental of Information Technology Lab**

<b>Module</b>	<b>Course Topics</b>	<b>Credits</b>
<b>I</b>	<ol style="list-style-type: none"><li>1. Implementation of internal and external commands of DOS.</li><li>2. Introduction to MSWord, Menus, Shortcuts, Document types</li><li>3. Working with documents and formatting documents.</li><li>4. Creating Tables, inserting files and pictures, working with various tools.</li><li>5. Opening new Presentation, Different presentation templates, setting backgrounds, selecting presentation layouts.</li><li>6. Creating and Formatting of presentation.</li><li>7. Adding Graphics and effects to presentation.</li><li>8. Implementation and working of spreadsheet.</li><li>9. Entering and Editing and Computing data in spreadsheet.</li><li>10. Working with database using MS Access.</li></ol>	1
<b>II</b>	<ol style="list-style-type: none"><li>1. Implementation of Fundamental Data Types.</li><li>2. Implementation of Fundamental Operators.</li><li>3. Implementation of Conditional Program such as if, switch etc.</li><li>4. Implementation of Basic Control Constructs such as for loop, while loop, do while loop.</li><li>5. Implementation of Various Pattern Printing Program.</li><li>6. Implementation of program to print various series.</li></ol>	1

**BCACS1152: Web Designing Lab**

<b>Module</b>	<b>Course Topics</b>	<b>Credits</b>
<b>I</b>	<ol style="list-style-type: none"><li>1. Implementation of List Tags in HTML.</li><li>2. Implementation of Table Tag in HTML.</li><li>3. Implementation of Frame Tag in HTML.</li><li>4. Implementation of Form Tags in HTML.</li><li>5. Implementation of CSS (Inline, External and Embedded) in DHTML.</li><li>6. Implementation of Class Concept in DHTML.</li><li>7. Implementation of DHTML Events.</li></ol>	1
<b>II</b>	<ol style="list-style-type: none"><li>1. Implementation of basic variables in Java Script.</li><li>2. Implementation of User Defined Functions in Java Script.</li><li>3. Implementation of inbuilt functions in Java Script.</li><li>4. Implementation of Form validation in Java Script.</li><li>5. Implementation of Changing Text Formatting Attributes using Styles in Dreamweaver.</li><li>6. Implementation of modifying an existing CSS layout using Dreamweaver.</li><li>7. Implementation of modifying the page width and background color in Dreamweaver.</li><li>8. Implementation of Managing Files and Folders with the Files Panel in Dreamweaver.</li><li>9. Creating a Website using Dreamweaver.</li></ol>	1

## **SEMESTER II**

**BCACS1201: Cyber Security**

**BCACS1202: Security and Data Privacy Laws and Standards**

Note: The Course **BCACS1201: Cyber Security** and **BCACS1202: Security and Data Privacy Laws and Standards** will be conducted by IBM



## BCACS1201: CYBER SECURITY

### Course Objective:

1. This course comprises a unique mix of cybersecurity technical and real-world industry skills, brought to provide awareness on the impact of cybersecurity threats in key industries and geographies.
2. Analyze top targeted industries and trends
3. Explore how cyber criminals are using operating system tools to get control.

**Learning Outcome:** Upon successful completion of the course the student will be able to:

5. Analyse top targeted industries and trends.
6. Explore how cyber criminals are using operating system tools to get control.
7. Uncover why cyber criminals are changing their techniques to gain illegal profits.
8. Determine what steps you can take to protect your organization against these threats.
9. Understand tools used by penetration testers and ethical hackers (network CLI tools, Telnet, SSH, Nmap, Wireshark, and many others).
10. Leverage high-end security enterprise solutions in high demand such as: IBM QRadar SIEM, Vulnerability Manager
11. Participate in Security Operation Center (SOC) role-playing scenarios

### Course Contents:

**Note: Number of Modules will depend on the credits. One module is of 1 credit**

Module	Course Topics	Hours	Credits
I	<b>Understand the current impact of cyber security threats:</b> Research global cyber security trends in different geographies, Familiarize with the taxonomy of cyber-attacks, Explore the enterprise cyber security domains <b>Explore the most frequently targeted industry sectors including:</b> Government, Energy and Utilities, Retail and Telecom Explore the cyber resilience framework understand the cyber resilience lifecycle	15 Hours	1
II	<b>Understand the need for a cyber-threat hunting approach:</b> Explore cyber-attack adversary frameworks, Investigate enterprise threat protection methods, Explore industry case studies <b>Understand network attack trends in the financial sector using crypto miners:</b> Understand how cyber criminals use networks in the dark web to perform illicit crime activities, Learn network protection practices like DNS, VPN, Understand enterprise network security practices through the analysis of an advanced persistent threat	15 Hours	1

<p style="text-align: center;"><b>III</b></p>	<p><b>Explore the mobile and IoT global phenomena:</b> Understand mobile and IoT attack surface, Explore recent most threatening IoT cyber-attack scenarios, Learn to protect your home and organization with endpoint protection practices</p> <p><b>Understand the wide adoption of industry applications:</b> Learn web application fundamentals, Investigate application security practices, Examine the anatomy of the most dangerous applications threats</p> <p><b>Understand the impact of data breaches and ransomware in Government and Health sectors:</b> Research the anatomy and impact of Insider Threat and Phishing cyber-attacks, of Research the anatomy and impact Ransomware and Cyber Fraud cyber-attacks, Explore a Healthcare end-to-end industry case study</p>	<p style="text-align: center;">15 Hours</p>	<p style="text-align: center;">1</p>
<p style="text-align: center;"><b>IV</b></p>	<p><b>Understand the reason of the global enterprise adoption of cloud computing:</b> Understand the cloud security challenges brought by an integrated data, network, access infrastructure, Review the key cloud security practices for the enterprise, Explore a Telco cloud data breach scenario</p> <p><b>Understand the drivers behind the enterprise adoption of Security Intelligence methods and tools:</b> Explore the characteristics of Security Information and Event Management (SIEM) platforms, Explore SIEM in Action through a real-life Phishing attempt scenario</p> <p><b>Understand the Incident Response and Threat hunting practice:</b> Explore the benefits of establishing a SOC (security Operation Center), understand the roles and responsibilities of SOC Operations team</p>	<p style="text-align: center;">15 Hours</p>	<p style="text-align: center;">1</p>

**Suggested Readings:**

3. Cyber Security Practitioner by IBM Corporation
4. IBM QRadar SIEM Foundations by IBM Corporation

## BCACS1202: Security and Data Privacy Laws and Standards

### Course Objective:

1. This course will examine legal, policy, and enterprise issues and problems related to security and privacy Learn about the Cyber Fraud and its Protection
2. Knowledge of laws and regulations concerning information security from both data protection and law enforcement perspectives.
3. Knowledge and implementation of Cyber Laws
4. Electronic data will be the focus but other forms of information also will be considered

### Learning Outcome: Upon successful completion of the course the student will be able to:

1. An understanding of concepts and expectations concerning privacy and the increasingly interconnected issue of security
2. Learn about the Cyber Fraud and its Protection
3. Knowledge about internal and external audits.
4. Learn the various data privacy acts and IT Acts

### Course Contents:

**Note: Number of Modules will depend on the credits. One module is of 1 credit**

Module	Course Topics	Hours	Credits
I	<b>CYBER LAW-CYBERCRIME:</b> Introduction to cyber crime and cyber law. Type of Cyber Crime. Law Enforcement and cyber crime, What is a Trusted system? Security Policies Methods of security, trusted operating system design, Assurance in Trusted Operated system, Knowing the basics of IP Addresses, Introduction to database, Security Requirements, Reliability and Integrity, Sensitive data, Inference, Multilevel databases, SQL Injections Vulnerability, Introduction, international cyber crime law and its case studies. Digital Piracy, Identity Theft, Cyber Bullying, Cyber Stalking, Cyber Harassment, Cyber Terrorism, Cyber Wars and Sex Crimes over Internet – Prostitution, Child Pornography	15 Hours	1
II	<b>SECURITY IMPLEMENTATION AND FRAUD SECURITY MODELS</b> Security planning, Risk analysis, Organization and security Policies, Physical Security. Securing the Operating System with Admin Privileges. Protecting Programs and data, Information and law, Rights of Employer Security, Case studies of Ethics, Digital Analysis, Digital Evidences and Forensic Tools, The Challenges of Password Management, Single Password v/s Multiple Passwords, Considerations for Using, Different Passwords For Different Applications, Good Password Management Policies and User System Security Features, Definition of Computer Fraud or Cyber Fraud – Characteristics Cyber Fraud Offense, fraud related Offenses. Law Enforcement Options, Methodologies for	15 Hours	1

	Hiding Evidence, Different methods for tracking down cyber crimes. Introduction to Security models, Multifactor authentication versus multi step authentication, Multifactor authentication methods; Time-based one time password, Frameworks, Standards, Security Certification ISO 17799/ ISO 27001, System Security Engineering Capacity Maturity Model, Laws and Legal Framework for Information Security, Recovery and risk analysis		
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**Suggested Readings:**

1. Timothy Morey Andrew Burt, Thomas C. Redman, Christine Moorman “Customer Data and Privacy: The Insights You Need from Harvard Business”
2. Naavi “Personal Data Protection Act of India (PDPA 2020)”

## **HSAE2201: Communicative English**

Note: The Syllabus of **HSAE2201: Communicative English** will be approved by the Board of Studies of School of Applied Sciences

## BCACS1203: Computer Networks and Security

### Course Objective:

1. Build an understanding of the fundamental concepts of computer networking.
2. Familiarize with the basic taxonomy and terminology of the computer networking area.
3. Describe how computer networks are organized with the concept of layered approach.
4. Introduce to advanced networking concepts, preparing for advanced courses in computer networking and security.

### Learning Outcome:

1. Understand and describe the layered protocol model.
2. Describe, analyze and evaluate a number of data link, network, and transport layer protocols.
3. Understand and building the skills of sub netting and routing mechanisms.
4. Understand the security features involved in data transfer

### Course Contents:

Module	Course Topics	Hours	Credits
I	<b>Introduction to Computer Network and Network Security:</b> Goals and Application of Network, Network Types, Protocols and Standards, Switched and Broadcast Network; Topology; Switching; Multiplexing; Transmission Medium; References Models: OSI Model, TCP/IP Protocol Suite; Example of Networks; Network Security Goals; Attack Threating; Cryptography; Stenography; Obfuscation; Security Services and Mechanism	15 Hours	1
II	<b>Data Link Layer:</b> Functions of Data Link Layer: Error Detection and Correction; Framing, Flow and Error control, Stop-and-wait Protocol, Go-Back-N Automatics Repeat Request, HDLC; Random Access: ALOHA, CSMA/CD, CSMA/CA; Sliding Window protocols; Error Handling; Channelization; IEEE Standards; Ethernet; Intermediary Network Devices	15 Hours	1
III	<b>Network Layer:</b> Functions of Network Layer; IPv4 Addresses, IPv6 Addresses; Mapping Logical to Physical Address; Mapping Physical to Logical Address; Routing Protocols; Tunnelling; Fragmentation; OSPF; Network Performance; Congestion Control Mechanism	15 Hours	1
IV	<b>Transport Layer, User Defined Layer and IP Security:</b> Function of Transport Layer; TCP; UDP; QoS; Security at Transport Layer; Function of Presentation and Session Layer; Application Layer: DNS, DDNS, TELNET, E-Mail, SMTP, FTP, WWW and HTTP; Architecture and Security of E-mail; SSL Architecture; Four Protocols; Firewall; IPSec: AH, ESP, IKE	15 Hours	1

**Suggested Readings:**

1. Andrew S Tanenbaum, David. J. Wetherall, "Computer Networks", Pearson Education, 5<sup>th</sup> Edition,
2. Behrouz A. Forouzan, "Data Communications and Networking", Tata McGraw-Hill, Fourth Edition
3. William Stallings, Network Security Essentials: Applications and Standards, Prentice Hall, 4th edition, 2010
4. Dayanand Ambawade, Dr. Deven shah, Prof. Mahendra Mehra, "Advance Computer Network", Wiley India.
5. Michael T. Goodrich and Roberto Tamassia, Introduction to Computer Security, Addison Wesley, 2011.

## BCACS1204: Relational Database Management System using SQL

### Course Objective:

1. To present the fundamental concepts of Database Management. To understand conceptual and physical design of a database.
2. To understand RDBMS and to design Relational database and perform various SQL commands.
3. To develop skill of Database Design, Database Languages and Database-System Implementation with respect to Relational Database Management System.
4. To develop the concepts of Transaction Processing System, Concurrency control and Recovery procedures in database.

**Learning Outcome:** Students who have successfully completed this course will have understanding of the following concepts:

1. Students will be able to understand the basic concepts of the database and data models.
2. Design a database using ER diagrams and map ER diagrams into Relations.
3. Develop a simple database applications using normalization.
4. Understand Concurrency, Recovery and Security mechanism in DBMS.

### Course Contents:

Module	Course Topics	Hours	Credits
I	<b>Introduction:</b> Meaning of data and information, need for data, data processing and information. Meaning of persistent data, Meaning of file and file management system. File Structure and Organization, Introduction, Logical and Physical Files, Basic File Operations, File Organization, Types of file organization. <b>Database Management System:</b> Introduction, Definition of DBMS, Evolution of DB & DBMS, Characteristics of the Database Approach, Components of Database System, database management system vs. file management system, Advantages and Disadvantages of DBMS, Users of DBMS, DBMS Architecture, Capabilities of good DBMS, Database Schemas and Instances, Classification of Database Management Systems, database languages; <b>Data Models:</b> Introduction Data Models: Object Based Logical Model; Record Based Logical Model: Relational Model, Network Model, Hierarchical Model; Entity Relationship Model.	15 Hours	1
II	<b>Relational Database Management System &amp; Data Modeling:</b> Introduction to relational database, Structure of Relational Database, Data Modeling Using the Entity-Relationship Model: Entity Types, Entity Sets, Attributes, and Keys, Relationships, Relationship Types, Rules, and Structural, Constraints, Weak Entity Types, ER Diagrams, Naming Conventions, and Design Issues. Relational Data Model, Relational Constraints, Relational model terminology; domains, Attributes, Tuples, Relations, <b>Relational Algebra:</b> Basic operations selection and projection, Set Theoretic operations Union, Intersection, set difference and division, Codd's Rules for relational algebra, Relational Database Schemas, Examples of Queries in Relational Algebra	15 Hours	1



III	<p><b>SQL and Database Design Theory:</b> The Relational Database Standard: Data Definition, Constraints, and Schema Changes in SQL, Types of SQL Commands(DDL, DML, DCL), SQL Operators and their Precedence, Insert, Delete, and Update Operations and Dealing with Constraint Violations, Queries and Sub Queries, Aggregate Functions, Joins, Unions, Intersection, Minus, Views (Virtual Tables) in SQL.</p> <p><b>Functional Dependencies and Normalization:</b> Informal Design Guidelines for Relation Schemas, Functional Dependencies, Anomalies in a Database, Armstrong Rules, Closure of Attributes, Normal Forms Based on Primary Keys, General Definitions of Second and Third Normal Forms, Boyce-Codd Normal Forms.</p>	15 Hours	1
IV	<p><b>Transaction Processing &amp; Concurrency Control:</b> Transaction Processing Concepts; Introduction to Transaction Processing, Consistency and Isolation, Atomicity and Durability, Transaction and System Concepts, Desirable Properties of Transactions. Transaction logs, Importance of backups. Database recovery. Data storage. Causes, of failures. Recovery concepts and terminology.</p> <p><b>Concurrency Control:</b> Definition of concurrency, lost update, dirty read and incorrect summary problems due to concurrency.</p>	15 Hours	1

### Suggested Readings:

1. Korth, Silbertz, Sudarshan —Data Base Concepts, McGraw-Hill.
2. Elmasri, Navathe —Fundamentals Of Data Base Systems, Addison Wesley.
3. Date C. J.—An Introduction to Data Base System, Addison Wesley.
4. Bipin C. Desai —An introduction to Data Base Systems, Galgotia Publication.
5. Ramakrishnan, Gehrke —Data Base Management System, McGraw-Hill.
6. Connolly & Begg —Database Systems: A Practical Approach to Design, Implementation and Management, Pearson Education.
7. R. S. Despandey --SQL/PL SQL forOracle.
8. Ivan Bayross -- SQL, PL/SQL: The Programming Language of Oracle, BPP Publication.

## BCACS1205: Digital Security and Forensic Fundamental

### Course Objective:

1. To study the concepts of privacy in today's environment.
2. To teach the latest applications and tools used in the IT security field.
3. To study about various Techniques in Digital Forensics and various investigation strategies.

### Learning Outcomes: On completion of this course students will be able to:

1. Obtain the knowledge of the role of private regulatory and self-help efforts.
2. Help to understand the emerging issues that affecting society and business.
3. To up skill the student's knowledge about cyber security practices and make them familiar with the current security threats and there remedies to prevent the data loss.
4. Familiarity in Open source Digital Forensics Platform and tools.

### Course Contents:

Module	Course Topics	Hours	Credits
I	<b>Introduction Digital Security:</b> Introduction and Security Trends General Security Concepts, Operational Security and People's Role in Information Security, Internet Standards and Physical Security, Symmetric Key Cryptography, Public Key Cryptography, Message Security, Digital Signature, User Authentication, Key Management, Kerberos.	15 Hours	1
II	<b>Internet and Web Application Security:</b> IP level security, IPSEC, Transport Layer Security, Application Layer Security: PGP, Firewalls, VPN, Email security: PGP and SMIME, Web Security: Web authentication, Injection Flaws, SQL Injection, Web Browser Security, E-Commerce Security.	15 Hours	1
III	<b>Fundamental of Forensics:</b> Understanding computer forensics, computer forensics versus other related disciplines, A brief History of computer Forensics, Definition and Cardinal Rules, Data Acquisition and Authentication Process, Windows Systems-FAT12, FAT16, FAT32 and NTFS, UNIX file Systems, mac file systems, computer artifacts, Internet Artifacts, OS Artifacts and their forensic applications.	15 Hours	1
IV	<b>Digital Forensics Tools:</b> Introduction to Digital Forensics, Forensic software and handling, forensic hardware and handling, Biometrics: face, iris and fingerprint recognition, Audio-video evidence collection, Preservation and Forensic Analysis, Open Source Examination Platform - Using Linux and Windows as the Host, Disk and File System Analysis, Media Analysis Concepts, Sleuth Kit, Partitioning and Disk Layouts, Special Containers, Hashing, Forensic Imaging.	15 Hours	1

### Suggested Readings:

1. C. Altheide & H. Carvey Digital Forensics with Open Source Tools, Syngress, 2011. ISBN: 9781597495868.
2. William Stallings, Cryptography and Network Security, Prentice Hall, New Delhi, 2006
3. Charles P. Fleeger, "Security in Computing", Prentice Hall, New Delhi, 2009

4. Cory Altheide, Harlan Carvey, Digital Forensics with Open Source Tools, Syngress imprint of Elsevier.
5. Bill Nelson, Amelia Phillips, Christopher Steuart, “Guide to Computer Forensics and Investigations”, Fourth Edition, Course Technology.

## BCACS1206: Human values and Professional Ethics

### Course Objectives:

1. The subject distinguishes between values and skills, and understands the need, basic guidelines, content and process of value education.
2. The subject focuses on understanding the harmony at all the levels of human living, and lives accordingly.
3. To highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually fulfilling human behavior and mutually Enriching interaction with Nature

### Learning Outcome: Upon successful completion of the course the student will be able to:

1. Understand the significance of value inputs in a classroom, distinguish between values and skills, understand the need, basic guidelines, content and process of value education, explore the meaning of happiness and prosperity and do a correct appraisal of the current scenario in the society
2. Distinguish between the Self and the Body, understand the meaning of Harmony in the Self the Co-existence of Self and Body.
3. Understand the value of harmonious relationship based on trust, respect and other naturally acceptable feelings in human-human relationships and explore their role in ensuring a harmonious society
4. Distinguish between ethical and unethical practices, and start working out the strategy to actualize a harmonious environment wherever they work

### Course Contents:

Module	Course Topics	Hours	Credits
I	<b>Introduction:</b> need, basic guidelines, content and process for Value Education; Self-Exploration–what is it? - its content and process; ‘Natural Acceptance’ and Experiential Validation- as the mechanism for self-exploration; Continuous Happiness and Prosperity- A look at basic Human Aspirations; Right understanding; Relationship and Physical Facilities- the basic requirements for fulfillment of aspirations of every human being with their correct priority; Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario; Method to fulfill the above human aspirations: understanding and living in harmony at various levels	15 Hours	0
II	<b>Understanding Harmony in the Human Being and family:</b> Understanding human being as a co-existence of the sentient ‘I’ and the material ‘Body’, Understanding the needs of Self (‘I’) and ‘Body’ , Understanding the Body as an instrument of ‘I’, Understanding the characteristics and activities of ‘I’ and harmony in ‘I’, Understanding the	15 Hours	0

	harmony of I with the Body; correct appraisal of Physical needs, meaning of Prosperity in detail, Programs to ensure Sanyam and Swasthya; Understanding harmony in the Family: the basic unit of human interaction , Understanding values in human-human relationship; meaning of Nyaya and program for its fulfillment to ensure Ubhay-tripti; Trust (Vishwas) and Respect (Samman) as the foundational values of relationship; Difference between intention and competence, Understanding the meaning of Samman, Difference between respect and differentiation; the other salient values in relationship, Understanding the harmony in the society (society being an extension of family), Sah-astitva as comprehensive Human Goals, Visualizing a universal harmonious order in society; Undivided Society (Akhand Samaj); Universal Order - from family to world family		
III	<b>Understanding Harmony in the Nature and Existence:</b> Whole existence as Co-existence Understanding the harmony in the Nature, Interconnectedness and mutual fulfillment among the four orders of nature- recyclability and self-regulation in nature, Understanding Existence as Co-existence (Sah-astitva) of mutually interacting units in all-pervasive space, Holistic perception of harmony at all levels of existence.	15 Hours	0
IV	<b>Implications of the above Holistic Understanding of Harmony on Professional Ethics:</b> Natural acceptance of human values, Definitiveness of Ethical Human Conduct, Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order, Competence in Professional Ethics: a) Ability to utilize the professional competence for augmenting universal human order, b) Ability to identify the scope and characteristics of people-friendly and eco-friendly production systems, technologies and management models, Case studies of typical holistic technologies, management models and production systems, Strategy for transition from the present state to Universal Human Order: a) At the level of individual: as socially and ecologically responsible engineers, technologists and managers, b) At the level of society: as mutually enriching institutions and organizations.	15 Hours	0

#### Suggested Readings:

1. R R Gaur, R Sangal, G P Bagaria, 2009, A Foundation Course in Human Values and Professional Ethics
2. Ivan Illich, 1974, Energy & Equity, The Trinity Press, Worcester, and Harper Collins, USA
3. E.F. Schumacher, 1973, Small is Beautiful: a study of economics as if people mattered, Blond & Briggs, Britain.
4. Sussan George, 1976, How the Other Half Dies, Penguin Press. Reprinted 1986, 1991

**BCACS1251: Computer Networks and Security Lab**

<b>Module</b>	<b>Course Topics</b>	<b>Credits</b>
<b>I</b>	<ol style="list-style-type: none"><li>1. Perform Window based commands in order to investigate and configure the network.</li><li>2. Implement TCP and UDP sockets.</li><li>3. Study of TCP/UDP performance.</li><li>4. Simulation of ARP and RARP.</li><li>5. Perform Encryption and Decryption Using Substitution and Transposition Techniques.</li></ol>	1
<b>II</b>	<ol style="list-style-type: none"><li>1. Simulation of Sliding Window Protocol.</li><li>2. Study of Network IP.</li><li>3. Simulation of DNS using UDP sockets.</li><li>4. Performance evaluation of Routing Protocols.</li></ol>	1

**BCACS1252: Relational Database Management System using SQL Lab**

<b>Module</b>	<b>Course Topics</b>	<b>Credits</b>
<b>I</b>	<ol style="list-style-type: none"><li>1. Use of DDL for creating objects (Table, Database).</li><li>2. Use of DML for performing retrieval operations.</li><li>3. Use of DCL for specifying constraints on tables.</li><li>4. Use of commands for as Changes in SQL.</li><li>5. Use of Aggregate Functions.</li><li>6. Use of Different Operators in SQL.</li><li>7. Use of String Functions.</li></ol>	1
<b>II</b>	<ol style="list-style-type: none"><li>1. Grouping of Records.</li><li>2. Ordering of Records.</li><li>3. Creating and Performing various operations on Views.</li><li>4. Performing Subqueries.</li><li>5. Performing queries for Union &amp; intersection, difference, Cartesian product and division.</li><li>6. Performing queries for various Joins.</li></ol>	1

## BCACS1301: Identity Access Management

**Note: Syllabus Provided by IBM**

### Course Objective:

1. Defining and managing the roles and access privileges of individual network users the circumstances in which users are granted (or denied) those privileges
2. Digital identity has been established, it must be maintained, modified and monitored throughout each user access lifecycle.

**Learning Outcome:** Upon successful completion of the course the student will be able to:

1. Learn about the emerging threats and counter measures
2. Will able to change a user's role, track user activities
3. Will able to handle Challenges of Password Management.
4. Learn about the Kerberos, single sign on and certificate authorities
5. Will be able to implement the concept of OTP, TOTP and HOTP
6. Knowledge about internal and external audits.
7. Understand the concept of IDaaS

### Course Contents:

**Note: Number of Modules will depend on the credits. One module is of 1 credit**

Module	Course Topics	Hours	Credits
I	<b>INTRODUCTION TO IAM:</b> Identity Management (IdM), Access Management (AM), Five Elements of Security, Key concepts of Identity and Access Management, Uniting Identity and Access Management <b>IAM FOR AN ENTERPRISE:</b> Business Challenge, IAM Strategy Framework, Identity Management Drivers, Cost of IAM Over Time, Business Drivers of IAM <b>INTRODUCTION TO LDAP:</b> Directories, LDAP: Protocol or Directory, LDAP History and Standards, Directory Components <b>LDAP CONCEPTS &amp; ARCHITECTURE:</b> Overview of LDAP Architecture, The Informational Model, THE NAMING MODEL, Functional Model, Security model, Directory security	15 Hours	1
II	<b>SINGLE SIGN-ON TECHNIQUES:</b> Introduction, Types of Single Sign-On, Single sign-on Protocols <b>ACCESS CONTROL:</b> Discretionary Access Control (DAC), Mandatory Access Control (MAC), Role Based Access Control (RBAC), Attribute-based access control (ABAC), Static Separation of Duty (SSoD), Dynamic Separation of Duty(DSoD), Fine grained and coarse-grained access control	15 Hours	1



	<b>PASSWORD MANAGEMENT:</b> The Challenges of Password Management, Single Password v/s Multiple Passwords, Considerations for Using Different Passwords For Different Applications, Good Password Management Policies and User, System Security Features		
<b>III</b>	<p><b>INTRODUCTION TO FEDERATION:</b> Kerberos and SPNEGO, Federated Identity Management Architecture, Security Assertion Markup Language, OAuth 2.0 concepts, OpenID Connect federations</p> <p><b>ORIGIN OF MULTI FACTOR AUTHENTICATION:</b> Multi-factor authentication versus multi-step authentication, Multi-factor authentication methods, Time-based one-time password, HOTP vs TOTP: What's the Difference?</p> <p><b>AUDITING &amp; REPORTING:</b> Auditing, The Role of Internal Auditors, Reporting Audit Results, Protecting Audit Results, Using External Auditors</p>	15 Hours	1
<b>IV</b>	<p><b>INTRODUCTION TO IDENTITY MANAGER:</b> Identity Manager, Centralized User Management, Simplify User Management, Lifecycle Management, Access Control Models of Identity Manager, Corporate Regulatory Compliance Using Identity Management, The Approach: Integrated IAM Governance with Intelligence and Accountability</p> <p><b>PRIVILEGED IDENTITY MANAGER:</b> Privileged IDs and why they are a problem, Privileged Identity Manager, Introducing IDaaS</p>	15 Hours	1

**Suggested Readings:**

1. ENTERPRISE IDENTITY & ACCESS MANAGEMENT by IBM Corporation
2. An Executive Guide to Identity and Access Management by Alasdair Gilchrist

## BCA4301: Basics of Design & Analysis of Algorithms

### Course Objective:

1. To know the importance of studying the complexity of a given algorithm.
2. To study various algorithmic design techniques.
3. To utilize data structures and/or algorithmic design techniques in solving new problems.
4. To know and understand basic computability concepts and the complexity classes P, NP, and NP-Complete.
5. To study some techniques for solving hard problems.

**Learning Outcome:** Upon successful completion of the course the student will be able to:

1. Prove the correctness and analyze the running time of the basic algorithms for those classic problems in various domains.
2. Apply the algorithms and design techniques to solve problems.
3. Analyze the complexities of various problems in different domains.

### Course Contents:

Module	Course Topics	Hours	Credits
I	<b>Basic Concepts of Algorithms:</b> Definition of algorithm; Characteristic of algorithm; Pseudo Codes & Time Complexity of Basic Control Structures; Time and Space Complexity of Insertion Sort; Selection Sort; Heap Sort; Bubble Sort; Asymptotic Notations (Growth of Functions).	15 Hours	1
II	<b>Divide and conquer:</b> Binary Search, Maximum & Minimum, Merge Sort, Quick Sort, Strassen's matrix multiplication; <b>Greedy Method:</b> General method, Knapsack Problem, Travelling Salesman problem, Job Sequencing with deadline, Optimal Storage on tapes, Huffman Codes, An Activity Selection Problem.	15 Hours	1
III	<b>Dynamic Programming:</b> Assembly Line Scheduling, Matrix Chain Multiplications, Longest Common Subsequence; <b>Backtracking:</b> General method, N Queens Problem, Sum of subsets, Hamiltonian Circuit Problem.	15 Hours	1
IV	<b>Branch &amp; Bound:</b> Introduction, Live Node, Dead Node and Bounding Functions, Travelling Salesman Problem, Knapsack Problem, Assignment Problem; <b>Analysis of Graph Algorithms:</b> Elementary Graph Algorithms, Multistage Graphs, <b>Minimum Spanning Trees:</b> Kruskal's & Prim's Algorithm, Single Source Shortest Path: Dijkstra's & Bellman Ford, All Pairs Shortest Path: Warshal Algorithm, Maximum Flow: Ford Fulkerson Algorithm	15 Hours	1

**Suggested Readings:**

1. Thomas H. Cormen, "Introduction to Algorithms", PHI.
2. Horowitz & Sahani, "Fundamental of Algorithms", Galgotia.
3. Aho, "Design & Analysis of Computer Algorithms", Pearson.
4. Johnsonbaugh, "Algorithms", Pearson.
5. Bressard "Fundamental of Algorithm", PHI.
6. Jon Kleinberg and Eva Tardos "Algorithm Design", Pearson Education, 2006.

## BCACS1302: Basics of Operating System

### Course Objective:

1. Able to Understand Operating systems and Different types of Operating systems.
2. Develop an understanding of Processes, and CPU scheduling and able to solve process synchronization problems.
3. Understand issues resource allocation and manage deadlock handling and memory management.
4. Explain paging and segmentation methods suitable for virtual memory.
5. Able to manage disk spaces management of file systems.

### Learning Outcomes: Upon successful completion of the course the student will:

1. Understand the main principles and techniques used to implement processes and threads as well as the different algorithms for process scheduling.
2. Understand the main mechanisms used for inter-process communication.
3. Be able to give the rationale for virtual memory abstractions in operating systems.
4. Have the ability to evaluate security risks in operating systems and understand the role operating systems can and should play in establishing security.

### Course Contents:

Module	Course Topics	Hours	Credits
I	<b>Introduction and Process Management:</b> Operating System: System Components, System Calls and its types, System Programs; Types of Operating System; Operating System Structure: Simple Structure, Layered Approach, Microkernels, Exokernels; Virtual machine; Introduction to Process: Process States, Process Control Block; Process Scheduling: Scheduling Queues, Schedulers, Context Switch, Scheduling Objectives, Scheduling Criteria; Scheduling Algorithms: First Come First Serve, Shortest Job First, Round Robin, Priority; Multiple- Processor Scheduling; Real-Time Scheduling; Multilevel Feedback Queue Scheduling; Threads.	15 Hours	1
II	<b>Process Synchronization and Deadlocks:</b> Critical Section Problem; Peterson's Solution; Semaphore: Usage of Semaphore; Classical Problems of Synchronization: Producer-Consumer, Readers-Writer, Dining Philosophers; Deadlock System Model; Deadlock Characterization: Necessary Condition, Resource Allocation graph; Deadlock Handling Methods: Deadlock Prevention, Deadlock Avoidance Mechanisms: Resource Allocation graph Algorithm, Banker's Algorithm, Deadlock Detection and Recovery.	15 Hours	1
III	<b>Memory Management:</b> Memory Management Strategies: Address Binding, Logical and Physical Address Space, Dynamic Linking; Swapping; Contiguous and Non-Contiguous Memory Allocation; Paging; Segmentation; Virtual Memory Management Concept; Demand Paging;	15 Hours	1

	Page Replacement Policies: Basic Page Replacement, FIFO Page Replacement, LRU Page Replacement, Optimal Page Replacement, Counting Based Page Replacement; Allocation of Frames: Minimum Number of Frames, Allocation Algorithm, Global Versus Local Allocation; Thrashing: Cause of Thrashing, Working Set Model.		
IV	<b>Storage Management:</b> File Concept: File Attribute, File Operations, File Types, File Structure; File Access Method: Sequential Method, Direct Access Method; Directory Structure; File System Implementation: File System Structure, Allocation Methods, Free space Management; <b>Secondary Storage Structure:</b> Disk Structure, Disk Scheduling Algorithms, Disk Management.	15 Hours	1

**Suggested Readings:**

1. Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, "Operating System Concepts", Wiley India, 2009, 8th edition.
2. Andrew S. Tanenbaum, "Modern Operating Systems", PHI, 3rd Edition
3. Elmasri, Carrick, Levine," Operating Systems: A Spiral Approach ", TMH

## BCACS1303: Introduction to System Security

### Course Objective:

1. To understand the basics of System Security
2. To understand Security Policies and Algorithms

**Learning Outcome:** Students who have successfully completed this course will have an understanding of the following concepts:

1. To learn about how to maintain the System's Security i.e., Confidentiality, Integrity and Availability.
2. The student will be able to understand the basics of system security, policies, cryptographic algorithms, and its issues along with its countermeasures.

### Course Contents:

Module	Course Topics	Hours	Credits
I	<b>System Security:</b> Introduction to System Security, Aspects of System Security, Need for Security, Goals of System Security, Features of a Good Security Policy, Security Attacks, Security Services and Mechanisms.	15 Hours	1
II	<b>Concepts of Security:</b> Principles of Security Steganography, Cryptographic Techniques: Plain Text and Cipher Text, Substitution Techniques, Block Cipher Principles, Block Cipher Modes of Operation, Transposition Techniques, Encryption and Decryption, Conventional Encryption Model, Data Encryption Standard (DES) Algorithm, Strength of DES	15 Hours	1
III	<b>Security Policies:</b> Introduction to Security Policy, Types of Security Policies, Role of Trust, Types of Access Control. Security Policies: Confidentiality, Integrity, Availability and Hybrid Policies, Academic Computer Security Policy: General University Policies, Electronic Mail Policies.	15 Hours	1
IV	<b>Authentication:</b> Basics of Authentication, Passwords: Attacking a Password System, Countering Password Guessing, Password Challenge-Response, Biometrics: Fingerprints, Faces, Voices, Eyes and Combinations, User Security, Program Security: Introduction to Program Security, Policy and Requirements.	15 Hours	1

### **Suggested Readings:**

1. Matt Bishop, "Introduction to Computer Security", Addison Wesley, 2005
2. William Stallings, "Computer Security: Principles and Practices", Pearson 6 Ed, ISBN 978-0-13-335469-0 2.
3. Berouz Forouzan, "Cryptography and Network Security", TMH, 2 edition, ISBN -978-00-707-0208-0.

## BCACS1304: Basics of Computer Organization & Architecture

**Course Objective:** Provide a better understanding of Computer Organization, its designing & implementation.

1. Explain Computer performance measurement methods.
2. Student should learn how to quantitatively evaluate different designs and organizations.
3. Student should be able to articulate design issues in the development of processor or other components that satisfy design requirements.

**Learning Outcome:** Upon successful completion of the course the student will:

1. Describe software and hardware interaction layers in computer architecture.
2. Describe various machine language instructions.
3. Be familiar with the terminology and basic principles of Digital electronics and Computer organization systems.

### Course Contents:

Module	Course Topics	Hours	Credits
I	<b>Introduction to Digital Electronics:</b> Number System, Boolean Algebra, Minimization of Boolean Expressions using K-Map; Logic Gates: Implementations of Logic Functions using Gates; <b>Combinational Circuits:</b> Introduction to combinational circuits, Adders & Subtractors; Multiplexer & De-Multiplexer; Decoder; <b>Sequential Circuit:</b> Introduction to Flip Flops, Types of Flip flop, Introduction of Registers; Classification of Registers, Introduction of Counter; Synchronous and Asynchronous counter.	15 Hours	1
II	<b>Register Transfer and Micro-operation:</b> Register Transfer Language: Register Transfer, Bus and Memory Transfer; Micro operations: Arithmetic, Logical, Shift micro- operations; Arithmetic logic shift unit; Timing and control; <b>Basic Computer Organizations and Design:</b> Instruction Cycle; Memory Reference Instructions; Register Reference Instructions; Input-Output Instructions; Instructions Format. <b>Central Processing Unit:</b> Accumulator based organization; General register organization; Stack organization; Addressing modes; RISC vs. CISC, Hard wired & micro programmed control Unit	15 Hours	1
III	<b>I/O Organizations:</b> Introduction to system buses; Input/ output interface; Interrupt; Serial Vs Parallel communications; Synchronous Data Transfer; Asynchronous Data Transfer methods: Strobe Control, handshaking; Modes of Data Transfer: Programmed I/O, Interrupt initiated I/O. DMA; DMA: DMA Controller, DMA Transfer.	15 Hours	1
IV	<b>Memory organizations:</b> Memory hierarchy; Main Memory: RAM Chips, ROM Chips; Address Mapping; Auxiliary Memory; Cache memory: Mapping Techniques: Direct mapping, Associative mapping, Set associative mapping; Associative memory; <b>Microprocessor:</b> Introduction to 8085 microprocessor with instruction set and programming concepts	15 Hours	1



**Suggested Readings:**

1. M. Morris Mano “Digital Logic and Computer Design”, 2<sup>nd</sup> Edition, PHI.
2. P. Raja, “Switching Theory”, Fourth Edition, Umesh Publication.
3. M. Morris Mano, “Computer System Architecture”, PHI
4. William Stalling, “Computer Organization & Architecture”, Pearson Education Asia
5. R. S. Goankar, “Microprocessor architecture, Programming and application with 8085”, Pen Ram International

**BCACS1351: Basics of Design & Analysis of Algorithm Lab**

<b>Module</b>	<b>Course Topics</b>	<b>Credits</b>
<b>I</b>	<ol style="list-style-type: none"><li>1. Implementation of 1D and 2D Arrays</li><li>2. Implementation of Bubble sort.</li><li>3. Implementation of Insertion sort</li><li>4. Implementation of Selection sort</li><li>5. Implementation of Merge sort.</li></ol>	<b>I</b>
<b>II</b>	<ol style="list-style-type: none"><li>1. Implementation of Quick sort.</li><li>2. Implementation of Heap sort</li><li>3. Implementation of Binary Search.</li><li>4. Implementation of Linear Search</li><li>5. Program to Implement Strassen's Algorithm.</li></ol>	<b>I</b>

**BCACS1352: Basics of Computer Organization Lab**

<b>Module</b>	<b>Course Topics</b>	<b>Credits</b>
<b>I</b>	<ol style="list-style-type: none"><li>1. Implementation of Gates.</li><li>2. Verification of various gates (NOT, OR, AND, Ex-OR, Ex-NOR) using universal gates. (NAND &amp; NOR).</li><li>3. Implementation of Adders</li><li>4. Implementation of Subtractors</li><li>5. Proving of Characteristic table of different Flip Flops</li></ol>	1
<b>II</b>	<ol style="list-style-type: none"><li>1. Write a program using 8085 &amp; verify for :<ol style="list-style-type: none"><li>A. Addition of two 8-bit numbers.</li><li>B. Addition of two 16-bit numbers (with carry).</li></ol></li><li>2. Write a program using 8085 &amp; verify for :<ol style="list-style-type: none"><li>A. Subtraction of two 8-bit numbers. (display of barrow)</li><li>B. Subtraction of two 16-bit numbers. (display of barrow)</li></ol></li><li>3. Write a program using 8086 for arranging an array of numbers in descending order &amp; verify.</li><li>4. Write a program using 8085 for finding First and second</li><li>5. Compliment of an 8-bit number.</li><li>6. Write a program using 8085 for finding first and second Compliment of 16-bit number.</li><li>7. Write a program using 8085 for left shift 8-bit number by 2.</li><li>8. Write a program using 8085 for left shift 16-bit number by 2.</li></ol>	1

## BCACS1401: Apply End to End Security to Cloud Application

**Note: Syllabus Provided by IBM**

### Course Objective:

1. To understand Cloud concepts, introduction to IBM cloud, ISO 27017-Cloud Security, PCI DSS Controls, Flips Levels.
2. To learn introductory concepts of Cloud Data Life Cycle (CSUSAD).
3. To learn concepts Physical and environmental protection and Audit Mechanism.
4. To learn concepts of IAM and Cloud Secure Development Life Cycle.

**Learning Outcome:** Upon successful completion of the course the student will be able to:

1. Able to deploy application on IBM Cloud.
2. Able to understand how to work on containerization concept using Docker as a Tool and will work on Kubernetes
3. To learn basic concepts of Web-Application security.
4. An overview of Virtual Private Cloud and Network Delivery.

### Course Contents:

Module	Course Topics	Hours	Credits
I	<b>Introduction to Security in cloud model:</b> Cloud Security Model, Cloud Broker Services, Introduction to IBM Cloud, Network Perimeter, What is Encryption, Cloud Foundry, Cryptographic Erasure, ISO 27017-Cloud Security 11114, NIST DP 800-53, PCI DSS Controls, FIPS Levels.  <b>Enterprise Cloud management:</b> Management plan implementation, What is Forensic Science, Evidence Management, OECD Privacy Principles, eDiscovery, GDPR's Key Points, Gap Analysis, ISO 27001: 2013 Domains, Risk Terminology, The CSA STAR components, Supply Chain Risk.	15 Hours	1
II	<b>Cloud Data Life Cycle (CSUSAD) &amp;DLP(data Loss Prevention):</b> Key data function: Access Process and Store, Data functions mapping to the data life cycle, Controls, Data dispersion in cloud storage, Erasure Coding, Threat to storage types, Database encryption, Gateway encryption, Key storage in cloud,	15 Hours	1
III	<b>Containerization,</b> Container Orchestration, Data De-identification/anonymization, Tokenization, DLP(data Loss Prevention), Data Discovery, DRM(digital rights management), Crypto-shredding,Chain of Custody, Software-Defined Networking(SDN), Data centre design	15 Hours	1

	standards, ENISA, Data protection risk, Risk assessment/Analysis, Automation of Controls, iSCSI.		
<b>IV</b>	<p><b>Audit Mechanism &amp; Application Security:</b> Key regulations for CSP facilities ,IAM ,VPC, Understanding of Cloud environment,BCDR planning factors, Business impact analysis (BIA), Design phase, API types, Phases and Methodologies, Cross-site scripting, Security misconfiguration , Threat Modelling, Software Supply-chain (API) management, ISO/IEC 27034-1</p> <p><b>IAM on Cloud:</b> Federated Identity management, SAML, WS federation, OAuth2.0, OpenID Connect, Reduced Sign-on (RSO), Database activity Monitor, Application Virtualization, Cloud Secure Development Life Cycle, Open Web Application Security Project (OWASP), VLANs, Distributed Resource Scheduling(DRS), Patch Management, Performance Monitoring, Intrusion Detection System</p>	15 Hours	1

**Suggested Readings:**

1. Ronald L. Krutz and Russell Dean Vines, Cloud Security: A Comprehensive Guide to Secure Cloud Computing.
2. John R. Vacca, Cloud Computing Security.

## BCA4401: Basics of Python Programming

### Course Objectives:

1. Appreciate the basic and advanced features of core language.
2. Handle and control system/OS level features.
3. Design and implement basic applications with database connectivity.

**Learning Outcome:** Upon successful completion of the course the student will be able to:

1. Acquire programming skills in core Python.
2. Develop the skill of designing Graphical user Interfaces in Python
3. Develop the ability to write database applications in Python

### Course Contents:

Module	Course Topics	Hours	Credits
I	<b>Introduction to Python, Variables, Expressions and Statements:</b> Introduction to Python: Interactive mode and script mode, difference b/w python 3 and python, Keywords, Statement, Indentation and Comment, Structuring Python Programs, scripting, Expressions and Values, Variables, Input and output, operators and operator precedence, conditional statement, Loops and Control Statements (continue, break and pass), Multiple line statements, Printing Information, Getting Information from the Keyboard.	15 Hours	1
II	<b>Conditional and Looping Construct, Functions:</b> if - else statement and nested if – else while, for, use of range function in for, Nested loops, break, continue, pass statement, Use of compound expression in conditional constructs, Built-In Function, invoking built in functions, Module(Importing entire module or selected objects using from statement), Functions from math, random, time & date module, <b>User Define Function:</b> Defining, invoking functions, passing parameters (default parameter values, keyword arguments), Scope of variables, void functions and functions returning values.	15 Hours	1
III	<b>Strings:</b> Introduction to String, Working with Text: Creating Strings of Characters, Using Special Characters in Strings, Creating a Multiline String, String functions concepts & their use, String operators: +, *, in, not in, range, slice [n:m], String built in functions & methods: len, capitalize, find, isalnum, isalpha, isdigit, lower, islower, isupper, upper, lstrip, rstrip, isspace, istitle, partition, replace, join, split, count, decode, encode, swap case, Strings constants.	15 Hours	1
	<b>Lists, Tuples, Sets, Dictionaries:</b> Concept of mutable lists, creating, initializing and accessing the elements of list, List operations (Concatenation, Repetition, Membership, list		

<b>IV</b>	slices), List comprehensions, List functions & methods: len, insert, append, extend, sort, remove, reverse, pop, Immutable concept, creating, initializing and accessing the elements in a tuple; Tuple functions: cmp(), len(), max(), min(), tuple(), Concept of Sets , creating, initializing and accessing the elements of sets, Concept of key-value pair, creating, initializing and accessing the elements in a dictionary, Traversing, appending, updating and deleting elements.	15 Hours	1
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**Suggested Readings:**

1. Kenneth A. Lambert, The Fundamentals of Python: First Programs, Cengage Learning, ISBN: 978- 1111822705.
2. Practical Programming: An introduction to Computer Science Using Python, second edition, Paul Gries, Jennifer Campbell, Jason Montojo, The Pragmatic Bookshelf.
3. Learning with Python: How to Think Like a Computer Scientist Paperback – Allen Downey, Jeffrey Elkner, 2015
4. David Beazley, Brian K. Jones “Python Cookbook”, 3rd Edition. O’Reilly Publications
5. Jake VanderPlas “Python Data Science Handbook”, O’Reilly Publications
6. David Beazley, “Python Essential Reference (4th Edition) “, Addison Wesley
7. Vernon L. Ceder,” The Quick Python Book, Second Edition”, Manning Publications
8. Brett Slatkin “, Effective Python”
9. Learning Python By Mark Lutz,O’Reilly Publication
10. Programming with python, A users Book, Michael Dawson, Cengage Learning
11. Python Essential Reference, David Beazley, Third Edition

## BCACS1402: Web Designing Using PHP

### Course Objective:

1. To create dynamic PHP web pages that tailor themselves to the user.
2. To develop the concepts on web designing and development using server side scripting language PHP and database as My SQL.
3. Create simple web applications in one tier, two tier and three tier architectures.

**Learning Outcome:** Students who have successfully completed this course will have understanding of the following concepts:

1. Develop website using PHP and My SQL.
2. Implement dynamic Webpages that interact with databases and files.
3. Write server side cross-platform HTML-embedded scripts.

### Course Contents:

Module	Course Topics	Total Hours	Credits
I	<b>Introduction to PHP:</b> Structure, Syntax, Comments, Data Types, Variables, Operators, Assignments, Multiple-Line Commands, Constants, Predefined Constants, echo & print statements; Built- in Functions; Expressions and Control Flow: Expressions, Literals and Variables, Operators; Operator Precedence, Associativity; Conditional Statements; Looping Statements: Break, Continue; Implicit and Explicit Casting, Dynamic Linking	15 Hours	1
II	<b>Strings:</b> Creating the HTML Form, Concatenating Strings, Handling Newlines, HTML and PHP, Encoding and Decoding Strings, Finding Substrings, Replacing Parts of a String; <b>Arrays:</b> Creating Array, Adding Items, Accessing Array Elements, Creating Multidimensional Arrays, Sorting Arrays, Transforming Between Strings and Arrays, Creating an Array from a Form.	15 Hours	1
III	<b>Functions:</b> Creating Functions, Functions with Arguments, Setting Default Argument Values, Returning values from functions, Understanding Variable Scope; <b>HTML Forms and PHP:</b> Creating a Simple Form, different Form Method, Receiving Form Data, Displaying Errors, Error Reporting	15 Hours	1
IV	<b>Web Application:</b> Creating Web Applications, Templates, Using Constants, Working with Date and Time, Handling HTML Forms; <b>Database Handling:</b> Introduction to SQL, Connecting MySQL, Creating and Selecting Database, Creating Table, Inserting, Retrieving, Deleting and Updating Data in Database	15Hours	1



**Suggested Readings:**

1. Robin Nixon,” Learning PHP, MySQL & JavaScript\_ with jQuery, CSS & HTML5”, O’ Reilly Media 4th ed.
2. Larry Ullman, “Php for the Web Visual Quickstart Guide”, Peachpit Press, 4th edition 2011
3. Alan Forbes, “The Joy of PHP Programming: A Beginner’s Guide to Programming Interactive Web Applications with PHP and MySQL”, Plum Island.
4. Tom Butler & Kevin Yank, “PHP & MySQL Novice to Ninja”, SitePoint
5. Lynn Beighley & Michael Morrison, “Head First PHP & MySQL”, O’Reilly.
6. Vikram Vaswani, “PHP: A Beginner’s Guide”, McGraw-Hill
7. Larry Ullman, “PHP 5 Advanced: Visual Quickpro Guide”, Peachpit Press

## BCA4404: Data Warehousing & Data Mining

### Course Objective:

1. Understand the architecture of Data warehouse and its organization.
2. Introduce DM as a cutting edge business intelligence method and acquaint the students with the DM techniques for building competitive advantage through proactive analysis, predictive modeling, and identifying new trends and behaviors.
3. Describing and demonstrating basic data mining algorithms, methods, and tools.
4. Identifying business applications of data mining.
5. Overview of the developing areas - web mining, text mining, and ethical aspects of data mining.

**Learning Outcome:** After successful completion of this course, the students would be able to:

1. Define what knowledge discovery and data mining are; define the concept, structure and major issues of data warehousing.
2. Discover interesting patterns from large amounts of data to analyze and extract patterns to solve problems, make predictions of outcomes.
3. Select and apply proper data mining algorithms to build analytical applications.
4. Comprehend the roles that data mining plays in various fields and manipulate different data mining techniques.

### Course Content:

Module	Course Topics	Hours	Credits
I	<b>Introduction:</b> Data Mining Definition, Steps In Data Mining, Architecture Of Data Mining System, Types Of Data For Data Mining: Relational Databases, Data Warehouses, Transactional Databases, Adverse Data Information System And Advance Applications, Classification Of Data Mining Systems, Data Mining Task Primitives, Integration Of A Data Mining System With A Data Base Or Data Warehouse System, Major Issues In Data Mining, Approaches to Build A Data Warehouse, Building A Data Warehouse, Metadata & Its Types.	15 Hours	1
II	<b>Data Preprocessing:</b> Need of data preprocessing, descriptive <b>Data Summarization:</b> Measuring the crystal Tendency, Measuring the Dispersion of data, Graphic Display of Basic Descriptive Data Summaries, Data cleaning, Data Integration and transformation, Data Reduction. <b>Data Warehouse and OLAP Technology:</b> Data warehouse, differences between operational Database systems and Data warehouses, Multidimensional data model. A three- tier data warehouse architecture.	15 Hours	1

<b>III</b>	<b>Mining Frequent Patterns:</b> Basic concepts Frequent Item set mining method: the Apriori Algorithm, Generating Association Rules from frequent item sets. FP-Growth Algorithm: FP Tree Representation. Frequent item set Generation in FP- Growth Algorithm.	15 Hours	1
<b>IV</b>	<b>Classification:</b> General Approach to solving classification problems, Classification by decision Tree Induction: Attribute selection measure, Tree pruning, Bayesian Classification: Bayes' Theorem Rule based classification, Nearest neighbor classifier. Evaluating the performance of a classifier: Holdout Method, Random sub sampling, cross-validation.	15 Hours	1

**Suggested Readings:**

1. Jiawei Han and Micheline Kamber, "Data Mining Concepts and Techniques" Elsevier.
2. Pang-Ning Tan, Michael Steinbach and Vipin Kumar, "Introduction to Data Mining", PHI
3. Max Bramer, "Principles of Data Mining", Springer

## BCACS1403: Cryptography & Cyber Security

### Course Objective:

3. To understand basics of Cryptography and Cyber Security
4. To understand Cryptography Theories and Algorithms

**Learning Outcome:** Students who have successfully completed this course will have understanding of the following concepts:

3. To learn about how to maintain the Confidentiality, Integrity and Availability of a data.
4. Student will be able to understand basic cryptographic algorithms, message and web authentication and security issues.
5. Ability to identify information system requirements for both of them such as client and server.

### Course Contents:

Module	Course Topics	Hours	Credits
I	Conventional Encryption Techniques: Conventional Encryption Models, Modern Technique, Algorithms, DES, IDE, RC5, CAST, RC2, And Confidentiality Using Conventional Encryption	15 Hours	1
II	Public Key Cryptography: Principles of Public Key Crpto-systems, RSA Algorithms, Key Management, Diffie-Hellman Key Exchange, Elliptic Curve Cryptography	15 Hours	1
III	Security Fundamentals: An Overview of Information Security: The Basic Components, Threats, Policy and Mechanism, Assumptions and Trust, Assurance, Operational Issues, Human Issues, Security nomenclature. Access Control Matrix, Security Policies: Confidentiality, Integrity, Availability Policies and Hybrid Policies, OS Security	15 Hours	1
IV	Attacks, Malicious Logic and Countermeasures: Phishing, Password Cracking, Key-loggers and Spywares, Types of Virus, Worms, DoS and DDoS, SQL injection, Buffer Overflow, Spyware, Adware and Ransomware. Antivirus and other security measures Intrusion Detection System: IDS fundamentals, Different types of IDS. Intrusion Prevention.	15 Hours	1

### Suggested Readings:

1. William Stallings, Computer Security: Principles and Practices, Pearson 6 Ed, ISBN 978-0-13-335469-0 2.
2. Nina Godbole, Sunit Belapure, Cyber Security- Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Wiely India Pvt.Ltd, ISBN- 978-81-265-2179-1 1.
3. CK Shyamala et el., Cryptography and Security, Wiley India Pvt. Ltd, ISBN-978-81-265-2285-9.
4. Berouz Forouzan, Cryptography and Network Security, TMH, 2 edition, ISBN -978-00-707-0208-0.

**BCA4451: Basics of Python Programming Lab**

<b>Module</b>	<b>Course Topics</b>	<b>Credits</b>
I	<ol style="list-style-type: none"><li>1. Installing and configuring Anaconda on windows, Linux or mac.</li><li>2. Introduction to Jupyter lab, Variables, keywords, basics operation, Taking input in jupyter , console Taking multiple inputs from user, operators implementation</li><li>3. Python Input Methods for Competitive Programming, Python Output using print() function Python end parameter in print(),if, else, if elif ladder implementation</li><li>4. Special keyword - in and is, for loop, range function, and examples use of enumerate, zip function in loops else with for.</li></ol>	1
II	<ol style="list-style-type: none"><li>5. Using strings, single quoted/double quoted/triple quoted Strings, string functions - split, trim, join, format, replace, count, find, index, rjust, ljust, center, upper, lower</li><li>6. Practical implementation of list, creation and traversal, list functions - append, insert, extend, remove, pop, clear, sort, count, index, copy</li><li>7. Practical implementation of tuples, creation and traversal, Practical implementation of Set, creation and traversal, set functions - add, update, remove, clear, pop, union, intersection, difference, disjoint, subset, superset</li><li>8. Practical implementation of Dictionary, creation and traversal, dictionary function - get, update, keys, items, values</li></ol>	1

**BCACS1452: Web Designing Using PHP Lab**

<b>Module</b>	<b>Course Topics</b>	<b>Credits</b>
<b>I</b>	<ol style="list-style-type: none"><li>1. Develop a Simple Hello Program in PHP by Installing &amp; configuring XAMPP with Dreamweaver</li><li>2. Develop a Program in PHP for type Casting of a Variables</li><li>3. Develop a Program in PHP to implement different types of operators</li><li>4. Develop a Program in PHP to implement different built-in functions</li><li>5. Develop a Program in PHP to implement if and nested if statements</li><li>6. Develop a Program in PHP to implement while loop</li><li>7. Develop a Program in PHP to implement do-while loop</li><li>8. Develop a Program in PHP to show use of break and continue</li><li>9. Develop a Program in PHP to implement switch case</li><li>10. Develop a Program in PHP to implement For Loop</li><li>11. Develop a Program in PHP to implement nested For Loop</li><li>12. Develop a Program in PHP to implement strings functions</li><li>13. Create a program in PHP to implement array</li><li>14. Design a program in PHP to implement array using function</li></ol>	1
<b>II</b>	<ol style="list-style-type: none"><li>1. Design a program in PHP to implement Error handling.</li><li>2. Design a program in PHP to show how to define your own functions</li><li>3. Design a program in PHP to show how to return values from functions: these can be variables, arrays, etc.</li><li>4. Design a program in PHP to show how to named constants</li><li>5. Design a program in PHP to show how to use math functions</li><li>6. Design a program in PHP to show how to use “printf” function for formatted output.</li><li>7. Design a personal information form ,Submit &amp; Retrieve the Form Data Using \$_GET(), \$_POST() and _REQUEST() variables</li><li>8. Design A Login Form and Validate that Form using PHP programming</li><li>9. create a PHP Code to make database connection, Create Data Base, Create Table in Mysql</li><li>10. Design a PHP code to Insert, Delete, Update, Select the Data From Data Base</li></ol>	1

## BCACS1501: Deployment of Private Cloud

### Note: Syllabus Provided by IBM

**Course Objective:** Introduction to RedHat Open Shift Get familiarized with OpenShift core concepts

1. Understanding Docker images and building custom Docker images
2. Understanding persistent storage and Network for OpenShift ‡Install and configure
3. Deploy containerized application on an OpenShift cluster
4. Deploy containerized application on an OpenShift cluster

**Learning Outcome:** Upon successful completion of the course the student will be able to:

1. Understand OpenShift basic concepts
2. Understand containers and images
3. Prepare the servers for installation
4. Understand the change log in identity provider

### Course Contents:

Module	Course Topics	Hours	Credits
I	<b>About OpenShift-</b> Introduction to OpenShift; Three kinds of Platform; advantages of using OpenShift; OpenShift architecture; OpenShift components benefits of OpenShift <b>Core Concepts-</b> Understand containers and images; pods and services; Builds and streams Routes & Templates; DeploymentsStorage concepts; OpenShift networking concept	15 Hours	1
II	<b>Installation of OpenShift platform</b> - The servers for installation; Steps to install and configure an OpenShift cluster; post-installation step <b>Configuration of OpenShift platform-</b> change log in identity provider; Create and manage users and accounts; Deploy an OpenShift router; Deploy an internal registry	15 Hours	1
III	<b>Use of web interface</b> - Fork a sample repository; Create projects and applications; Verify if the application is running; Configuring automated builds; code change and manually rebuild images <b>Use of command line interface-</b> Create projects and applications using CLI; Verify if the application is running; Configuring automated build; code change and manually rebuild image <b>Creating custom container images-</b> Custom docker image creation approaches; basics of a docker file; Design considerations for a custom docker file; Building custom images using a docker file	15 Hours	1
IV	<b>Controlling access to OpenShift resources-</b> access control on OpenShift resources; secrets and their application; security policies and their application	15 Hours	1

	<p><b>Allocation persistent storage-</b> persistent storage concepts such as PVs and PVCs; Implement persistent storage for use by the application; persistence is configured for internal registry</p> <p><b>Managing application deployment-</b>Understand pod replicas and how to scale them; control pod scheduling; Manage image; image streams templates</p>		
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**Suggested Readings:**

1. OpenShift in Action- Jamie DuncanJamie
2. Learn OpenShift: Deploy, build, manage, and migrate applications with OpenShift Origin- ArtemiiKropachev



## BCACS1502: Digital Image Processing

### Course Objectives:

1. To introduce the concepts of image processing and basic analytical methods to be used in image processing.
2. To familiarize students with image enhancement and restoration techniques.
3. To explain different image compression techniques.
4. To introduce segmentation and morphological processing techniques.

**Learning Outcome:** Upon successful completion of the course the student will be able to:

1. Understand the need for image transforms different types of image transforms and their properties.
2. Develop any image processing application.
3. Learn different techniques employed for the enhancement of images.
4. Learn different causes for image degradation and overview of image restoration techniques.
5. Understand the need for image compression and to learn the spatial and frequency domain techniques of image compression.
6. Learn different feature extraction techniques for image analysis and recognition

### Course Contents:

Module	Course Topics	Hours	Credits
I	<b>Introduction to Digital Image Processing:</b> Origin, Fundamental Step, Component; Light and Electromagnetic Spectrum, Basic Concept in Sampling and Quantization; Some Basic Relationships Between Pixels: Neighbors of a Pixel, Adjacency, Connectivity, Regions, Boundaries, Distance Measures.	15 Hours	1
II	<b>Image Enhancement in the Spatial Domain:</b> Basic Gray Level Transformations, Histogram Processing, Using Arithmetic/Logic Operations, Smoothing Spatial Filters, Sharpening Spatial Filters; <b>Image Enhancement in the Frequency Domain:</b> Introduction to the Fourier Transform and the Frequency Domain, Smoothing Frequency Domain Filters, Sharpening Frequency Domain Filters.	15 Hours	1
III	<b>Image Restoration:</b> Noise Models, Image Restoration Using Spatial Domain Filtering, Image Restoration using Frequency Domain Filtering, Estimating the Degradation Function, Inverse Filtering; Colour	15 Hours	1

	Fundamental, Colour Models, Colour Transformation, Smoothing and Sharpening, Colour Segmentation.		
<b>IV</b>	<b>Image Compression and Image Segmentation:</b> Introduction, Image Compression Model, Error-Free Compression, Lossy compression, Detection of Discontinuities, Edge Linking and Boundary Detection, Thresholding	15 Hours	1

**Suggested Readings:**

1. Anil K. Jain "Fundamentals of Digital Image Processing", Prentice Hall, 1989.
2. R. Chellappa "Digital Image Processing", IEEE, 1985
3. Bernd Jahne "Image Processing for Scientific Applications", CRC Press, 1997
4. R.C. Gonzalez & R.E. Woods "Digital Image Processing", Pearson, 2017
5. J.C. Russ "The Image Processing Handbook", CRC Press, 2011
6. W.K. Pratt "Digital Image Processing", John Wiley & Sons, 2007
7. Andrews & Hunt "Digital Image Restoration", Prentice Hall, 1997

## BCA4502: Mobile Application Development

### Course Objectives:

1. The capabilities and limitations of mobile platforms that affect application development and deployment
2. The technology and business trends impacting mobile application development
3. The characterization and architecture of mobile applications
4. The techniques for deploying and testing mobile applications, and for enhancing their performance and scalability

### Learning Outcome

1. Model and manage mobile application development using a range of methods.
2. Advantages and limitations of development frameworks.
3. Designing and develop mobile applications using a chosen application development framework
4. Develop enterprise-level mobile solutions.

### Course Contents:

Module	Course Topics	Hours	Credits
I	<b>Android Development:</b> Overview: Overview of the Android Operating System Development tools, Deploying application packages, Step-by-step application development Android version: Platform version: Android 10.0, 5.0 Lollipop, 4.4 Kit-Kat, Framework API level: SDK compatibility, each platform version has an API level; NDK API level: API level for native headers	15 Hours	1
II	<b>Tools for application development:</b> Android SDK: Provides the Java framework classes, Compiles to java byte code, Class framework is updated with every OS release Android NDK: C/C++ tool chain for compiling to machine code, Android platform tools, adb (android debug bridge): runs and debugs apps from your dev machine. <b>Android developer tools:</b> Eclipse plug-in for Android, Android studio (doesn't yet fully support all NDK features) Application packages: .apk files: compressed files, class byte code, resources (icons, sounds, etc.), Binary native files; All .apks are signed: Default development key is created by SDK, When updating an application, signature are checked.	15 Hours	1

<p style="text-align: center;"><b>III</b></p>	<p><b>Installing an application, Android Menu, Adaptor, Layout Manager, View:</b> From your local computer using adb; AndroidManifest.xml: Package Name / version, Required SDK and target, SDK Application/Activities, Permissions; Android Activity: Provides user interaction: <a href="http://developer.android.com/reference/android/app/Activity.html">http://developer.android.com/reference/android/app/Activity.html</a>, Callbacks for life-cycle management: onCreate(), onResume(), onPause(); An application can have multiple activities: Needs one launcher activity, Use onCreate() to create UI; Android Menu: Option Menu, Context Menu, Popup Menu; Adaptor: Array, Array list, Base adaptor; Layout Manager: Relative layout, Linear layout, Table layout, Grid layout, Frame layout, Constraint layout; Views: Grid view, Web view, Scroll view, Search view, Table view, Dynamic view.</p>	<p style="text-align: center;">15 Hours</p>	<p style="text-align: center;">1</p>
<p style="text-align: center;"><b>IV</b></p>	<p><b>Android service, Data Storage, Content Provider, Android Notification, Multimedia, Speech API, Telephone API, Location API:</b> Android service: API, Android started service, Android bound service, Android service life cycle, Android service example; Data Storage: Shared preferences, Internal storage, External storage; Content Provider: Content provider fundamental, Contact content provider, Other built-in content Provider, Creating custom content provider, Understanding content URI, Content Resolver, Sharing Information from custom content provider; Android Notification: Notification API, Creating notification builder, Setting notification properties, Attaching actions, Issuing notification, Notification compat.Builder class, Android Notification class; Multimedia: Wallpaper, Live wallpaper, Multimedia API, Playing audio, Creating audio, Playing video, Alarm manager, Gallery; Speech API: Text to speech API, Text to Speech example, Managing speed and pitch; Telephone API: Telephone manager, Get call state, Call state Broadcast receiver, Simple caller Talker, Making phone call, Sending mails, sms; Location API: Location API fundamental, Example of android: Location API, Working with Google API.</p>	<p style="text-align: center;">15 Hours</p>	<p style="text-align: center;">1</p>

**Suggested Readings:**

1. Pradeep Kothari, “Android Application Development (With KitKat support)” Black Book, Dreamtech Press
2. Barry Burd, “Android Application Development (All-In-One for Dummies)”, Second Edition, John Wiley & Sons

## **Open Elective**

## BCACS1511: IT Governance, Risk & Information Security Management

### Course Objectives:

1. This course will discuss a range of topics from elements and domains of IT Governance, understanding and constructing frameworks, to proprietary frameworks.
2. IT Governance is a subset discipline of Corporate Governance focused on Information Technology (IT) systems, their performance, and risk management.
3. This course are designed to prepare students to analyze and improve the ways in which societies, organizations, and people engage with, try to steer, and adapt to technological change.

### Learning Outcomes:

1. Understand the concepts of governance, risk management and compliance (GRC).
2. Understand the regulatory environment.
3. The reason for being governance is essential for effective regulatory compliance risk management.
4. Identify high-risk areas and compliance in your organization.
5. Apply Risk-based Approach Develop and implement governance, risk management and compliance strategic plan define, and enhance.

### Course Content:

Module	Course Topics	Hours	Credits
I	<b>Introduction to IT/business alignment, planning, execution and governance:</b> overview, definition, purpose, scope, Challenges and issues, Steps IT governance real, IT governance current and future state transformation roadmap, IT Governance Framework, IT governance – decision rights and authority.	15 Hours	1
II	<b>IT Governance and Information Security:</b> Introduction, Research Methodology, IT Governance Standards, IT security knowledge, Conditions, Strategic issues, IT services and Assets Security Management, Vulnerabilities, security compliance, control, Verification. <b>IT Governance in Organizations:</b> Introduction, Background and Literature, Review, Theoretical Framework, IT Governance in MENA Medium and Large Organizations, Case Study.	15 Hours	1
III	<b>Maturity Frameworks for Information Security Governance:</b> COBIT 5 Maturity Framework: Introduction, Literature Review and Background Research Methodology; ITILv4 Maturity Framework. <b>Information Security Policy:</b> Introduction, Problem Statement, Security Requirements, Clauses.	15 Hours	1
IV	<b>Cyber Security Risk Management:</b> Introduction, Governance, Risk Management, Components.	15 Hours	1

	<b>Managing ICT security through Governance and Control:</b> Governance, Control, Audit; Framework, Governance category, Security Policy, Roles, Legal and regulatory; Governance and Risk management process, Risk assessment, Risk Management; COBIT.		
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**Suggest Readings:**

1. Dr. Gad j seling PMP COP, “Implementing IT Governance A pocket Guide” Van Haren Publishing
2. Yassine Maleh, Abdelkebir Sahid, Mamoun Alazab, Mustapha Belaissaoui, “IT Governance and Information Security Guides, Standards, and Frameworks”, CRC Press
3. SIGLER , “Securing an IT Organization through Governance, Risk Management, and Audit” Taylor & Francis Publications
4. Alan Calder, “IT Governance: Implementing Frameworks and Standards for the Corporate Governance of IT”, IT Governance Publishing
5. <https://www.redbooks.ibm.com/redbooks/pdfs/sg247517.pdf>
6. <https://www.educause.edu/focus-areas-and-initiatives/policy-andsecurity/cybersecurity-program/resources/information-security-guide/toolkits/information-security-governance>
7. <https://www.informit.com/articles/article.aspx?p=2931571&seqNum=3>
8. <https://www.informit.com/articles/article.aspx?p=2931571&seqNum=2>
9. <https://www.ibm.com/cloud/learn/grc>

## BCACS1512: Cyber Law And Indian IT Act

### Course Objective:

1. Enable learners to understand, explore, and acquire a critical understanding of Cyber Law;
2. Develop an understanding for Intellectual Property Rights in Cyberspace.
3. Make learners conversant with the social and intellectual property issues emerging from 'Cyberspace'.
4. Understand the legal provisions related to specific cybercrimes and liabilities attached to such crimes.

### Learning Outcome:

Upon successful completion of this course, students should be able to:

1. Explore the legal and policy developments in various countries to regulate cyberspace;
2. Develop the understanding of relationship between intellectual property and cyberspace;
3. Give learners in depth knowledge of Information Technology Act and legal frame work of Right to Privacy, Data Security and Data Protection.
4. Analyze and apply cyber law to issues related to Intellectual Property law.

### Course Contents:

Module	Course Topics	Hours	Credit
I	<b>Introduction to Cyber Laws and Cyber Space:</b> Definition of Cyber Law, Cyber Space and Netizen, Origin/history & functioning of internet, Cyber World and the rule of Law in Cyber World, Significance of Law in Dealing with Challenges Faced by Cyber World, Issues of Jurisdiction and Applicable Law in Cyberspace, International Treaties, Conventions and Protocols Concerning Cyberspace	15 Hours	1
II	<b>Intellectual Property Rights in Cyberspace:</b> Concept of Property in Cyber Space, Implication on Intellectual Property Rights – International & National Legal Preparedness, Interface with Copyright Law, Patent Law, Trademarks & Domain Names Related issues, The ICANN Uniform Domain Name Dispute Resolution Policy	15 Hours	1
III	<b>Information Technology Act, 2000 – Cyber Law in India:</b> Historical background & Objectives, Legal Recognition of Electronic Records and Procedures, Legal Recognition of Digital Signature, Electronic & Digital Signatures – legal issues, E Commerce Certifying Authority and its Role, Cyber Appellate Tribunal, Grey Areas of Information Technology Act, 2000.	15 Hours	1
IV	<b>Cyber Crimes &amp; Legal Framework:</b> Kinds of Offences and Penalties defined under the IT Act, 2000, Cyber Crime against – Person, Property & Government, E-Evidence and Computer Forensic, Concept of E-Litigation, Right to Privacy and its Legal Framework, <b>National &amp; International Legal:</b> National & International Legal Framework for Protecting Privacy,	15 Hours	1



	Freedom of Speech & Expression vis-à-vis Cyber Law (Sec 66A of IT Act Declared unconstitutional by Supreme Court)		
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**Suggested Readings:**

1. Pavan Duggal, "Textbook on Cyber Law", Universal Law Publishing Co.
2. Dr. Jyoti Rattan, "Cyber Laws & Information Technology", Bharat Law House Pvt. Ltd.
3. Pavan Duggal, "Cyber Law- The Indian Perspective", Saakshar Law Publications
4. Farooq Ahmad, "Cyber Law in India (Internet)", New Ena Law Pub. Faridabad
5. Nandan Kamath, "Law Relating to Computers Internet & E-commerce - A Guide to Cyber laws & the Information Technology", Universal Law Publishers
6. Dr. Talat Fatima, "Cyber Crimes", Eastern Book Company

## BCACS1513: Biometric Security

### Course Objectives:

1. To understand the basics of Biometrics and its functionalities.
2. To learn the role of biometric in the organization.
3. To expose the concept of IRIS and sensors.
4. To expose the context of Biometric Applications.
5. To learn to develop applications with biometric security.

### Learning Outcome:

1. Identify the various Biometric technologies.
2. Design of biometric recognition for the organization.
3. Develop simple applications for privacy.
4. Understand the need of biometric in the society.

### Course Content:

Module	Course Topics	Hours	Credits
I	<b>Introduction:</b> Person Recognition, Biometric systems, Biometric functionalities: verification, identification: Biometric systems errors, The design cycle of biometric systems, Applications of Biometric systems, Security and privacy issues.	15 Hours	1
II	<b>Finger Print And Facial Recognition Fingerprint:</b> Introduction, Friction ridge pattern- finger print acquisition: sensing techniques, image quality, Feature Extraction, matching, indexing. <b>Face Recognition:</b> Introduction, Image acquisition: 2D sensors, 3D sensors, Face detection, Feature extraction, matching.	15 Hours	1
III	<b>Iris And Other Traits:</b> Design of IRIS recognition system: IRIS segmentation, normalization, encoding and matching, IRIS quality, performance evaluation, other traits, ear detection, ear recognition, gait feature extraction and matching challenges, hand geometry, soft biometrics.	15 Hours	1
IV	<b>Security Governance in a Digital Enterprise:</b> Introduction, Features, classification of behavioral biometrics, properties of behavioral biometrics, signature, keystroke dynamics, voice, merits, demerits, applications, error sources, types, open issues, future trends.	15 Hours	1

**Suggested Readings:**

1. James wayman, Anil k.Jain, Arun A.Ross, Karthik Nandakumar, "Introduction to Biometrics", Springer, 2011.
2. John Vacca, "Biometrics Technologies and Verification Systems", Elsevier 2007.
3. James Wayman, Anil Jain, David MAltoni, DasioMaio(Eds), "Biometrics Systems Technology", Design and Performance Evaluation.Springer 2005 .
4. Khalid Saeed with Marcin Adamski, Tapalina Bhattasali, Mohammed K. Nammous, Piotr panasiuk, mariusz Rybnik and soharab H.Sgaikh, "New Directions in Behavioral Biometrics", CRC Press 2017.

## BCACS1514: Distributed Database Management

### Course Objective:

1. To efficiently execute strategy expressed in a low level language in local databases.
2. To provide a mechanism that makes the distribution of data transparent to users.
3. A series of distributed computers can do the work of much more powerful stand-alone systems, and can even reach processing power and speeds of the fastest supercomputers.

**Learning Outcome:** Students who have successfully completed this course will have understanding of the following concepts:

1. Understand distributed database systems architecture and design.
2. Be able to apply methods and techniques for distributed query processing and optimization. Understand the broad concepts of distributed transaction process.
3. To understand the basic concepts of Data warehousing and OLAP technology.

### Course Contents:

Module	Course Topics	Total Hours	Credits
I	<b>Distributed Data Base:</b> An Overview: Distributed Database Management System, Defining Distributed Database System, Problem Areas, Distributed versus Centralized Database, Levels of Distributed Transparency. <b>Heterogeneity DDBMS Architecture:</b> Client/Server, Peer to peer, Types of Data Fragmentation, Distributed Transparency, Integrity Constraints, Framework for Distributed Database Design, Fragment Allocation.	15 Hours	1
II	<b>Query Transformation &amp; Optimization:</b> Query processing objectives, characterization of query processors, query decomposition, Equivalence Transformation for Queries, Transforming Global Queries into Fragment Queries, Distributed Grouping and Aggregate Function Evaluation, Parametric Queries, centralized query optimization, distributed query optimization Framework for Query Optimization, Join Queries, General Queries.	15 Hours	1
III	<b>Transaction Management &amp; Concurrency control:</b> Framework for Transaction Management, Definition, properties, Transaction Supporting Atomicity. <b>Distributed Concurrency Control:</b> Foundation of Distributed Concurrency Control, Locking based Concurrency Control, Time stamp based Concurrency Control, Distributed Deadlock, Concurrency Control Based on Timestamps.	15 Hours	1

<b>IV</b>	<b>Reliability &amp; Distributed Transaction:</b> Reliability and Concurrency Control, Determining a Consistent View of Network, Detection and Resolution of Inconsistency, Checkpoint and Cold Restart; <b>Distributed Database Administration:</b> Catalog Management in Distributed Database, Authorization and Protection.	15 Hours	1
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**Suggested Readings:**

1. S. Ceri, G. Pelagatti, "Distributed Database: Principles and Systems", McGrawHill, New York, 1985.
2. M. Tamer Ozsu, "Principles of Distributed Database Systems", Pearson Education.
3. Abraham Silberschatz, Henry F. Korth, S. Sudarshan, "Database System Concepts", McGrawHill, 2002
4. David Bell, Jane Grimson, "Distributed Database Systems", Addison-Welley.
5. O. H. Bray, "Distributed Database Management Systems", Lexington Books.
6. W. Draffman & F. Poole, "Distributed Database – An Advance Course", Cambridge University Press.
7. M. T. Ozsu, U Dayal and P. Valduriez (editors), "Distributed Object Management", MorganKaufmann.
8. A. Dogac, M. T. Ozsu, A. Billiris, and T. Sellis (editors), "Advances in Object-Oriented Database System, Springer-Verlag.
9. Chhanda Ray, "Distributed Database System", Pearson, 2009.

## BCACS1551: Digital Image Processing Using MATLAB

Module	Course Topics	Credits
I	<b>Working with Images</b> 1. Image types 2. Importing and exporting images 3. Displaying images 4. Finding image characteristics 5. Converting image formats <b>Applying Image Enhancement Techniques</b> 6. Adjusting image intensity 7. Enhancing images using arithmetic operations 8. Cropping and resizing images <b>Filtering Images</b> 9. Block processing 10. Image convolution and correlation 11. Spatial domain filtering 12. Frequency domain filtering	1
II	<b>Image Restoration Techniques</b> 1. Reducing noise 2. Deblurring images 3. Correcting background illumination <b>Feature Extraction Using Segmentation and Edge Detection</b> 5. Image thresholding 6. Edge detection 7. Transforms 8. Morphological segmentation <b>Image Registration and Image Reconstruction</b> 9. Basics of image registration 10. Basics of object reconstruction 11. Morphological reconstruction	1

## BCA4552: Mobile Application Development Lab

Module	Course Topics	Credits
I	<ol style="list-style-type: none"><li>1. Develop an application that uses GUI components, Font and Colours</li><li>2. Develop an application that uses Layout Managers and event listeners.</li><li>3. Develop a native calculator application.</li><li>4. Write a mobile application that creates alarm clock.</li><li>5. Write an application that draws basic graphical primitives on the screen.</li><li>6. Develop an application that makes use of databases.</li><li>7. Develop an application that makes use of Notification Manager</li></ol>	1
II	<ol style="list-style-type: none"><li>1. Implement an application that uses Multi-threading</li><li>2. Develop a native application that uses GPS location information</li><li>3. Implement an application that writes data to the SD card.</li><li>4. Implement an application that creates an alert upon receiving a message</li><li>5. Write a mobile application that makes use of RSS feed</li><li>6. Develop a mobile application to send an email.</li><li>7. Develop a Mobile application for simple needs (Mini Project)</li></ol>	1