



Bengaluru North University

**National Education Policy - 2020
(NEP-2020)**

Syllabus for Bachelor of Computer Application (B.C.A)

(III & IV Semester)

Submitted to
Registrar
Bengaluru North University
Sri Devaraj Urs Extension
Tamaka, Kolar -563103

Curriculum Design/Syllabus Framing Committee

Sl. No	Name	Designation
1.	Mr. S.Manikandan Assistant Professor, Dept. of Computer Science, Government First Grade College, KR Puram, Bengaluru	Chairperson
2.	Dr. Murugan.K Assistant Professor, Dept. of Computer Science, Govt. College for Women, Kolar.	Member
3.	Dr. Hamela K Assistant Professor, Dept. of Computer Science, Government First Grade College , Malur,	Member
4.	Rashmi Rao K Associate Professor, Dept. of Computer Science, Government First Grade College, KR Puram, Bengaluru	Member
5.	Mr. Sankar Assistant Professor, Dept. of Computer Science, LBS Government First Grade College, RT Nagar, Bengaluru	Member
6.	Dr. Rajendirakumar Assistant Professor, Dept. of Computer Science, Govt. College for Women, Kolar.	Member
7.	Mr. Suresha K V Assistant Professor, Dept. of Computer Science, Government First Grade College, Chikkaballapur.	Member
8.	Mrs. Lakshmi Devi M S Assistant Professor, Dept. of Computer Science, Government First Grade College, Varthur, Bengaluru.	Member

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Curriculum for BCA

Sem	Core Courses	Hour / Week		DS Elective Courses	Hours/ Week
		Theory	Lab		
III	Database Management Systems	3			
	C# and DOT NET Framework	3			
	Computer Communication and Networks	3			
	LAB: DBMS		4		
	LAB: C# and DOT NET Framework		4		
IV	Python Programming	3			
	Computer Multimedia and Animation	3			
	Operating Systems Concepts	3			
	LAB: Multimedia and Animation		4		
	LAB: Python programming		4		

Course Content for BCA, Semesters III and IV

Semester: III

Course Title: Database Management System	Course code: 21BCA3C7L
Total Contact Hours: 42	Course Credits: 03+02
Formative Assessment Marks: 40	Duration of SEE/Exam: 03 Hours
Summative Assessment Marks: 60	

Course Outcomes (COs):

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

- Explain the various database concepts and the need for database systems.
- Identify and define database objects, enforce integrity constraints on a database using DBMS.
- Demonstrate a Data model and Schemas in RDBMS.
- Identify entities and relationships and draw ER diagram for a given real-world problem.
- Convert an ER diagram to a database schema and deduce it to the desired normal form.
- Formulate queries in Relational Algebra, Structured Query Language (SQL) for database manipulation.
- Explain the transaction processing and concurrency control techniques.

DSC7: Database Management System (DBMS)

Unit	Description	Hours
1	Database Architecture: Introduction to Database system applications. Characteristics and Purpose of database approach. People associated with Database system. Data models. Database schema. Database architecture. Data independence. Database languages, interfaces, and classification of DBMS.	08
2	E-R Model: Entity-Relationship modeling: E – R Model Concepts: Entity, Entity types, Entity sets, Attributes, Types of attributes, key attribute, and domain of an attribute. Relationships between the entities. Relationship types, roles and structural constraints, degree and cardinality ratio of a relationship. Weak entity types, E -R diagram.	08
3	Relational Data Model: Relational model concepts. Characteristics of relations. Relational model constraints: Domain constraints, key constraints, primary & foreign key constraints, integrity constraints and null values.	10

	Relational Algebra: Basic Relational Algebra operations. Set theoretical operations on relations. JOIN operations Aggregate Functions and Grouping. Nested Sub Queries-Views. Introduction to PL/SQL & programming of above operations in PL/SQL	
4	Data Normalization: Anomalies in relational database design. Decomposition. Functional dependencies. Normalization. First normal form, Second normal form, Third normal form. Boyce-Codd normal form.	07
5	Query Processing Transaction Management: Introduction Transaction Processing. Single user & multiuser systems. Transactions: read & write operations. Need of concurrency control: The lost update problem, Dirty read problem. Types of failures. Transaction states. Desirable properties (ACID properties) of Transactions. Concurrency Control Techniques: Locks and Time stamp Ordering. Deadlock & Starvation.	09

References:

1. Fundamentals of Database Systems, Ramez Elamassri, Shankant B. Navathe, 7th Edition, Pearson, 2015
2. An Introduction to Database Systems, Bipin Desai, Galgotia Publications, 2010.
3. Introduction to Database System, C J Date, Pearson, 1999.
4. Database Systems Concepts, Abraham Silberschatz, Henry Korth, S.Sudarshan, 6th Edition, McGraw Hill, 2010.
5. Database Management Systems, Raghu Rama Krishnan and Johannes Gehrke, 3rd Edition, McGraw Hill, 2002

Practical's:

Student would be able to create tables, execute queries and PL/SQL programs.

1. Execute a single line query and group functions.
2. Execute DDL Commands.
3. Execute DML Commands
4. Execute DCL and TCL Commands.
5. Implement the Nested Queries.
6. Implement Join operations in SQL
7. Create views for a particular table
8. Implement Locks for a particular table
9. Write PL/SQL procedure for an application using exception handling.
10. Write PL/SQL procedure for an application using cursors.
11. Write a PL/SQL procedure for an application using functions
12. Write a PL/SQL procedure for an application using package

Course Title: C# and Dot Net Framework	Course code: 21BCA3C8L
Total Contact Hours: 42	Course Credits: 03+02
Formative Assessment Marks: 40	Duration of SEE/Exam: 03 Hours
Summative Assessment Marks: 60	

Course Outcomes (COs):

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

- Describe Object Oriented Programming concepts like Inheritance and Polymorphism in C# programming language.
- Interpret and Develop Interfaces for real-time applications.
- Build custom collections and generics in C#.

DSC8: C# and Dot Net Framework

Unit	Description	Hours
1	Introduction to .Net Technologies: Introduction to Web Technologies. HTML Basics, Scripts. Sample Programs. Advantages and Disadvantages of Client-side and Server-side Scripts. Overview of Client-side Technologies and Server-side Technologies.	08
2	Introduction to C#: Overview of C#, Literals, Variables, Data Types, Operators, Expressions, Control Structures-Methods, Arrays, Strings, Structures, Enumerations. OOPS with C#: Classes, Objects, Inheritance, Polymorphism, Interfaces, Operator Overloading Delegates, Events, Errors and Exceptions.	08
3	Introduction to VB.NET: Introduction VB.NET -IDE – Creating a shortcut to start VB.NET. Maneuverings the Toolbar Auto-hide, Docking and Undocking, Placing and Resizing the Windows, Forms, Properties Window and Solution Explorer. Writing and Event Procedure. Execution Basic Keywords. Data Types. VB.NET statements. Conditional statements: If Else, Select Case, Switch and Choose Loops: Do, For Next, For Each Next, While loop. Arrays.	08
4	Application Development on .NET: C#.NET: Building Windows Applications, VB.NET: Windows Forms. Working with Controls, Timer, Picture-box, Group-box, Combo-box, Horizontal and Vertical Scrollbar, Numeric-up-down, Track-bar, and Progress-bar. Subroutines and Functions in VB.NET. Database applications	10
5	ADO .NET Connectivity: Introduction to ADO.NET, ADO vs ADO.NET. Architecture: Data reader, Data adopter, Accessing Data with ADO.NET. Programming Web Applications with Web Forms. ASP .NET applications with ADO.NET	08

References:

1. "Programming in C#", E. Balagurusamy, 4th Edition, Tata McGraw-Hill, 2017.
2. "Visual Basic.NET", Shirish Chavan, 3rd Edition, Pearson Education, 2009.
3. "ASP.NET and VB.NET Web Programming", Matt J. Crouch, Edition 2012.
4. "Computing with C# and the .NET Framework", Arthur Gittleman, 2nd Edition, Jones & Bartlett Publishers, 2011

Practicals:

1. Develop a C# .NET console application to demonstrate the conditional statements.
2. Develop a C# .NET console application to demonstrate the control statements.
3. Develop an application in C#.NET that demonstrates the windows controls
4. Demonstrate Multithreaded Programming in C#.NET
5. Demonstrate subroutines and functions in C#.NET
6. Develop an application for deploying various built-in functions in VB.NET
7. Develop an MDI application for Employee Pay-roll transactions in VB.NET
8. Construct a console application to demonstrate the OOP Concepts
9. Develop a web application in VB.NET for dynamic Login Processing
10. Develop a Windows application with database connectivity for core-banking transactions

Course Title: Computer Communication and Networks	Course code: 21BCA3C9L
Total Contact Hours: 42	Course Credits: 03
Formative Assessment Marks: 40	Duration of SEE/Exam: 03 Hours
Summative Assessment Marks: 60	

Course Outcomes (COs):

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

- Explain the transmission technique of digital data between two or more computers and a computer network that allows computers to exchange data.
- Apply the basics of data communication and various types of computer networks in real world applications.
- Compare the different layers of protocols.
- Compare the key networking protocols and their hierarchical relationship in the conceptual model like TCP/IP and OSI.

DSC9: Computer Communication and Networks

Unit	Description	Hours
1	Introduction: Computer Networks and its applications, Network structure, network architecture, Topologies, LAN, WAN, MAN, The OSI reference model, The TCP/IP reference model.	08
2	The Physical Layer: Transmission Media – Twisted pair, coaxial cable, optical fiber, radio transmission, microwaves and infrared transmission, Switching – message switching, Multiplexing.	07
3	The Data Link Layer: Data Link Layer design issues, Error detection – Single parity checking, Checksum, polynomial codes – CRC, Error correction- Hamming code, Elementary data link protocols, sliding window protocols	08
4	The Network Layer: Network layer design issues, Routing algorithms – Flooding, Distance vector routing, Hierarchical routing, Link state routing, Congestion, control algorithms – Leaky bucket, token bucket algorithm, admission control, Hop by Hop choke packets.	09
5	The Transport Layer and Application Layer: Elements of Transport service, Elements of Transport, protocols, Internet transport protocols (TCP & UDP), DNS, Electronic Mailing, and World Wide Web.	10

References:

1. Computer Networks, Andrew S. Tanenbaum, 5th Edition, Pearson Education, 2010.
2. Data Communication & Networking, Behrouza A Forouzan, 3rd Edition, Tata McGraw

Hill,2001.

3. Data and Computer Communications, William Stallings, 10th Edition, Pearson Education, 2017.
4. Data Communication and Computer Networks, Brijendra Singh, 3rd Edition, PHI, 2012.
5. Data Communication & Network, Dr. Prasad, Wiley Dreamtech.
6. <http://highered.mheducation.com/sites/0072967757/index.html>

Semester: IV

Course Title: Python Programming	Course code: 21BCA3C10L
Total Contact Hours: 42	Course Credits: 03+02
Formative Assessment Marks: 40	Duration of SEE/Exam: 03 Hours
Summative Assessment Marks: 60	

Course Outcomes (COs):**At the end of the course, students will be able to:**

- Explain the basic concepts of Python Programming.
- Demonstrate proficiency in the handling of loops and creation of functions.
- Identify the methods to create and manipulate lists, tuples and dictionaries.
- Discover the commonly used operations involving file handling.
- Interpret the concepts of Object-Oriented Programming as used in Python.
- Develop the emerging applications of relevant fields using Python.

DSC10: Python Programming

Unit	Description	Hours
1	Introduction to Features and Applications of Python; Python Versions; Installation of Python; Python Command Line mode and Python IDEs; Simple Python Program. Python Basics: Identifiers; Keywords; Statements and Expressions; Variables; Operators; Precedence and Association; Data Types; Indentation; Comments; Built-in Functions- Console Input and Console Output, Type Conversions; Python Libraries; Importing Libraries with Examples. Python Control Flow: Types of Control Flow; Control Flow Statements- if, else, elif, while loop, break, continue statements, for loop Statement; range () and exit () functions.	08
2	Exception Handling: Types of Errors; Exceptions; Exception Handling using try, except and finally. Python Functions: Types of Functions; Function Definition- Syntax, Function Calling, Passing Parameters/arguments, the return statement; Default Parameters; Command line Arguments; Key Word Arguments; Recursive Functions; Scope and Lifetime of Variables in Functions. Strings: Creating and Storing Strings; Accessing Sting Characters; the str() function; Operations on Strings- Concatenation, Comparison, Slicing and Joining, Traversing; Format Specifiers; Escape Sequences; Raw and Unicode Strings; Python String Methods.	08
3	Lists: Creating Lists; Operations on Lists; Built-in Functions on Lists; Implementation of Stacks and Queues using Lists; Nested Lists. Dictionaries: Creating Dictionaries; Operations on Dictionaries; Built-in Functions on Dictionaries; Dictionary Methods; Populating and Traversing Dictionaries. Tuples and Sets: Creating Tuples; Operations on Tuples; Built-in Functions	08

	on Tuples; Tuple Methods; Creating Sets; Operations on Sets; Built-in Functions on Sets; Set Methods.	
4	<p>File Handling: File Types; Operations on Files– Create, Open, Read, Write, Close Files; File Names and Paths; Format Operator.</p> <p>Object Oriented Programming: Classes and Objects; Creating Classes and Objects; Constructor Method; Classes with Multiple Objects; Objects as Arguments; Objects as Return Values; Inheritance- Single and Multiple Inheritance, Multilevel and Multipath Inheritance; Encapsulation- Definition, Private Instance Variables; Polymorphism- Definition, Operator Overloading.</p>	08
5	<p>GU Interface: The tkinter Module; Window and Widgets; Layout Management- pack, grid and place.</p> <p>Python SQLite: The SQLite3 module; SQLite Methods- connect, cursor, execute, close; Connect to Database; Create Table; Operations on Tables- Insert, Select, Update. Delete and Drop Records.</p> <p>Data Analysis: NumPy- Introduction to NumPy, Array Creation using NumPy, Operations on Arrays; Pandas- Introduction to Pandas, Series and DataFrames, Creating DataFrames from Excel Sheet and .csv file, Dictionary and Tuples. Operations on DataFrames.</p> <p>Data Visualisation: Introduction to Data Visualisation; Matplotlib Library; Different Types of Charts using Pyplot- Line chart, Bar chart and Histogram and Pie chart.</p>	10

References:

1. Think Python How to Think Like a Computer Scientist, Allen Downey et al., 2nd Edition, Green Tea Press. Freely available online @ <https://www.greenteapress.com/thinkpython/thinkCSpy.pdf>, 2015.
2. Introduction to Python Programming, Gowrishankar S et al., CRC Press, 2019.
3. Python Data Analytics: Data Analysis and Science Using Pandas, matplotlib, and the Python Programming Language, Fabio Nelli, Apress®, 2015
4. Advance Core Python Programming, MeenuKohli, BPB Publications, 2021.
5. Core PYTHON Applications Programming, Wesley J. Chun, 3rd Edition, Prentice Hall 2012.
6. Automate the Boring Stuff, Al Sweigart, No Starch Press, Inc, 2015.
7. Data Structures and Program Design Using Python, D Malhotra et al., Mercury Learning and Information LLC, 2021.
8. <http://www.ibiblio.org/g2swap/byteofpython/read/>
9. <https://docs.python.org/3/tutorial/index.html>

Programs for Practical Component:

Part-A

1. Check if a number belongs to the Fibonacci Sequence
2. Solve Quadratic Equations
3. Find the sum of n natural numbers
4. Display Multiplication Tables
5. Check if a given number is a Prime Number or not
6. Implement a sequential search
7. Create a calculator program
8. Explore string functions

9. Implement Selection Sort
10. Implement Stack
11. Read and write into a file

Part-B

1. Demonstrate usage of basic regular expression
2. Demonstrate use of advanced regular expressions for data validation.
3. Demonstrate use of List
4. Demonstrate use of Dictionaries
5. Create SQLite Database and Perform Operations on Tables
6. Create a GUI using Tkinter module
7. Demonstrate Exceptions in Python
8. Drawing Line chart and Bar chart using Matplotlib
9. Drawing Histogram and Pie chart using Matplotlib
10. Create Array using NumPy and Perform Operations on Array
11. Create DataFrame from Excel sheet using Pandas and Perform Operations on DataFrames

Note: A minimum of 10 Programs should be done in each Part.

Evaluation Scheme for Lab Examination:

Assessment Criteria		Marks
Program – 1 from Part A	Writing the Program	03
	Execution and Formatting	07
Program -2 from Part B	Writing the Program	03
	Execution and Formatting	07
Viva Voice based on Python Programming		05
Total		25

Course Title: Computer Multimedia & Animation	Course code: 21BCA3C11L
Total Contact Hours: 42	Course Credits: 03+02
Formative Assessment Marks: 40	Duration of SEE/Exam: 03 Hours
Summative Assessment Marks: 60	

Course Outcomes (COs):

At the end of the course the student should be able to:

- Understand basic elements using in web development
- Understand and develop animations using CSS
- Understand and develop HTML5-SVG animation

- Understand and develop HTML5-CANVAS animations

DSC11: Computer Multimedia & Animation

Unit	Description	Hours
1	Web Design: Origins and evolution of HTML, Basic syntax, Basic text markup, Images, Lists, Tables, Forms, Frame, Overview and features of HTML5. CSS: Introduction, Levels of style sheets, Style specification formats, Selector forms, Property value forms, Font properties, List properties, Color, Alignment of text, The and <div> tags; Overview and features of CSS3. JavaScript: Object orientation and JavaScript; General syntactic characteristics; Primitives, operations, and expressions; Screen output and keyboard input.	10
2	Animation: What is an Animation? The Start and End States, Interpolation, Animations in HTML. All About CSS Animations, Creating a Simple Animation, Detailed Look at the CSS Animation Property, Keyframes, Declaring Multiple Animations, Wrap-up. All About CSS Transitions, Adding a Transition, Looking at Transitions in Detail, The Longhand Properties, Longhand Properties vs. Shorthand Properties, Working with Multiple Transitions.	09
3	HTML5 – SVG: Viewing SVG Files, Embedding SVG in HTML5, HTML5 – SVG Circle, HTML5 – SVG Rectangle, HTML5 – SVG Line, HTML5 – SVG Ellipse, HTML5 – SVG Polygon, HTML5 – SVG Polyline, HTML5 – SVG Gradients, HTML5 – SVG Star.	08
4	HTML5 – CANVAS: The Rendering Context, Browser Support, HTML5 Canvas Examples, Canvas - Drawing Rectangles, Canvas - Drawing Paths, Canvas - Drawing Lines, Canvas - Drawing Bezier Curves, Canvas - Drawing Quadratic Curves, Canvas - Using Images, Canvas - Create Gradients,	08
5	HTML5 - Styles and Colors, Canvas - Text and Fonts, Canvas - Pattern and Shadow, Canvas - Save and Restore States, Canvas - Translation, Canvas - Rotation, Canvas - Scaling, Canvas - Transforms, HTML5 Canvas - Composition, Canvas – Animations.	07

References:

1. The Complete Reference HTML and CSS, 5th Edition, Thomas A Powell, 2017.
2. Animation in HTML, CSS, and JavaScript, Kirupa Chinnathambi, 1st Edition, Createspace Independent Pub, 2013.
3. <https://www.w3.org/Style/CSS/current-work#CSS3>
4. <http://bedford-computing.co.uk/learning/cascading-style-sheets-css/>

Practicals

Part A:

- 1) Write a HTML/5 program to demonstrate the use of Font family, font variant, font style, and font size.
- 2) Write a HTML/5 program to display random contents using list properties:
 - a) Ordered list b) Unordered list
- 3) Write a HTML/5 program to create gradient using CSS.
- 4) Write a HTML/5 code to demonstrate following CSS animation properties:
 - a) Delay b) Direction c) Duration
- 5) Write a HTML/5 program to demonstrate key frames
- 6) Write a HTML/5 code to demonstrate CSS transition and transformation.
- 7) Write a HTML/5 program to turn on/off a light bulb using JavaScript. Make use of .gif image and buttons.

Part B:

- 1) Write a HTML/5 program to draw rectangle, line, polygon, polyline using SVG.
- 2) Write a HTML/5 program to draw linear and radial gradient ellipse using SVG.
- 3) Write a HTML/5 program to draw a star using SVG.
- 4) Write a HTML/5 program to draw line, circle, rectangle, gradient, text using canvas.
- 5) Write a HTML/5 program to demonstrate translation, rotation, scaling, and transform using canvas.
- 6) Write a HTML/5 program to demonstrate Bezier Curves and Quadratic Curves.
- 7) Write a HTML/5 program to create canvas and add a red square onto the game area with up/down/left/right controller buttons.
- 8) Write a HTML/5 canvas program to add random size obstacles with red square controller button.

Evaluation Scheme for Lab Examination

Assessment Criteria		Marks
Program – 1 from Part A	Writing the Program	3
	Execution and Formatting	7
Program – 2 from Part B	Writing the Program	3
	Execution and Formatting	7
Viva Voice based on Lab Activities		5
Total		25

Course Title: Operating System Concepts	Course code: 21BCA3C12L
Total Contact Hours: 42	Course Credits: 03
Formative Assessment Marks: 40	Duration of SEE/Exam: 03 Hours
Summative Assessment Marks: 60	

Course Outcomes (COs):

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

- Explain the fundamentals of the operating system.
- Comprehend multithreaded programming, process management, process synchronization, memory management and storage management.
- Compare the performance of Scheduling Algorithms
- Identify the features of I/O and File handling methods.

DSC12: Operating System Concepts

Unit	Description	Hours
1	Introduction to Operating System: Definition, History and Examples of Operating System; Computer System organization; Types of Operating Systems; Functions of Operating System; Systems Calls; Operating System Structure. Process Management: Process Concept- Process Definition, Process State, Process Control Block, Threads; Process scheduling- Multiprogramming, Scheduling Queues, CPU Scheduling, Context Switch; Operations on Processes- Creation and Termination of Processes; Inter process communication (IPC)- Definition and Need for Inter process Communication; IPC Implementation Methods- Shared Memory and Message Passing;	08
2	Multithreaded Programming: Introduction to Threads; Types of Threads; Multithreading- Definition, Advantages; Multithreading Models; Thread Libraries; Threading Issues. CPU Scheduling: Basic concepts; Scheduling Criteria; Scheduling Algorithms; Multiple-processor scheduling; Thread scheduling; Multiprocessor Scheduling; Real-Time CPU Scheduling.	10
3	Process Synchronization: Introduction; Race Condition; Critical Section Problem and Peterson's Solution; Synchronization Hardware, Semaphores; Classic Problems of Synchronization- Readers and Writers Problem, Dining Philosophers Problem; Monitors. Deadlocks: System Model; Deadlocks Characterization; Methods for Handling Deadlocks; Deadlock Prevention; Deadlock Avoidance; Deadlock Detection; and Recovery from Deadlock.	10

4	<p>Memory Management: Logical and Physical Address Space; Swapping; Contiguous Allocation; Paging; Segmentation; Segmentation with Paging.</p> <p>Virtual Memory: Introduction to Virtual Memory; Demand Paging; Page Replacement; Page Replacement Algorithms; Allocation of frames, Thrashing.</p>	08
5	<p>File System: File Concepts- Attributes, Operations and Types of Files; File System; File Access methods; Directory Structure; Protection; File System Implementation- File System Structure, Allocation Methods, Free Space Management</p>	06

References:

1. Operating System Concepts, Silberschatz' et al., 10th Edition, Wiley, 2018.
2. Operating System Concepts - Engineering Handbook, Ghosh PK, 2019.
3. Understanding Operating Systems, McHoes A et al., 7th Edition, Cengage Learning, 2014.
4. Operating Systems - Internals and Design Principles, William Stallings, 9th Edition, Pearson.
5. Operating Systems – A Concept Based Approach, Dhamdhere, 3rd Edition, McGraw Hill Education India.
6. Modern Operating Systems, Andrew S Tanenbaum, 4th Edition, Pearson.

(Skill Enhancement Course: SEC for BCA Course)

Semester: III

Course Title: Open Source Tools	Course Credits: 2 (1L+0T+2P)
Semester: III	Duration of SEE: 01 Hour
Total Contact Hours: 13 hours of theory and 26-28 hours of practical's	SEE: 30 Marks IA: 20 Marks

Course Outcomes (COs):

- Recognize the benefits and features of Open Source Technology and to interpret, contrast and compare open source products among themselves
- Use appropriate open source tools based on the nature of the problem
- Write code and compile different open-source software.

Course Content (Open Source Tools)

Module	Details of topic	Duration
Module 1: Open Source Softwares	i. Introduction to Open sources, Need of Open Sources, Open Source –Principles, Standard Requirements, Advantages of Open Sources – ii. Free Software – FOSS iii. Licenses – GPL, LGPL, Copyrights, Patents, Contracts & Licenses and Related Issues iv. Application of Open Sources. Open Source Operating Systems : FEDORA, UBUNTU	05 hours
Module 2: Programing Tools And Techniques	i. Usage of design Tools like Argo UML or equivalent ii. Version Control Systems like Git or equivalent iii. Bug Tracking Systems (Trac, BugZilla) iv. BootStrap	04 hours
Module 3: Case Studies	i. Apache ii. Berkeley Software Distribution iii. Mozilla (Firefox) iv. Wikipedia v. Joomla vi. GNU Compiler Collection vii. Libre Office	04 hours

Text Book:

1. KailashVadera, Bhavyesh Gandhi, “Open Source Technology”, Laxmi Publications Pvt. Ltd 2012, 1st Edition.

Reference Book:

1. Fadi P. Deek and James A. M. McHugh, “Open Source: Technology and Policy”, Cambridge Universities Press 2007.

Open Elective for III & IV Semester

Python Programming Concepts

Course Title: Python Programming Concepts	Course Credits: 3 (3L+0T+0P)
Semester: III	Duration of SEE: 03 Hour
Total Contact Hours: 42	SEE: 60 Marks IA: 40 Marks

Course Outcomes (COs):

- Explain the fundamentals of Computers.
- Explain the basic concepts of Python Programming.
- Demonstrate proficiency in the handling of loops and the creation of functions.
- Identify the methods to create and store strings.

Unit I Fundamentals of Computers

10 Hrs

Introduction to Computers - Computer Definition, Characteristics of Computers, Evolution and History of Computers, Types of Computers, Basic Organization of a Digital Computer; Number Systems – different types, conversion from one number system to another; Computer Codes – BCD, Gray Code, ASCII and Unicode; Boolean Algebra – Boolean Operators with Truth Tables; Types of Software – System Software and Utility Software; Computer Languages - Machine Level, Assembly Level & High Level Languages, Translator Programs – Assembler, Interpreter and Compiler; Planning a Computer Program - Algorithm, Flowchart and Pseudo code with Examples.

Unit II Python Basics

10 Hrs

Introduction to Features and Applications of Python; Python Versions; Installation of Python; Python Command Line mode and Python IDEs; Simple Python Program. Identifiers; Keywords; Statements and Expressions; Variables; Operators; Precedence and Association; Data Types; Indentation; Comments; Built-in Functions- Console Input and Console Output, Type Conversions; Python Libraries; Importing Libraries with Examples; Illustrative programs.

Unit III

08 Hrs

Python Control Flow: Types of Control Flow; Control Flow Statements- if, else, elif, while loop, break, continue statements, for loop Statement; range() and exit () functions; Illustrative programs.

Unit IV

08 Hrs

Python Functions: Types of Functions; Function Definition- Syntax, Function Calling, Passing Parameters/arguments, the return statement; Default Parameters; Command line Arguments; Key Word Arguments; Illustrative programs.

Unit V

06 Hrs

Strings: Creating and Storing Strings; Accessing Sting Characters; the str() function; Operations on Strings- Concatenation, Comparison, Slicing and Joining, Traversing; Format Specifiers; Escape Sequences; Raw and Unicode Strings; Python String Methods; Illustrative programs.

References

1. Computer Fundamentals (BPB), P. K. Sinha & Priti Sinha
2. Think Python How to Think Like a Computer Scientist, Allen Downey et al., 2nd Edition, Green Tea Press. Freely available online 2015.
@<https://www.greenteapress.com/thinkpython/thinkCSPy.pdf>
3. Introduction to Python Programming, Gowrishankar S et al., CRC Press, 2019.
4. <http://www.ibiblio.org/g2swap/byteofpython/read/>
5. http://scipy-lectures.org/intro/language/python_language.html
6. <https://docs.python.org/3/tutorial/index.html>

Open Elective

PRINCIPLES OF INTERNET

Course Title: PRINCIPLES OF INTERNET	Course Credits: 3 (3L+0T+0P)
Semester: IV	Duration of SEE: 03 Hour
Total Contact Hours: 42	SEE: 60 Marks IA: 40 Marks

Course Outcomes (COs):

- Able to explain understand the internet standards and recent web technologies like Conferencing, newsgroup etc.
- Able to implement, compile, test and run HTML program
- Able to explain understand web Browsers.

UNIT I

09 Hrs

Basics of Networks – Advantages and disadvantages- Types of networks - LAN, WAN, MAN - Topologies of Networks – Bus Topology, Ring Topology, Star Topology, Mesh Topology, Tree Topology.

UNIT II

06 Hrs

Internet Basics – Advantages and disadvantages – Internet Applications
– IP Address- Internet Services– URL- E-mail - E-mail features – Emil Providers.

UNIT III

09 Hrs

Introduction to Internet Protocol –TCP –UDP-FTP – The Telnet –The Usenet – Internet Chat.

UNIT IV

09 Hrs

WWW Overview – Web pages -The Web Servers – Web Browsers– Search Engines-
Introduction to Firewalls – Uses of Firewalls – Types of Firewalls.

UNIT V

09 Hrs

Art of creating a website – Hypertext and HTML – Features – Elements – Attributes- Structure of HTML– Basic tags in HTML – Formatting tags in HTML – HTML Lists –Types of Lists.

Text Book:

1. Raj Kamal , “Internet and Web Technologies”, Mc GrawHill Education,2007.

References:

1. Joe krayank & Joe Habraken, “Internet 6 in 1”, Prentice Hall of India Private Limited, New Delhi, 1998.
2. “Internet Complete”, BPB publications, New Delhi, 1998.



Bengaluru North University

**National Education Policy - 2020
(NEP-2020)**

Syllabus for Bachelor of Computer Applications (B.C.A)

(V & VI Semester)

Submitted to
Registrar
Bengaluru North University
Sri Devaraj Urs Extension
Tamaka, Kolar -563103

Curriculum Design/Syllabus Framing Committee
Proceeding of BOS Meeting in Computer Science and BCA

The meeting of BOS in Computer Science and BCA was held at Government First Grade College ,KR Puram, Bengaluru-36 On 17.08.2023 and 18.08.2023 at 11.00 am.

The chairman welcomed all the members and requested them to discuss the agenda.




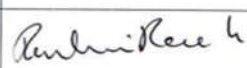



Agenda :

Finalizing and approving the B.Sc Computer Science and BCA syllabus (DSC, Elective, Vocational and SEC) for V and VI semester to introduced at Undergraduate course for the academic year 2023-24.

Decision:

The BOS Members discussed in detail regarding Computer Science and BCA subject and approved the same V and VI semester syllabus for the academic year 2023-24.

The following BOS members were present

Sl. No	Name	Designation	Signature
1.	Mr. S.Manikandan Assistant Professor, Dept. of Computer Science, Government First Grade College, KR Puram, Bengaluru .	Chairperson	
2.	Dr. Murugan.K Assistant Professor, Dept. of Computer Science, Government First Grade College, KR Puram, Bengaluru .	Member	
3.	Dr. Hamela K Assistant Professor, Dept. of Computer Science, Government First Grade College , Malur.	Member	
4.	Rashmi Rao K Associate Professor, Dept. of Computer Science, Government First Grade College, Hoskote.	Member	
5.	Mr. Sankar Assistant Professor, Dept. of Computer Science, LBS Government First Grade College, RT Nagar, Bengaluru	Member	
6.	Dr. Rajendirakumar Assistant Professor, Dept. of Computer Science, Govt. College for Women, Kolar.	Member	
7.	Mrs. Lakshmi Devi M S Assistant Professor, Dept. of Computer Science, Government First Grade College, Varthur, Bengaluru.	Member	

The meeting was concluded with vote of thanks by chairman.



S.Manikandan
Chairperson
BOS-UG Computer Science & BCA(NEP)
Bengaluru North University, Kolar.

Curriculum Structure

Program: B.C.A

Subject: Computer Science

Curriculum for BCA

Semester	Course No.	Theory/ Practical	Credits	Paper Title	Marks	
					S.A.	I.A.
V	DSC13	Theory	4	Design & Analysis of Algorithms	60	40
	DSC13-Lab	Practical	2	Design & Analysis of Algorithms Lab	25	25
	DSC14	Theory	4	Statistical Computing and R Programming	60	40
	DSC14-Lab	Practical	2	R Programming Lab	25	25
	DSC15	Theory	4	Software Engineering	60	40
	DSE-E1	Theory	3	A. Cloud Computing B. Business Intelligence	60	40
	Voc-1	Theory	3	Digital Marketing	60	40
	SEC-4	Theory/Practical	2	Cyber Security	30	20
VI	DSC16	Theory	4	Artificial Intelligence and Applications	60	40
	DSC17	Theory	4	PHP and MySQL	60	40
	DSC17-Lab	Practical	2	PHP and MySQL Lab	25	25
		Project	6	Project Work		
	DSE-E2	Theory	3	A. Fundamentals of Data Science B. Mobile Application Development	60	40
	Voc-2	Theory	3	Web Content Management System	60	40
	SEC-5	Theory/Practical	2	Logical Reasoning	30	20

Program Name	BCA	Semester	V
Course Title	Design and Analysis of Algorithm (Theory)		
Course Code:	DSC13	No. of Credits	04
Contact hours	52 Hours	Duration of SEA/Exam	2:30 hours
Formative Assessment Marks	40	Summative Assessment Marks	60

Course Outcomes (COs): After the successful completion of the course, the student will be able to:

CO1. Understand the fundamental concepts of algorithms and their complexity, including time and space complexity, worst-case and average-case analysis, and Big-O notation. BL (L1, L2)

CO2. Design algorithms for solving various types of problems, such as Sorting, Searching, Graph traversal, Decrease-and-Conquer, Divide-and-Conquer and Greedy Techniques. BL (L1, L2, L3)

CO3. Analyze and compare the time and space complexity of algorithms with other algorithmic techniques. BL (L1, L2, L3, L4)

CO4. Evaluate the performance of Sorting, Searching, Graph traversal, Decrease-and-Conquer, Divide-and-Conquer and Greedy Techniques using empirical testing and benchmarking, and identify their limitations and potential improvements. BL (L1, L2, L3, L4)

CO5. Apply various algorithm design to real-world problems and evaluate their effectiveness and efficiency in solving them. BL (L1, L2, L3)

Note: Blooms Level(BL): L1=Remember, L2=Understand, L3=Apply, L4=Analyze, L5= Evaluate, L6= Create

Contents	52 Hrs
Introduction: What is an Algorithm? Fundamentals of Algorithmic problem solving, Fundamentals of the Analysis of Algorithm Efficiency, Analysis Framework, Measuring the input size, Units for measuring Running time, Orders of Growth, Worst-case, Best-case and Average-case efficiencies.	10
Asymptotic Notations and Basic Efficiency classes, Informal Introduction, O-notation, Ω -notation, θ -notation, mathematical analysis of non-recursive algorithms, mathematical analysis of recursive algorithms.	10
Brute Force & Exhaustive Search: Introduction to Brute Force approach, Selection Sort and Bubble Sort, Sequential search, Exhaustive Search- Travelling Salesman Problem and Knapsack Problem, Depth First Search, Breadth First Search	11
Decrease-and-Conquer: Introduction, Insertion Sort, Topological Sorting Divide-and-Conquer: Introduction, Merge Sort, Quick Sort, Binary Search, Binary Tree traversals and related properties.	11
Greedy Technique: Introduction, Prim's Algorithm, Kruskal's Algorithm, Dijkstra's Algorithm, Lower-Bound Arguments, Decision Trees, P Problems, NP Problems, NP-Complete Problems, Challenges of Numerical Algorithms.	10

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs 1-15)

Course Outcomes (COs) / Program Outcomes (POs)	Program Outcomes (POs)														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Discuss the fundamentals of the algorithms.															
Describe the analysis of algorithm efficiency using different notations.															
Discuss various problems using Brute force technique.															
Describe various problems using Divide and-Conquer Technique.															
Describe various problems using Decrease-and-Conquer.															
Discuss Greedy Techniques.															
Devise an algorithm using appropriate design strategies for problem solving.															
Estimate the computational complexity of different algorithms.															
Demonstrate the hardness of simple NP-complete problems.															

Pedagogy: Lecture/ PPT/ Videos/ Animations/ Role Plays/ Think-Pair-Share/ Predict-Observe-Explain/ Demonstration/ Concept mapping/ Case Studies examples/ Tutorial/ Activity/ Flipped Classroom/ Jigsaw/ Field based Learning/ Project Based Learning/ Mini Projects/ Hobby Projects/ Forum Theatre/ Dance/ Problem Based Learning/ Game Based Learning/ Group Discussion/ Collaborative Learning/ Experiential Learning / Self Directed Learning etc.

Formative Assessment for Theory	
Assessment Occasion/ type	Marks
Internal Assessment Test 1	10%
Internal Assessment Test 2	10%
Quiz/ Assignment/ Small Project	10%
Seminar	10%
Total	40 Marks
<i>Formative Assessment as per guidelines.</i>	

Course Title	Design and Analysis of Algorithms Laboratory (Practical)	Practical Credits	02
Course Code	DSC13-Lab	Contact Hours	4 Hours/wk
Formative Assessment	25 Marks	Summative Assessment	25 Marks

Practical Content

1. Write a program to sort a list of N elements using Selection Sort Technique.
2. Write a program to perform Travelling Salesman Problem
3. Write program to implement Dynamic Programming algorithm for the 0/1 Knapsack problem.
4. Write a program to perform Knapsack Problem using Greedy Solution
5. Write program to implement the DFS and BFS algorithm for a graph.
6. Write a program to find minimum and maximum value in an array using divide and conquer.
7. Write a test program to implement Divide and Conquer Strategy. Eg: Quick sort algorithm for sorting list of integers in ascending order.
8. Write a program to implement Merge sort algorithm for sorting a list of integers in ascending order.
9. Sort a given set of n integer elements using Merge Sort method and compute its time complexity. Run the program for varied values of $n > 5000$, and record the time taken to sort.
10. Sort a given set of n integer elements using Quick Sort method and compute its time complexity. Run the program for varied values of $n > 5000$ and record the time taken to sort.
11. Write C program that accepts the vertices and edges for a graph and stores it as an adjacency matrix.
12. Implement function to print In-Degree, Out-Degree and to display that adjacency matrix.
13. Write program to implement backtracking algorithm for solving problems like N queens .
14. Write a program to implement the backtracking algorithm for the sum of subsets problem
15. Write program to implement greedy algorithm for job sequencing with deadlines.
16. Write program to implement Dynamic Programming algorithm for the Optimal Binary Search Tree Problem.
17. Write a program that implements Prim's algorithm to generate minimum cost spanning Tree.
18. Write a program that implements Kruskal's algorithm to generate minimum cost spanning tree.

Pedagogy: Demonstration, Hands-on, Simulation

Formative Assessment for Practical	
Assessment Occasion/ type	Marks
Total	25 Marks
<i>Formative Assessment as per guidelines.</i>	

References

1	Introduction to the Design and Analysis of Algorithms, Anany Levitin: 2nd Edition, 2009, Pearson.
2	Computer Algorithms/C++, Ellis Horowitz, SatrajSahni and Rajasekaran, 2nd Edition, 2014, Universities Press.
3	Introduction to Algorithms, Thomas H. Cormen, Charles E. Leiserson, Ronal L. Rivest, Clifford Stein, 3rd Edition, PHI.
4	Design and Analysis of Algorithms, S. Sridhar, Oxford (Higher Education)
5	Weblinks and Video Lectures (e-Resources): http://elearning.vtu.ac.in/econtent/courses/video/CSE/06CS43.html https://nptel.ac.in/courses/106/101/106101060/ http://elearning.vtu.ac.in/econtent/courses/video/FEP/ADA.html http://cse01-iiith.vlabs.ac.in/ http://openclassroom.stanford.edu/MainFolder/CoursePage.php?course=IntroToAlgorithms

Program Name	BCA	Semester	V
Course Title	Statistical Computing & R Programming (Theory)		
Course Code:	DSC14	No. of Credits	04
Contact hours	52 Hours	Duration of SEA/Exam	2:30 hours
Formative Assessment Marks	40	Summative Assessment Marks	60

Course Outcomes (COs): After the successful completion of the course, the student will be able to:

- CO1. Explore fundamentals of statistical analysis in R environment.
- CO2. Describe key terminologies, concepts and techniques employed in Statistical Analysis.
- CO3. Define Calculate, Implement Probability and Probability Distributions to solve a wide variety of problems.
- CO4. Conduct and interpret a variety of Hypothesis Tests to aid Decision Making.
- CO5. Understand, Analyse, and Interpret Correlation Probability and Regression to analyse the underlying relationships between different variables.

Contents	52 Hrs
Introduction of the language, numeric, arithmetic, assignment, and vectors, Matrices and Arrays, Non-numeric Values, Lists and Data Frames, Special Values, Classes, and Coercion, Basic Plotting.	10
Reading and writing files, Programming, Calling Functions, Conditions and Loops: stand-alone statement with illustrations in exercise 10.1, stacking statements, coding loops, Writing Functions, Exceptions, Timings, and Visibility.	10
Statistics And Probability, basic data visualisation, probability, common probability distributions: common probability mass functions, bernoulli, binomial, poisson distributions, common probability density functions, uniform, normal, student's t-distribution.	11
Statistical testing and modelling, sampling distributions, hypothesis testing, components of hypothesis test, testing means, testing proportions, testing categorical variables, errors and power, Analysis of variance.	10
Simple linear regression, multiple linear regression, linear model selection and diagnostics. Advanced graphics: plot customization, plotting regions and margins, point and click coordinate interaction, customizing traditional R plots, specialized text and label notation. Defining colors and plotting in higher dimensions, representing and using color, 3D scatter plots.	11

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs 1-15)

Course Outcomes (COs) / Program Outcomes (POs)	Program Outcomes (POs)														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15

Course Outcomes (COs) / Program Outcomes (POs)	Program Outcomes (POs)														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15

Pedagogy: Lecture/ PPT/ Videos/ Animations/ Role Plays/ Think-Pair-Share/ Predict-Observe-Explain/ Demonstration/ Concept mapping/ Case Studies examples/ Tutorial/ Activity/ Flipped Classroom/ Jigsaw/ Field based Learning/ Project Based Learning/ Mini Projects/ Hobby Projects/ Forum Theatre/ Dance/ Problem Based Learning/ Game Based Learning/ Group Discussion/ Collaborative Learning/ Experiential Learning / Self Directed Learning etc.

Formative Assessment for Theory	
Assessment Occasion/ type	Marks
Internal Assessment Test 1	10%
Internal Assessment Test 2	10%
Quiz/ Assignment/ Small Project	10%
Seminar	10%
Total	40 Marks
<i>Formative Assessment as per guidelines.</i>	

References	
1	Tilman M. Davies, “The book of R: A first course in programming and statistics”, San Francisco, 2016.
2	Vishwas R. Pawgi, “Statistical computing using R software”, Nirali prakashan publisher, e1 edition, 2022.
3	https://www.youtube.com/watch?v=KlsYCECWEWE https://www.geeksforgeeks.org/r-tutorial/ https://www.tutorialspoint.com/r/index.htm

Program Name	B.C.A	Semester	V
Course Title	R Programming Lab		
Course Code:	DSC14-Lab	No. of Credits	02
Contact hours	04 Hours per week	Duration of SEA/Exam	1:30 hours
Formative Assessment Marks	25	Summative Assessment Marks	25

Overview

The following program problematic comprises of R programming basics and application of several Statistical Techniques using it. The module aims to provide exposure in terms of Statistical Analysis, Hypothesis Testing, Regression and Correlation using R programming language.

Learning Objectives

The objective of this Laboratory to make students exercise the fundamentals of statistical analysis in R environment. They would be able to analysis data for the purpose of exploration using Descriptive and Inferential Statistics. Students will understand Probability and SamplingDistributions and learn the creative application of Linear Regression in multivariate context for predictive purpose.

Course Outcomes:

- Install, Code and Use R Programming Language in R Studio IDE to perform basic tasks on Vectors, Matrices and Data frames. Explore fundamentals of statistical analysis in R environment.
 - Describe key terminologies, concepts and techniques employed in Statistical Analysis.
 - Define Calculate, Implement Probability and Probability Distributions to solve a wide variety of problems.
 - Conduct and interpret a variety of Hypothesis Tests to aid Decision Making.
 - Understand, Analyse, and Interpret Correlation Probability and Regression to analyse the underlying relationships between different variables.
1. Write a R program for different types of data structures in R.
 2. Write a R program that include variables, constants, data types.
 3. Write a R program that include different operators, control structures, default values for arguments, returning complex objects.
 4. Write a R program for quick sort implementation, binary search tree.
 5. Write a R program for calculating cumulative sums, and products minima maxima and calculus.
 6. Write a R program for finding stationary distribution of markanov chains.
 7. Write a R program that include linear algebra operations on vectors and matrices.
 8. Write a R program for any visual representation of an object with creating graphs using graphic functions: Plot(),Hist(),Linechart(),Pie(),Boxplot(),Scatterplots().
 9. Write a R program for with any dataset containing dataframe objects, indexing and subsetting data frames, and employ manipulating and analyzing data.
 10. Write a program to create an any application of Linear Regression in multivariate context for predictive purpose.

Program Name	B.C.A	Semester	V
Course Title	Software Engineering (Theory)		
Course Code:	DSC15	No. of Credits	04
Contact hours	52 Hours	Duration of SEA/Exam	2:30 hours
Formative Assessment Marks	40	Summative Assessment Marks	60

Course Outcomes (COs): After the successful completion of the course, the student will be able to:

CO1	How to apply the software engineering lifecycle by demonstrating competence in communication, planning, analysis, design, construction, and deployment.
CO2	An ability to work in one or more significant application domains.
CO3	Work as an individual and as part of a multidisciplinary team to develop and deliver quality software.
CO4	Demonstrate an understanding of and apply current theories, models, and techniques that provide a basis for the software lifecycle.
CO5	Demonstrate an ability to use the techniques and tools necessary for engineering practice.

Contents	52 Hrs
OVERVIEW: Introduction; Software engineering ethics; Software process models; Process activities; Coping with change; Agile software development: Agile methods; Plan-driven and agile development.	10
REQUIREMENTS ENGINEERING: Functional and non-functional requirements; Software requirements document; Requirement's specification; Requirements engineering processes; Requirement's elicitation and analysis; Requirement's validation; Requirements management.	10
SYSTEM MODELING: Context models; Interaction models- Use case modeling, Sequence diagrams; Structural models- Class diagrams, Generalization, Aggregation; Behavioral models- Data-driven modeling, Event-driven modeling; Model-driven engineering.	10
ARCHITECTURAL DESIGN: Architectural design decisions; Architectural views; Architectural patterns- Layered architecture, Repository architecture, Client-server architecture Pipe and filter architecture. DESIGN AND IMPLEMENTATION: Object-oriented design using the UML- System context and interactions, Architectural design, Object class identification, Design models, Interface specification; Design patterns; Implementation issues.	12
SOFTWARE TESTING: Development testing- Unit testing, Choosing unit test cases, Component testing, System testing. Test-driven development; Release testing; User testing- Alpha, Beta, Acceptance testing.	10

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs 1-15)

Course Outcomes (COs) / Program Outcomes (POs)	Program Outcomes (POs)														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15

Pedagogy: Lecture/ PPT/ Videos/ Animations/ Role Plays/ Think-Pair-Share/ Predict-Observe-Explain/ Demonstration/ Concept mapping/ Case Studies examples/ Tutorial/ Activity/ Flipped Classroom/ Jigsaw/ Field based Learning/ Project Based Learning/ Mini Projects/ Hobby Projects/ Forum Theatre/ Dance/ Problem Based Learning/ Game Based Learning/ Group Discussion/ Collaborative Learning/ Experiential Learning / Self Directed Learning etc.

Formative Assessment for Theory	
Assessment Occasion/ type	Marks
Internal Assessment Test 1	10%
Internal Assessment Test 2	10%
Quiz/ Assignment/ Small Project	10%
Seminar	10%
Total	40 Marks
<i>Formative Assessment as per guidelines.</i>	

Text Books:

1 | Ian Somerville, "Software Engineering" 8th Edition, Pearson Education, 2009.

References Books:

1 | Waman S Jawadekar, "Software Engineering Principles and Practice", Tata McGrawHill, 2004.

2 | Roger S. Pressman, "A Practitioners Approach", 7th Edition, McGraw-Hill, 2007.

3 | P Jalote, "An Integrated Approach to software Engineering", Narosa Publication.

Program Name	B.Sc./B.C.A	Semester	V
Course Title	Cloud Computing (Theory)		
Course Code:	DSE-E1	No. of Credits	03
Contact hours	42 Hours	Duration of SEA/Exam	2:30 hours
Formative Assessment Marks	40	Summative Assessment Marks	60

Course Outcomes (COs): After the successful completion of the course, the student will be able to:

CO1	Explain the core concepts of the cloud computing paradigm such as how and why this paradigm shift came about, the characteristics, advantages and challenges brought about by the various models and services in cloud computing.
CO2	Apply the fundamental concepts in data centres to understand the trade-offs in power, efficiency and cost.
CO3	Identify resource management fundamentals like resource abstraction, sharing and sandboxing and outline their role in managing infrastructure in cloud computing.
CO4	Analyze various cloud programming models and apply them to solve problems on the cloud.

Contents	42 Hrs
Introduction: Different Computing Paradigms- Parallel Computing, Distributed Computing, Cluster Computing, Grid Computing, Cloud Computing etc., Comparison of various Computing Technologies; Cloud Computing Basics- What is Cloud Computing? History, Characteristic Features, Advantages and Disadvantages, and Applications of Cloud Computing; Trends in Cloud Computing; Leading Cloud Platform Service Providers.	8
Cloud Architecture: Cloud Service Models- Infrastructure as a Service (IaaS), Platform as a Service (PaaS) and Software as a Service (SaaS), Comparison of different Service Models; Cloud Deployment Models- Public Cloud; Private Cloud, Hybrid Cloud, Community Cloud; Cloud Computing Architecture- Layered Architecture of Cloud. Virtualization- Definition, Features of Virtualization; Types of Virtualizations- Hardware Virtualization, Server Virtualization, Application Virtualization, Storage Virtualization, Operating System Virtualization; Virtualization and Cloud Computing, Pros and Cons of Virtualization, Technology Examples- Xen: Paravirtualization, VMware: Full Virtualization, Microsoft Hyper-V.	10
Cloud Application Programming and the Aneka Platform: Aneka Cloud Application Platform- Framework Overview, Anatomy of the Aneka Container; Building Aneka Clouds (Infrastructure Organization, Logical Organization, Private Cloud Deployment Mode, Public Cloud Deployment Mode, Hybrid Cloud Deployment Mode); Cloud Programming and Management- Aneka SDK (Application Model and Service Model); Management Tools (Infrastructure, Platform and Application management).	8
Cloud Platforms in Industry: Amazon Web Services- Compute Services, Storage Services, Communication Services, Additional Services; Google AppEngine- Architecture and Core Concepts, Application Life-Cycle, Cost Model, Observations; Microsoft Azure- Azure Core Concepts (Compute, Storage, Core Infrastructure and Other Services), SQL Azure, Windows Azure Platform Appliance.	8
Cloud Applications: Scientific Applications- Healthcare (ECG Analysis in the Cloud)	8

Biology (Protein Structure Prediction and Gene Expression Data Analysis for Cancer Diagnosis), Geoscience (Satellite Image Processing); Business and Consumer Applications- CRM and ERP, Productivity, Social Networking, Media Applications, Multiplayer Online Gaming.

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs 1-15)

Course Outcomes (COs) / Program Outcomes (POs)	Program Outcomes (POs)														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15

Pedagogy: Lecture/ PPT/ Videos/ Animations/ Role Plays/ Think-Pair-Share/ Predict-Observe-Explain/ Demonstration/ Concept mapping/ Case Studies examples/ Tutorial/ Activity/ Flipped Classroom/ Jigsaw/ Field based Learning/ Project Based Learning/ Mini Projects/ Hobby Projects/ Forum Theatre/ Dance/ Problem Based Learning/ Game Based Learning/ Group Discussion/ Collaborative Learning/ Experiential Learning / Self Directed Learning etc.

Formative Assessment for Theory	
Assessment Occasion/ type	Marks
Internal Assessment Test 1	10%
Internal Assessment Test 2	10%
Quiz/ Assignment/ Small Project	10%
Seminar	10%
Total	40 Marks
<i>Formative Assessment as per guidelines.</i>	

Text Books:	
1	Rajkumar Buyya, Christian Vecchiola, S. ThamaraiSelvi: "Mastering CloudComputing- Foundations and Applications Programming", Elsevier, 2013
2	Barrie Sosinsky: "Cloud Computing Bible", Wiley-India, 2010
3	K Chandrashekar: "Essentials of Cloud Computing", CRC Press, 2015
4	Derrick Rountree, Ileana Castrillo: "The Basics of Cloud Computing", Elsevier, 2014

Program Name	B.Sc.	Semester	V
Course Title	Business Intelligence (Theory)		
Course Code:	DSE-E1	No. of Credits	03
Contact hours	42 Hours	Duration of SEA/Exam	2:30 hours
Formative Assessment Marks	40	Summative Assessment Marks	60

Course Outcomes (COs): After the successful completion of the course, the student will be able to:

CO1	Describe the Decision Support systems and Business Intelligence framework.
CO2	Explore knowledge management, explain its activities, approaches and its implementation.
CO3	Describe business intelligence, analytics, and decision support systems

Contents	42 Hrs
Information Systems Support for Decision Making, An Early Framework for Computerized Decision Support, The Concept of Decision Support Systems, A Framework for Business Intelligence, Business Analytics Overview, Brief Introduction to Big Data Analytics	8
Introduction and Definitions, Phases of the Decision, Making Process, The Intelligence Phase, Design Phase, Choice Phase, Implementation Phase, Decision Support Systems Capabilities, Decision Support Systems Classification, Decision Support Systems Components.	8
Basic Concepts of Neural Networks, Developing Neural Network-Based Systems, Illuminating the Black Box of ANN with Sensitivity, Support Vector Machines, A Process Based Approach to the Use of SVM, Nearest Neighbor Method for Prediction, Sentiment Analysis Overview, Sentiment Analysis Applications, Sentiment Analysis Process,, Sentiment Analysis, Speech Analytics.	10
Decision Support Systems modeling, Structure of mathematical models for decision support, Certainty, Uncertainty, and Risk, Decision modeling with spreadsheets, Mathematical programming optimization, Decision Analysis with Decision Tables and Decision Trees, Multi-Criteria Decision Making With Pairwise Comparisons.	8
Automated Decision Systems, The Artificial Intelligence field, Basic concepts of Expert Systems, Applications of Expert Systems, Structure of Expert Systems, Knowledge Engineering, and Development of Expert Systems.	8

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs 1-15)

Course Outcomes (COs) / Program Outcomes (POs)	Program Outcomes (POs)														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15

Pedagogy: Lecture/ PPT/ Videos/ Animations/ Role Plays/ Think-Pair-Share/ Predict-Observe-Explain/ Demonstration/ Concept mapping/ Case Studies examples/ Tutorial/ Activity/ Flipped Classroom/ Jigsaw/ Field based Learning/ Project Based Learning/ Mini Projects/ Hobby Projects/ Forum Theatre/ Dance/ Problem Based Learning/ Game Based Learning/ Group Discussion/ Collaborative Learning/ Experiential Learning / Self Directed Learning etc.

Formative Assessment for Theory	
Assessment Occasion/ type	Marks
Internal Assessment Test 1	10%
Internal Assessment Test 2	10%
Quiz/ Assignment/ Small Project	10%
Seminar	10%
Total	40 Marks
<i>Formative Assessment as per guidelines.</i>	

Text Books:	
1	Ramesh Sharda, Dursun Delen, Efraim Turban, J.E.Aronson, Ting-Peng Liang, David King, “BusinessIntelligence and Analytics: System for Decision Support”, 10th Edition, Pearson Global Edition. Reference books
2	Data Analytics: The Ultimate Beginner's Guide to Data Analytics Paperback – 12 November 2017by Edward Miz
Additional Reading:	
1	https://shorturl.at/iuAT0
2	https://www.coursera.org/courses?query=business%20intelligence

Program Name	B.Sc./B.C.A	Semester	VI
Course Title	Digital Marketing (Theory)		
Course Code:	Voc-2	No. of Credits	03
Contact hours	42 Hours	Duration of SEA/Exam	2:30 hours
Formative Assessment Marks	40	Summative Assessment Marks	60

Course Outcomes (COs): After the successful completion of the course, the student will be able to:

1. Understand the fundamental concepts and principles of digital marketing.
2. Develop practical skills to implement various digital marketing strategies and techniques.
3. Analyze and evaluate the effectiveness of digital marketing campaigns.
4. Apply critical thinking and problem-solving skills to real-world digital marketing scenarios.
5. Create comprehensive digital marketing plans and strategies.

Note: Blooms Level(BL): L1=Remember, L2=Understand, L3=Apply, L4=Analyse, L5= Evaluate, L6= Create

Contents	42 Hrs
Introduction to Digital Marketing: Overview of digital marketing, Evolution of digital marketing, Importance and benefits of digital marketing, Digital marketing channels and platforms Digital Marketing Strategy and Planning: Developing a digital marketing strategy, Setting goals and objectives, Budgeting and resource allocation.	8
Campaign planning and execution, Monitoring and adjusting digital marketing campaigns Social Media Marketing: Overview of social media marketing, Social media platforms and their features, Creating and optimizing social media profiles, Social media content strategy, Social media advertising and analytics	8
Email Marketing: Introduction to email marketing, Building an email list, Creating effective email campaigns, Email automation and segmentation, Email marketing metrics and analytics Content Marketing: Understanding content marketing, Content strategy and planning,	8
Content creation and distribution, Content promotion and amplification, Content marketing metrics and analytics. Mobile Marketing: Mobile marketing overview, Mobile advertising strategies, Mobile app marketing, Location-based marketing, Mobile marketing analytics	8
Analytics and Reporting: Importance of analytics in digital marketing, Setting up web analytics tools (e.g., Google Analytics), Tracking and measuring key performance indicators (KPIs), Conversion tracking and optimization, Reporting and data visualization	10

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs 1-15)

Course Outcomes (COs) / Program Outcomes (POs)	Program Outcomes (POs)														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15

Pedagogy: Lecture/ PPT/ Videos/ Animations/ Role Plays/ Think-Pair-Share/ Predict-Observe-Explain/ Demonstration/ Concept mapping/ Case Studies examples/ Tutorial/ Activity/ Flipped Classroom/ Jigsaw/ Field based Learning/ Project Based Learning/ Mini Projects/ Hobby Projects/ Forum Theatre/ Dance/ Problem Based Learning/ Game Based Learning/ Group Discussion/ Collaborative Learning/ Experiential Learning / Self Directed Learning etc.

Formative Assessment for Theory	
Assessment Occasion/ type	Marks
Internal Assessment Test 1	10%
Internal Assessment Test 2	10%
Quiz/ Assignment/ Small Project	10%
Seminar	10%
Total	40 Marks
<i>Formative Assessment as per guidelines.</i>	

References	
1	"Digital Marketing Strategy: An Integrated Approach to Online Marketing" by Simon Kingsnorth.
2	"Email Marketing Rules: How to Wear a White Hat, Shoot Straight, and Win Hearts" by Chad S. White
3	"Content Inc.: How Entrepreneurs Use Content to Build Massive Audiences and Create Radically Successful Businesses" by Joe Pulizzi
4	"Mobile Marketing: How Mobile Technology is Revolutionizing Marketing, Communications and Advertising" by Daniel Rowles
5	"Web Analytics 2.0: The Art of Online Accountability and Science of Customer Centricity" by Avinash Kaushik

Program Name	B.C.A	Semester	VI
Course Title	Artificial Intelligence and Applications (Theory)		
Course Code:	DSC16	No. of Credits	04
Contact hours	52 Hours	Duration of SEA/Exam	2:30 hours
Formative Assessment Marks	40	Summative Assessment Marks	60

Course Outcomes (COs): After the successful completion of the course, the student will be able to:

CO1	Gain a historical perspective of AI and its foundations.
CO2	Become familiar with basic principles and strategies of AI towards problem solving
CO3	Understand and apply approaches of inference, perception, knowledge representation, and learning.
CO4	Understand the various applications of AI

Contents	52 Hrs
Introduction- What is Artificial Intelligence, Foundations of AI, History, AI - Past, Present and Future. Intelligent Agents- Environments- Specifying the task environment, Properties of task environments, Agent based programs-Structure of Agents , Types of agents- Simple reflex agents, Model-based reflex agents, Goal-based agents; and Utility-based agents.	10
Problem Solving by Searching- Problem-Solving Agents, Well-defined problems and solutions, examples Problems, Searching for Solutions, Uninformed Search Strategies-Breadth-first search, Uniform-cost search, Depth-first search, Depth-limited search, Iterativedeepening depth-first search, Bidirectional search, Greedy best-first search, A* Search, AO* search Informed (Heuristic) Search Strategies, Heuristic Functions	10
Knowledge Representation - Knowledge-Based Agents, The Wumpus World , Logic, Propositional Logic, Propositional Theorem Proving, Effective Propositional Model Checking, Agents Based on Propositional Logic, First-Order Logic-Syntax and Semantics of First-Order Logic, Using First-Order Logic, Unification and Lifting Forward Chaining, Backward Chaining	12
Learning- Forms of Learning, Supervised Learning, Machine Learning - Decision Trees, Regression and Classification with Linear Models, Artificial Neural Networks, Support Vector Machines	10
Applications of AI - Natural Language Processing, Text Classification and Information Retrieval, Speech Recognition , Image processing and computer vision, Robotics	10

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs 1-15)

Course Outcomes (COs) / Program Outcomes (POs)	Program Outcomes (POs)														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15

Pedagogy: Lecture/ PPT/ Videos/ Animations/ Role Plays/ Think-Pair-Share/ Predict-Observe-Explain/ Demonstration/ Concept mapping/ Case Studies examples/ Tutorial/ Activity/ Flipped Classroom/ Jigsaw/ Field based Learning/ Project Based Learning/ Mini Projects/ Hobby Projects/ Forum Theatre/ Dance/ Problem Based Learning/ Game Based Learning/ Group Discussion/

Collaborative Learning/ Experiential Learning / Self Directed Learning etc.

Formative Assessment for Theory	
Assessment Occasion/ type	Marks
Internal Assessment Test 1	10%
Internal Assessment Test 2	10%
Quiz/ Assignment/ Small Project	10%
Seminar	10%
Total	40 Marks
<i>Formative Assessment as per guidelines.</i>	

Text Books:

1	Stuart Russel, Peter Norvig: Artificial Intelligence A Modern Approach, 2nd Edition, Pearson Education, 2003
2	Tom Mitchell, "Machine Learning", 1 st Edition, McGraw-Hill,2017
3	Elaine Rich, Kevin Knight, Shivashankar B Nair: Artificial Intelligence, Tata McGraw Hill 3rd edition, 2013

Program Name	BCA	Semester	VI
Course Title	PHP & MySQL (Theory)		
Course Code:	DSC17	No. of Credits	04
Contact hours	52 Hours	Duration of SEA/Exam	2:30 hours
Formative Assessment Marks	40	Summative Assessment Marks	60

Course Outcomes: After the successful completion of the course, the student will be able to:

CO1. Design dynamic and interactive web pages and websites.

CO2. Run PHP scripts on the server and retrieve results.

CO3. Handle databases like MySQL using PHP in websites.

Note: Blooms Level(BL): L1=Remember, L2=Understand, L3=Apply, L4=Analyse, L5= Evaluate, L6= Create

Contents	52 Hrs
Introduction to PHP: Introduction to PHP, History and Features of PHP, Installation & Configuration of PHP, Embedding PHP code in Your Web Pages, Understanding PHP, HTML and White Space, Writing Comments in PHP, Sending Data to the Web Browser, Data types in PHP, Keywords in PHP, Using Variables, Constants in PHP, Expressions in PHP, Operators in PHP.	10
Programming with PHP: Conditional statements: if, if-else, switch, The ? Operator, Looping statements: while Loop, do-while Loop, for Loop Arrays in PHP: Introduction- What is Array?, Creating Arrays, Accessing Array elements, Types of Arrays: Indexed v/s Associative arrays, Multidimensional arrays, Creating Array, Accessing Array, Manipulating Arrays, Displaying array, Using Array Functions, Including and Requiring Files- use of Include() and Require(), Implicit and Explicit Casting in PHP.	12
Using Functions , Class- Objects, Forms in PHP: Functions in PHP, Function definition, Creating and invoking user-defined functions, Formal parameters versus actual parameters, Function and variable scope, Recursion, Library functions, Date and Time Functions Strings in PHP: What is String?, Creating and Declaring String, String Functions	10
Class & Objects in PHP: What is Class & Object, Creating and accessing a Class & Object, Object properties, object methods, Overloading, inheritance, Constructor and Destructor Form Handling: Creating HTML Form, Handling HTML Form data in PHP Database Handling Using PHP with MySQL: Introduction to MySQL: Database terms, Data Types.	10
Accessing MySQL –Using MySQL Client and Using php MyAdmin, MySQL Commands, Using PHP with MySQL: PHP MySQL Functions, Connecting to MySQL and Selecting the Database, Executing Simple Queries, Retrieving Query Results, Counting Returned Records, Updating Records with PHP	10

Course Articulation Matrix: Mapping of Course Outcomes (Cos) with Program Outcomes (Pos 1-15)

Course Outcomes (Cos) / Program Outcomes (Pos)	Program Outcomes (Pos)														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15

Pedagogy: Lecture/ PPT/ Videos/ Animations/ Role Plays/ Think-Pair-Share/ Predict-Observe-Explain/ Demonstration/ Concept mapping/ Case Studies examples/ Tutorial/ Activity/ Flipped Classroom/ Jigsaw/ Field based Learning/ Project Based Learning/ Mini Projects/ Hobby Projects/ Forum Theatre/ Dance/ Problem Based Learning/ Game Based Learning/ Group Discussion/ Collaborative Learning/ Experiential Learning / Self Directed Learning etc.

Formative Assessment for Theory	
Assessment Occasion/ type	Marks
Internal Assessment Test 1	10%
Internal Assessment Test 2	10%
Quiz/ Assignment/ Small Project	10%
Seminar	10%
Total	40 Marks

Formative Assessment as per guidelines.

References	
1	PHP & MySQL for Dynamic Web Sites- Fourth Edition By Larry Ullman.
2	Learning PHP, MySQL and JavaScript By Robin Nixon –O'REILLY Publications
3	Programming PHP By Rasmus Lerdorf, Kevin Tatroe, Peter MacIntyre

4 SAMS Teach Yourself PHP in 24 hours, Author: Matt Zandstra, Sams Publishing

Program Name	B.C.A	Semester	VI
Course Title	PHP and MySQL Lab		
Course Code:	DSC17-Lab	No. of Credits	02
Contact hours	04 Hours per week	Duration of SEA/Exam	1:30 hours
Formative Assessment Marks	25	Summative Assessment Marks	25

Practical Assignments for PHP Programming

Sl. No	Title of the Experiment
1	Write a PHPscript to print “hello world”.
2	Write a PHPscript to find odd or even number from given number.
3	Write a PHPscript to find maximum of three numbers.
4	Write a PHPscript to swap two numbers.
5	Write a PHPscript to find the factorial of a number.
6	Write a PHPscript to check whether given number is palindrome or not.
7	Write a PHP script to reverse a given number and calculate its sum
8	Write a PHP script to to generate a Fibonacci series using Recursive function
9	Write a PHP script to implement atleast seven string functions.
10	Write a PHP program to insert new item in array on any position in PHP.
11	Write a PHP script to implement constructor and destructor
12	Write a PHP script to implement form handling using get method
13	Write a PHP script to implement form handling using post method.
14	Write a PHP script that receive form input by the method post to check the number is prime or not
15	Write a PHP script that receive string as a form input
16	Write a PHP script to compute addition of two matrices as a form input.
17	Write a PHP script to show the functionality of date and time function.
18	Write a PHP program to upload a file
19	Write a PHP script to implement database creation
20	Write a PHP script to create table
21	Develop a PHP program to design a college admission form using MYSQL database.

Program Name	B.Sc./B.C.A	Semester	VI
Course Title	Fundamentals of Data Science (Theory)		
Course Code:	DSE-E2	No. of Credits	03
Contact hours	42 Hours	Duration of SEA/Exam	2:30 hours
Formative Assessment Marks	40	Summative Assessment Marks	60

Course Outcomes (COs): After the successful completion of the course, the student will be able to:

CO1	Understand the concepts of data and pre-processing of data.
CO2	Know simple pattern recognition methods
CO3	Understand the basic concepts of Clustering and Classification
CO4	Know the recent trends in Data Science

Contents	42 Hrs
Unit I: Data Mining: Introduction, Data Mining Definitions, Knowledge Discovery in Databases (KDD) Vs Data Mining, DBMS Vs Data Mining, DM techniques, Problems, Issues and Challenges in DM, DM applications.	8
Data Warehouse: Introduction, Definition, Multidimensional Data Model, Data Cleaning, Data Integration and transformation, Data reduction, Discretization	8
Mining Frequent Patterns: Basic Concept – Frequent Item Set Mining Methods -Apriori and Frequent Pattern Growth (FPGrowth) algorithms -Mining Association Rules	8
Classification: Basic Concepts, Issues, Algorithms: Decision Tree Induction. Bayes Classification Methods, Rule-Based Classification, Lazy Learners (or Learning from your Neighbours), k Nearest Neighbour. Prediction - Accuracy- Precision and Recall	10
Clustering: Cluster Analysis, Partitioning Methods, Hierarchical Methods, Density-Based Methods, Grid-Based Methods, Evaluation of Clustering	8

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs 1-15)

Course Outcomes (COs) / Program Outcomes (POs)	Program Outcomes (POs)														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Understand the concepts of data and pre-processing of data															
Know simple pattern recognition methods															
Understand the basic concepts of Clustering and Classification															
Know the recent trends in Data Science															

Pedagogy: Lecture/ PPT/ Videos/ Animations/ Role Plays/ Think-Pair-Share/ Predict-Observe-Explain/ Demonstration/ Concept mapping/ Case Studies examples/ Tutorial/ Activity/ Flipped Classroom/ Jigsaw/ Field based Learning/ Project Based Learning/ Mini Projects/ Hobby Projects/ Forum Theatre/ Dance/ Problem Based Learning/ Game Based Learning/ Group Discussion/ Collaborative Learning/ Experiential Learning / Self Directed Learning etc.

Formative Assessment for Theory	
Assessment Occasion/ type	Marks
Internal Assessment Test 1	10%
Internal Assessment Test 2	10%
Quiz/ Assignment/ Small Project	10%
Seminar	10%
Total	40 Marks
<i>Formative Assessment as per guidelines.</i>	

Text Books:	
1	Jiawei Han and Micheline Kambar – “Data Mining Concepts and Techniques” Second Edition Elsevier Publications
2	Arun K Pujari – “Data Mining Techniques” 4 th Edition, Universities Press
3	Pang-Ning Tan, Michael Steinbach, Vipin Kumar: Introduction to Data Mining, Pearson Education, 2012.
4	K.P.Soman, Shyam Diwakar, V.Ajay: Insight into Data Mining – Theory and Practice, PHI
5	Pang-Ning Tan, Michael Steinbach, Vipin Kumar - “Introduction to Data Mining”, Pearson Education

Program Name	B.Sc./B.C.A	Semester	VI
Course Title	Mobile Application Development (Theory)		
Course Code:	DSE-E2	No. of Credits	03
Contact hours	42 Hours	Duration of SEA/Exam	2:30 hours
Formative Assessment Marks	40	Summative Assessment Marks	60

Course Outcomes (COs): After the successful completion of the course, the student will be able to:

CO1	Create Servlets for server side programming Create, test and debug Android application by setting up Android development environment
CO2	Critique mobile applications on their design pros and cons,
CO3	Program mobile applications for the Android operating system and understand techniques for designing and developing sophisticated mobile interfaces
CO4	Deploy applications to the Android marketplace for distribution.

Contents	42 Hrs
Android OS design and Features: Android development framework, SDK features, Installing and running applications on Android Studio, Creating AVDs, Types of Android applications, Best practices in Android programming, Android tools, Building your First Android application.	8
Android Application Design Essentials: Anatomy of an Android applications, Android terminologies, Application Context, Activities, Services, Intents, Receiving and Broadcasting Intents, Android Manifest File and its common settings, Using Intent Filter, Permissions.	8
Android User Interface Design Essentials: User Interface Screen elements, Designing User Interfaces with Layouts, Drawing and Working with Animation.	8
Testing Android applications, Publishing Android application, Using Android preferences, Managing Application resources in a hierarchy, working with different types of resources.	8
Using Common Android APIs: Using Android Data and Storage APIs, Managing data using Sqlite, Sharing Data between Applications with Content Providers, Using Android Networking APIs, Using Android Web APIs, Deploying Android Application to the World.	10

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs 1-15)

Course Outcomes (COs) / Program Outcomes (POs)	Program Outcomes (POs)														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15

Pedagogy: Lecture/ PPT/ Videos/ Animations/ Role Plays/ Think-Pair-Share/ Predict-Observe-Explain/ Demonstration/ Concept mapping/ Case Studies examples/ Tutorial/ Activity/ Flipped Classroom/ Jigsaw/ Field based Learning/ Project Based Learning/ Mini Projects/ Hobby Projects/ Forum Theatre/ Dance/ Problem Based Learning/ Game Based Learning/ Group Discussion/ Collaborative Learning/ Experiential Learning / Self Directed Learning etc.

Formative Assessment for Theory	
Assessment Occasion/ type	Marks
Internal Assessment Test 1	10%
Internal Assessment Test 2	10%
Quiz/ Assignment/ Small Project	10%
Seminar	10%
Total	40 Marks
<i>Formative Assessment as per guidelines.</i>	

Text Books:	
1	Lauren Darcey and Shane Conder , “Android Wireless Application Development”, Pearson Education, 2nd ed. (2011)
2	Reto Meier, “Professional Android 2 Application Development”, Wiley India Pvt Ltd
3	Mark L Murphy, “Beginning Android”, Wiley India Pvt Ltd
4	Android Application Development All in one for Dummies by Barry Burd, Edition: I
5	Beginning Android 4 Application Development, Wei-Meng Lee, Wiley India (Wrox), 2013
6	Professional Android 4 Application Development, Reto Meier, Wiley India, (Wrox), 2012

Program Name	B.Sc./B.C.A	Semester	V
Course Title	Web Content Management System (Theory)		
Course Code:	Voc-1	No. of Credits	03
Contact hours	42 Hours	Duration of SEA/Exam	2:30 hours
Formative Assessment Marks	40	Summative Assessment Marks	60

Course Outcomes (COs): After the successful completion of the course, the student will be able to:

CO1	Understand content development basics;
CO2	Gain Knowledge of tools for multimedia content development for audio/ video, graphics, animations, presentations, screen casting
CO3	Host websites and develop content for social media platforms such as wiki and blog
CO4	Understand e-publications and virtual reality
CO5	Use of e-learning platform Moodle and CMS applications Drupal and Joomla

Contents	42 Hrs
Web Content Development and Management, Content Types and Formats, Norms and Guidelines of Content Development, Creating Digital Graphics, Audio Production and Editing,	8
Web Hosting and Managing Multimedia Content, Creating and Maintaining a Wiki Site. Presentation Software Part I, Presentation Software Part II, Screen casting Tools and Techniques, Multilingual Content Development.	8
Planning and Developing Dynamic Web Content Sites, Website Design Using CSS Creating and Maintaining a WIKI Site, Creating and Managing a Blog Site,	8
E- Publication Concept, E- Pub Tools, Simulation and Virtual Reality Applications, Creating 2D and 3 D Animations. Introduction to Moodle, Creating a New Course and Uploading,	10
Create and Add Assessment, Add and Enroll User and Discussion Forum, Content Management System: Joomla, Content Management System: Drupal	8

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs 1-15)

Course Outcomes (COs) / Program Outcomes (POs)	Program Outcomes (POs)														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15

Pedagogy: Lecture/ PPT/ Videos/ Animations/ Role Plays/ Think-Pair-Share/ Predict-Observe-Explain/ Demonstration/ Concept mapping/ Case Studies examples/ Tutorial/ Activity/ Flipped Classroom/ Jigsaw/ Field based Learning/ Project Based Learning/ Mini Projects/ Hobby Projects/ Forum Theatre/ Dance/ Problem Based Learning/ Game Based Learning/ Group Discussion/ Collaborative Learning/ Experiential Learning / Self Directed Learning etc.

Formative Assessment for Theory	
Assessment Occasion/ type	Marks
Internal Assessment Test 1	10%
Internal Assessment Test 2	10%
Quiz/ Assignment/ Small Project	10%
Seminar	10%
Total	40 Marks
<i>Formative Assessment as per guidelines.</i>	

Text Books:

1	Web Content Management: Systems, Features, and Best Practices 1st Edition by Deane Barker.
2	Content Management Bible (2nd Edition) 2nd Edition by Bob Boiko.
3	Moodle for Learning Management System (LMS): A Practical and Visual Guidebook of Administrator and Instructor for Distance Education Paperback – October 12, 2020 by James Koo
4	Using Joomla!: Efficiently Build and Manage Custom Websites 2nd Edition by Ron Severdia

Additional Reading:

https://onlinecourses.swayam2.ac.in/cec20_lb09/preview

Program Name	B.Sc./B.C.A	Semester	VI
Course Title	Logical Reasoning (Theory)		
Course Code:	SEC-5	No. of Credits	02
Contact hours	30 Hrs	Duration of SEA/Exam	01 hrs
Formative Assessment Marks	30	Summative Assessment Marks	20

Course Outcomes (COs): After the successful completion of the course, the student will be able to:

CO1	Quickly understand the given problem and come up with the correct answer
CO2	Identify,constructandcomputenumericalsituationsbyworkwithnumbers
CO3	Conceiveanddevelopamethodologyforanalyzingdataandsolvingaproblem
CO4	Define, modify and apply critical thinking to real time situations

Contents	30 Hrs
Arithmetic Reasoning: Analytical Thinking, Syllogistic Logic, Problem solving; Number System; LCM &HCF; Divisibility Test; Surds and Indices; Logarithms; Ratio, Proportions and Variations; Partnership; Time speed and distance; work time problems;	10
Data Interpretation: Numerical Data Tables; Line Graphs; Bar Charts and Pie charts; Mix Diagrams; Geometrical Diagrams, and other forms of Data Representation	10
Lateral Thinking, Reasoning & Logic: Verbal and Non-verbal Logic, Family Tree; Linear Arrangements; Circular and Complex Arrangement; Conditionality and Grouping; Sequencing and Scheduling; Selections; Networks; Venn Diagram in Logical Reasoning.	10

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes

Course Outcomes (COs) /Program Outcomes (POs)	Program Outcomes (POs)														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Quickly understand the given problem and come up with the correct answer															
Identify,constructandcomputenumericalsituationsbyworkwithnumbers															
Conceiveanddevelopamethodologyforanalyzingdataandsolvingaproblem.															
Define, modify and apply critical thinking to real time situations.															

Pedagogy: Problem Solving

Formative Assessment for Theory	
Assessment Occasion/ type	Marks
Internal Test 1	30%
Assignment / Surprise Test/	20%
Total	25 Marks
<i>Formative Assessment as per guidelines.</i>	

References

1	R.S.Aggarwal- "A Modern Approach to Verbal and Non-Verbal Reasoning" Sultan Chand and Sons, New Delhi
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References

2	R.S.Aggarwal–“Quantitative Aptitude”, Sultan Chand and Sons, New Delhi
3	Dr.Ravi Chopra – “Verbal and Non–Verbal Reasoning”, MacMillan India
4	Dr.Edward DeBono – “Lateral Thinking”, Penguin Books, New Delhi