K.E. Society's
Rajarambapu Institute of Technology, Rajaramnagar
(An Empowered Autonomous Institute, affiliated to Shivaji University, Kolhapur)
Curriculum Structure and Evaluation Scheme
To be implemented for 2024 - 28 Batch

Department of Computer Applications

Class: S.Y. BCA   **Semester:** III

| Course Code	Course	Teaching Scheme				Evaluation Scheme					
		L	T	P	C	Scheme	Theory (Marks %)			Practical (Marks %)	
							Max	Min for Passing			
						ESE	50				
BC201	Object-Oriented Programming Using Java	3	-	-	3	ISE	20		40		
						UT1	15	40			
						UT2	15				
						ESE	50	40			
BC203	Operating System	3	-	-	3	ISE	20		40		
						UT1	15	40			
						UT2	15				
						ESE	50	40			
BC205	Web Technology	2	-	-	2	ISE	20		40		
						UT1	15	40			
						UT2	15				
						ESE	50	40			
BC207	Digital Marketing	2	-	-	2	ISE	20		40		
						UT1	15	40			
						UT2	15				
						ESE	50	40			
BC209	Data Analytics using Python	2	-	2	2	ISE	---	---	---	50	50
						ESE	---	---	---	50	50
BC211	Object Oriented Programming Using Java Lab	-	-	4	2	ISE	---	---		50	50
						ESE	---	---	---	50	50
BC213	Web Technology Lab	-	-	4	2	ISE	---	---	---	50	50
						ESE	---	---	---	50	50
BC215	Environmental Science	2	-	2	3	ISE	50	40	40		
						ESE	50	40			
	Mini Project	-	-	2	1	ISE	--	--	--	50	50
	Total	**14**		**14**	**20**						

Total Contact Hours: 28

ISE = In Semester Evaluation, UT-I = Unit Test- I, UT- II = Unit Test – II   ESE = End Semester Exam

Total Contact Hours/week   28
Total Credits   20

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Class: S.Y. BCA   **Semester: IV**

Course Code	Course	Teaching Scheme L	T	P	C	Scheme	Theory (Marks %) Max	Min for Passing		Practical (Marks %)	
BC202	Software Engineering and Project Management	3	-	-	3	ISE	20	40	40		
						UT1	15				
						UT2	15				
						ESE	50	40			
BC204	Computer Networks	3	-	-	3	ISE	20	40	40		
						UT1	15				
						UT2	15				
						ESE	50	40			
	Professional Elective- 1	2	-	2	3	ISE	20	40	40		
						UT1	15				
						UT2	15				
						ESE	50	40			
BC212	Mobile Application Development Lab	2	-	4	4	ISE	---	---	---	50	50
						ESE	---	---	---	50	50
BC214	Design Thinking and Innovation	2	-	-	2	ISE	---	---	---	50	50
						ESE	---	---	---	50	50
BC216	Internship	-	-	-	4	ISE	---	---	---	50	50
						ESE	---	---	---	50	
	MOOCS**	-	-	-	1	--	--	--	--	--	--
	Total	**12**		**6**	**20**						

Total Contact Hours: 18

ISE = In Semester Evaluation, UT-I = Unit Test- I, UT- II = Unit Test – II, ESE = End Semester Exam

Total Contact Hours/week: 18
Total Credits: 20

Students are required to undergo internship training of a minimum of two weeks in the vacation of Semester- IV and its evaluation will be carried out in the Semester-V.

Professional Elective - 1

Specialization	Course Code	Course
Data Science	BC206	Statistical Methods for Data Science
Artificial intelligence and Machine Learning	BC208	Introduction to Artificial Intelligence
Information and Cyber Security	BC210	Fundamentals of Information Security
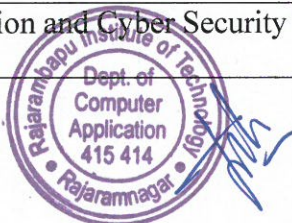
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Class: **S.Y. BCA**	Semester: **III**	**L**	**T**	**P**	**Credits**
Course Code: **BC201**	Course Name: **Object-Oriented Programming Using Java**	3	-	-	3

Course Description:

This course introduces beginners to Java programming, covering its history, features, and core concepts like data types, operators, and control flow. Students will learn Object-Oriented Programming (OOP) fundamentals, including inheritance, polymorphism, and abstraction. It also covers key Java topics like abstract classes, interfaces, and packages. The course delves into the java.util package, focusing on collections, utility classes like Random, Scanner, and Collections. Students will explore Java applets and GUI programming using AWT components. Learners can write, compile, and execute Java programs by the end.

Course Learning Outcomes:

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

1. Implement OOP concepts using Java.

2. Demonstrate input processing and output generation.

3. Develop Java classes and applets.

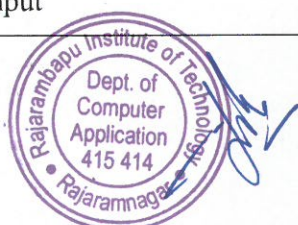4. Utilize Java collections and utility classes.

Prerequisite: Basic Programming Knowledge

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Course Content		
Unit No	**Description**	**Hrs**
1.	**Introduction to java** History of Java, Features of Java,Comparison between C++ and java,Java Virtual Machine (JVM), Tokens, Java Keywords, Data Types-integer (byte, short, int, long), floating point (float, double), char, Boolean, Operators-arithmetic, relational, logical, unary, ternary, bitwise.	06
2.	**Decision-Making Statements** Branching and looping statement, Typecasting-Implicit and Explicit, Command line arguments, Writing Simple Java program, Compiling and executing Java program	06
3.	**Fundamentals of Object-Oriented Programming using Java** Introduction - Class, Object, and Method, Static Keywords, Constructors, and Destructors, Super and This Keyword, Encapsulation and Abstraction, Inheritance - Definition and Its Types (Single, Multilevel, Hierarchical), Polymorphism - Definition and Concepts of Overloading and Overriding ,Difference Between Overloading and Overriding.	06
4.	**Abstract & Interface** Abstract class and method, use of final keyword. Interface: Defining and implementing an interface, implementing multiple inheritances using the interface, and the difference between an abstract class and an interface. Packages- Defining and accessing user-defined package	06
5.	**Introduction to java.util –** Overview of java.util package, Importance and common use cases. Introduction to key classes - ArrayList, HashMap, HashSet, Collection. Collections Framework Overview – Introduction to Collection interface,List, Set, and Map interfaces. Utility Classes in java.util - Collections class: Sorting, searching, shuffling Date and Calendar classes for date/time handling, Random class for generating random numbers, Scanner class for user input	08

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6.	**Java Applets and GUI:** Applet concept, creating basic applet, applet lifecycle, controlling applet content. Introduction to AWT controls – Button, Lable, TextField, TextArea, List, Checkbox and RadioButtons, Scrollbar, Menu, etc. (Only AWT Component)	04

References

TextBooks:

- E. Balagurusamy, "Programming with Java: A Primer," McGraw-Hill Education.
- Herbert Schildt, "Java: The Complete Reference," McGraw-Hill Education.

Reference Books:

- Kathy Sierra and Bert Bates, "Head First Java," O'Reilly Media.
- Joshua Bloch, "Effective Java," Addison-Wesley.
- Bruce Eckel, "Thinking in Java," Prentice Hall.Oracle Java Documentation.

Web Links and Video Lectures:

- NPTEL Course on "Object-Oriented Programming using Java" - Prof. Debasis Samanta, IIT Kharagpur.
- Online platforms like Coursera, Udemy, and edX offering Java programming courses.

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Class: **S.Y. BCA**	Semester- **III**	**L**	**T**	**P**	**Credits**
Course Code: **BC203**	Course Name: **Operating System**	3	--	--	3

Course Description:

This course provides a comprehensive introduction to the fundamental concepts of operating systems (OS). It covers OS components, process management, scheduling algorithms, file systems, deadlocks, concurrent processing, and the differences between Windows and Linux OS. The course also explores system calls, protection mechanisms, and interruptions in an OS environment. Through theoretical learning and practical implementations, students will gain an in-depth understanding of how modern operating systems function and manage resources efficiently.

Course Learning Outcomes:

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

1. Access different operating Systems and it's types.

2. Apply the concept of a process and scheduling algorithms.

3. Realize the concept of deadlock and different ways to handle it.

4. Analyze various memory management techniques and file systems.

Prerequisite: Basic information of Computer hardware and Devices

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Course Content		
Unit No	**Description**	**Hrs**
1.	**Introduction to Operating Systems:** Definition of Operating Systems, Evolution of Operating Systems, Components and Services of an OS, OS Structures and Architectures, Types of Operating Systems: Batch Systems, Multiprogramming and Time Sharing, Parallel Systems, Distributed Systems, Real-Time Systems.	06
2.	**Operating System Interfaces and Structures:** Operating System Services, System Calls and APIs, System Programs, Operating System Structure (Monolithic, Layered, Microkernel, etc.)	06
3.	**Process and Thread Management:** Definition and States of a Process, Process State Transitions, Process Control Block (PCB), Process Scheduling: Scheduling Objectives, Preemptive vs Non-preemptive Scheduling, Scheduling Algorithms (FCFS, SJF, RR), Performance Evaluation of Scheduling, Threads and Multithreading: Concepts and Benefits, Types of Threads	06
4.	**Process Synchronization and Deadlocks:** Inter-process Communication (IPC), Race Conditions and Critical Section Problems, Synchronization Techniques: Mutual Exclusion, Semaphores, Monitors, Deadlocks: System Model and Characterization, Prevention, Avoidance (Banker's Algorithm), Detection and Recovery.	06
5.	**Memory Management** Logical vs Physical Address Mapping, Swapping, Memory Allocation Strategies: MFT and MVT, Internal and External Fragmentation, Compaction, Paging and Segmentation, Virtual Memory Concepts: Demand Paging, Page Replacement Algorithms, Frame Allocation, Thrashing.	06
6.	**Input/Output (I/O) Management** Principles of I/O Hardware, Disk Structure and Organization, Disk Scheduling Algorithms.	06

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References –

Text Books:

- Operating Systems: A Concept-Based Approach – D. M. Dhamdhere
- Operating Systems: Internals and Design Principles – William Stallings
- Operating System Concepts – Abraham Silberschatz, Peter B. Galvin, Greg Gagne

Reference Books:

- Operating System Concepts – Abraham Silberschatz, Peter B. Galvin, Greg Gagne
- Modern Operating Systems – Andrew S. Tanenbaum, Herbert Bos
- Operating System Principles – P. B. Galvin, A. Silberschatz

Web links and Video Lectures (e-Resources)

- https://nptel.ac.in/courses/117/106/117106113/
- https://swayam.gov.in/nd1_noc19_cs50/preview
- https://www.classcentral.com/course/swayam-introduction-to-operating-systems-6559

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Class: **S.Y. BCA**	Semester: **III**	**L**	**T**	**P**	**Credits**
Course Code: **BC205**	Course Name: **Web Technology**	**2**	**-**	**-**	**2**

Course Description:

This course provides a comprehensive understanding of web technologies and development. It begins with the fundamentals of the Internet, including protocols, website functioning, and web hosting concepts. Students will then explore HTML and CSS to structure and style web pages effectively. The course covers JavaScript for creating interactive web applications with control structures, event handling, and form validation.

Course Learning Outcomes:

1. Apply web fundamentals, including HTML, CSS, and essential web technologies for development.

2. Leverage JavaScript to build interactive web applications with functions, events, and form validation.

3. Implement PHP and MySQL for server-side development and data integration with HTML.

4. Manipulate data in PHP using strings, arrays, numbers, and handle errors.

Prerequisite: Basic Programming Knowledge

Department of Computer Applications

Course Content		
Unit No	**Description**	**Hrs**
1.	**Fundamentals of the Internet** Basics of the Internet, Internet Protocols (HTTP, FTP, IP),World Wide Web (WWW) & Website Functioning - HTTP, DNS, and IP Address, Working of a Website. Web Technologies & Hosting - Web Browsers and Web Servers (Types and Functions), Types of Websites (Static vs. Dynamic), Web development Lifecycle, Basics of Web Hosting.	04
2.	**Introduction to HTML** Overview, History, and Features, HTML Tags & Attributes, HTML Form Elements, HTML Frameset and Limitations Fundamentals of CSS - Basics, Syntax, and Importance of CSS, Types of CSS (Inline, Internal, External), CSS Selectors (Group, ID, Class), CSS Properties (Border, Background, List, Image, Margins), Advantages and Limitations of CSS	04
3.	**Introduction to JavaScript** Overview and Features, Client-Side vs. Server- Side Scripting, JavaScript Fundamentals - Identifiers & Operators, Control Structures (Loops & Conditionals), Dialog Boxes (Alert, Confirm, Prompt)	04
4.	**Functions and Event Handling** Defining and Using Functions, Event Handling in JavaScript, Objects and Form Validation - JavaScript Objects and Properties, Form Validation Techniques.	04
5.	**Introduction to PHP and MySQL** Why Use PHP and MySQL? Basics of Server-Side Web Scripting, Setting Up PHP - Installing PHP, Integrating PHP with HTML. PHP Syntax and Data Handling - PHP Syntax and Variables, Passing Information Between Pages	04

Department of Computer Applications

6.	**Working with Data in PHP** Strings and String Functions, Arrays and Array Functions, Handling Numbers in PHP. Error Handling in PHP - Common PHP Errors and Debugging Techniques	**04**

Reference

Textbook:

- "Internet & World Wide Web: How to Program" - Paul Deitel and Harvey Deitel.
- "HTML and CSS: Design and Build Websites" - Jon Duckett
- "Eloquent JavaScript: A Modern Introduction to Programming" - Marijn Haverbeke
- "PHP & MySQL: Novice to Ninja" - Kevin Yank
- "PHP and MySQL Web Development" - Luke Welling and Laura Thomson

Reference Book:

- "Web Technologies: A Computer Science Perspective" by Jeffrey C. Jackson
- "Learning Web Design: A Beginner's Guide to HTML, CSS, JavaScript, and Web Graphics" - Jennifer Niederst Robbins
- "Murach's PHP and MySQL" - Joel Murach and Ray Harris

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Class: **S.Y. BCA**	Semester: **III**	**L**	**T**	**P**	**Credits**
Course Code: **BC207**	Course Name: **Digital Marketing**	**2**	**–**	**–**	**2**

Course Description:

With Digital Marketing, students gain a comprehensive understanding of their chosen domain while developing expertise in the field of Digital Marketing. The programs emphasize practical learning, and real-world case studies to develop online advertising, content creation, social media management, data analysis, and marketing analytics skills. They can pursue roles such as Digital Marketing specialist, social media manager, SEO analyst, content marketer, digital advertising executive, or digital marketing strategist. With the increasing demand for professionals who can navigate the digital landscape and engage audiences effectively, graduates can contribute to driving online visibility, customer engagement, and business growth.

Course Learning Outcomes:

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

1. Analyze digital marketing concepts, strategies, and the role of digitalization in business growth.
2. Apply SEO techniques, email marketing strategies, and social media tools to enhance digital presence.
3. Analyze digital advertising, content marketing, and E-CRM solutions for effective customer engagement.
4. Evaluate digital marketing performance using analytics tools to optimize campaigns and business outcomes.

Prerequisite: Basics of Computers

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Course Content		
Unit No	Description	Hrs
1.	**Introduction to Digital Marketing** Definition and Importance of Digital Marketing, Inbound & Outbound Marketing Strategies, Principles of Digital Marketing (I's), Market Mix and Comparison: Traditional vs. Digital Marketing, Digital Marketing Process, Digital Strategy (DS): Value, Ethics, and Vision of a Company, Basics of Strategy, Four Pillars of Digital Strategy, Five Rules	04
2.	**Digital Transformation & Marketing Channels** Basics and Types of Digital Marketing Channels, Social Media Marketing & Content Marketing, Email & Mobile Marketing Strategies, Affiliate and Influencer Marketing, Brand and Advertisement Marketing, SEO, SCO, and Search Engine Marketing (SEM)	04
3.	**Search Engine Optimization (SEO) & Website Optimization** Fundamentals of SEO: On-Page and Off-Page Optimization, Competitor Analysis and Search Engine Submission, Directory Submission and Social Bookmarking, Article Submission, Press Release, and Blog Creation, Forum Posting, Commenting, and Google Mapping/Listing	04
4.	**Email Marketing & Campaign Management** Concepts and Importance of Email Marketing, Email Marketing Policies and Compliance Guidelines, Creating an Email Campaign and Building an Email Database, Campaign Strategies and Email Design Principles, Spam Minimization, Bounce Rate Optimization, Email Analytics and Performance Reporting	04
5.	**Social Media Marketing & Content Strategies** Evolution and History of Social Media Marketing, LinkedIn Marketing: Premium Accounts & Business Promotions, YouTube Marketing: Account Setup & Video Optimization, Vimeo & Dailymotion: Content Strategy and Engagement, Use of social media for Business Growth	04
6.	**Data-Driven Marketing & Customer Relationship Management (CRM)** Role of Data in Digital Marketing Strategy, E-CRM Solutions: Core Concepts and Components, Data Warehousing, Data Mining, and OLAP,	04

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	Clickstream Analysis and Collaborative Filtering, Evaluating CRM Solutions for Digital Marketing, Role of Contact Centers in Relationship Marketing.	

References -

Text Books:

- Fredrick, Howard, O'Connor, Allan and Kuratko, Donald F., Entrepreneurship: Theory, Process and Practice, Cengage Learning

Reference Books:

- Michael R. Solomon, Bikramjit Rishi, Tracy L. Tuten, Social Media Marketing
- Karen E. Sutherland, Strategic Social Media Management: Theory and Practice, Springer publication
- Amy Van Looy, Social Media Marketing, Springer International Publishing

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Class: **S.Y. BCA**	Semester: **III**	L	T	P	Credits
Course Code: **BC209**	Course Name: **Data Analytics using Python**	2	--	2	2

Course Description:

This course covers Data Analytics and Python, focusing on data types, analytics tools, Python programming, data visualization, statistical analysis, time series forecasting, and data preprocessing. Students will gain hands-on experience with NumPy, pandas, Matplotlib, and Seaborn to analyze and visualize data, preparing them for real-world applications.

Course Learning Outcomes:

By the end of this course, students will be able to:

1. Analyze key concepts of data analytics, data sources, and real-world applications.

2. Apply Python programming concepts, including data structures and libraries like NumPy, pandas, and Matplotlib, for data analysis.

3. Analyze datasets using statistical techniques and data visualization to extract meaningful insights.

4. Evaluate data preprocessing techniques and time series forecasting models to enhance data-driven decision-making.

Prerequisite: Basic understanding of programming (preferably Python), Basic knowledge of statistics and probability (helpful but not required)

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Course Content		
Unit No	**Description**	**Hrs**
1.	**Introduction to Data Analytics & Python** What is Data Analytics? Real-world applications of data analytics. Types of Data Sources: Structured, Unstructured, Semi-structured. Introduction to Data Analytics Tools: Power BI, Tableau, QlikView, Excel.	04
2.	**Introduction to Python for Data Analytics** Basics of Python programming: Syntax, Variables, Data Types, Data Structures (Lists, Tuples, Dictionaries), Functions and Loops, Introduction to Python libraries for data analysis: NumPy – Handling numerical data, pandas – Data manipulation and analysis, Matplotlib & Seaborn – Data visualization.	04
3.	**Data Visualization** Introduction to Data Visualization, Basic visualizations using Matplotlib: Line plots, Bar charts, Histograms, Advanced visualizations using Seaborn: Box plots, Heatmaps, Pair plots, Choosing the right visualization for insights.	04
4.	**Statistical Analysis** Introduction to Sampling Techniques, Understanding the Central Limit Theorem, Descriptive statistics: Mean, Median, Standard Deviation, Distributions, Basic Probability concepts and their use in data analytics.	04
5.	**Time Series Analysis** What is Time Series Data? Time series forecasting techniques: ARIMA (Autoregressive Integrated Moving Average), Exponential Smoothing, Identifying trends, seasonality, and anomalies in time series data.	04
6.	**Data Cleaning & Preprocessing** Techniques for data cleaning: Handling missing values (imputation techniques), Removing duplicates and outliers, Data type conversions and normalization, Data preprocessing for analytics: Feature scaling, encoding categorical data, Preparing data for visualization and modelling	04
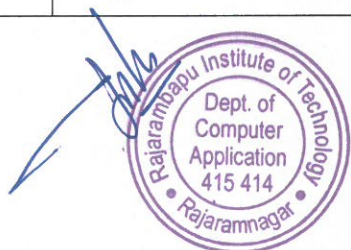
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References -

Text Books:

- McKinney, W. (2012). Python for data analysis: Data wrangling with Pandas, NumPy, and IPython. " O'Reilly Media, Inc.
- Swaroop, C. H. (2003). A Byte of Python. Python Tutorial.
- Ken Black, sixth Editing. Business Statistics for Contemporary Decision Making. "John Wiley & Sons, Inc".
- Anderson Sweeney Williams (2011). Statistics for Business and Economics. "Cengage Learning".

Reference Books:

- Douglas C. Montgomery, George C. Runger (2002). Applied Statistics & Probability for Engineering. "John Wiley & Sons, Inc"
- Jay L. Devore (2011). Probability and Statistics for Engineering and the Sciences. "Cengage Learning
- David W. Hosmer, Stanley Lemeshow (2000). Applied logistic regression (Wiley Series in probability and statistics). "Wiley-Interscience Publication".
- Jiawei Han and Micheline Kamber (2006). Data Mining: Concepts and Techniques.
- Leonard Kaufman, Peter J. Rousseeuw (1990). Finding Groups in Data: An Introduction to Cluster Analysis. John Wiley & Sons, Inc

EReferences:

- https://archive.nptel.ac.in/noc/courses/noc22/SEM1/noc22-cs08
- https://www.coursera.org/learn/data-analysis-with-python

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Experiments		
Experiment No	**Description**	**Hrs**
1.	Write a Python program to calculate the sum of a list of numbers and implement a function to find the largest number in a given list.	2
2.	Install and set up Jupyter Notebook, create a basic Python notebook, and demonstrate basic markdown formatting and code execution.	2
3.	Load a CSV file and display the first five rows using pandas and compute basic statistics (mean, median, mode) for numerical columns.	2
4.	Load a dataset from Kaggle and explore its structure, and identify and count missing values in the dataset.	2
5.	Implement different techniques to handle missing values (imputation, deletion), and compare the effects of different missing value handling techniques.	2
6.	Encode categorical variables using One-Hot Encoding and Label Encoding, and perform feature scaling using StandardScaler and MinMaxScaler.	2
7.	Generate line, bar, and scatter plots for a given dataset, and create a histogram and a box plot to visualize data distributions.	2
8.	Modify plot aesthetics (titles, labels, legends) to enhance readability, and create a heatmap to visualize correlations between numerical variables.	2
9.	Calculate measures of central tendency and dispersion for a dataset, and generate frequency distributions and interpret histograms.	2
10.	Load a dataset into Power BI or Tableau, create different visualizations (bar charts, pie charts, heatmaps), and design an interactive dashboard to extract insights.	2

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Class: **S.Y. BCA**	Semester: **III**	L	T	P	Credits
Course Code: **BC211**	Course Name: **Object Oriented Programming Using Java Lab**	-	-	4	2

Course Description:

This course provides an in-depth understanding of Java programming fundamentals and advanced concepts. Students will gain hands-on experience in implementing core Java features such as branching, looping, type casting, constructors, inheritance, polymorphism, interfaces, packages, multithreading, exception handling, and applets. By completing this course, students will develop proficiency in writing Java programs and understanding object-oriented programming principles.

Course Learning Outcomes:

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

1. Implement basic Java operations using loops, type casting, and command-line arguments.
2. Demonstrate OOP concepts like constructors, inheritance, and polymorphism.
3. Apply interfaces, packages, and multithreading in Java applications.
4. Handle exceptions and develop Java applets for interactive programs.

Prerequisite: Core Java

Course Content		
Experiment No	**Description**	**Hrs**
1	Write Java programs that use loops and conditionals to check whether a given number is a palindrome, a prime number, and an Armstrong number.	4
2	Demonstrate implicit and explicit type casting, and perform basic arithmetic operations using command-line arguments.	4
3	Create a Student class to demonstrate all types of constructors in Java, including default, parameterized, and copy constructors, and display student details.	4

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4	Implement single, multilevel, and hierarchical inheritance with an Employee base class and subclasses.	4
5	Demonstrate method overloading and overriding with a Calculator class and subclass extension.	4
6	Define a Shape interface and implement calculateArea() in Circle, Rectangle, Triangle, and Square classes.	4
7	Use a user-defined package to check numbers for Even/Odd, Palindrome, and Armstrong properties by calling package methods.	4
8	Demonstrate Java collections: Array, Set, and Map with adding, removing, searching, and iteration.	4
9	Display current date and time using Date and Calendar classes, including formatting and extracting date fields.	4
10	Create a Java applet to display a welcome message, using colors, fonts, and shapes.	4

References –

Text Books -:

- E. Balagurusamy, "Programming with Java: A Primer," McGraw-Hill Education.
- Herbert Schildt, "Java: The Complete Reference," McGraw-Hill Education.

Reference Books -:

- Kathy Sierra and Bert Bates, "Head First Java," O'Reilly Media.
- Joshua Bloch, "Effective Java," Addison-Wesley.
- Bruce Eckel, "Thinking in Java," Prentice Hall.

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Class: **S.Y. BCA**	Semester: **III**
Course Code: **BC213**	Course Name: **Web Technology Lab**

L	T	P	Credits
-	-	4	2

Course Description:

This course provides hands-on experience in web development using HTML, CSS, JavaScript, and PHP. Students will learn to design and develop interactive web pages by utilizing text formatting tags, hyperlinks, images, tables, forms, and frames. The course emphasizes structured website development with CSS for styling, JavaScript for client-side scripting, and PHP for server-side processing. Students will be able to design well-structured interactive, and dynamic web applications with seamless navigation and user interaction

Course Learning Outcomes:

1. Design web pages using HTML elements and navigation links.
2. Apply CSS for consistent and responsive styling.
3. Implement JavaScript for interactivity and form validation.
4. Develop dynamic web applications using PHP.

Prerequisite: Basic Programming

	Course Content	
Expt. No.	**Description**	**Hrs**
1	Design web pages using text formatting tags, headings, paragraphs, and inline text styles in HTML.	4
2	Create multipage navigation using internal, external, email, and document hyperlinks in HTML.	4
3	Build an HTML page with headings, images, links, and explore image alignment and link styling.	4
4	Develop a class timetable using HTML tables with rowspan, colspan, and table styling attributes.	4
5	Use HTML frames to display and navigate between multiple pages in a single window.	4
6	Design a complete HTML form using various input controls and understand form structure and layout.	4

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7	Apply internal and external CSS to style fonts, colors, and layout consistently across multiple HTML pages.	4
8	Use JavaScript to generate a Fibonacci series and demonstrate dynamic content generation.	4
9	Design and validate an HTML form using JavaScript for checking user inputs.	4
10	Use PHP to process form data, perform string and array operations, and integrate PHP with HTML.	4

Reference

Textbook:

- "Internet & World Wide Web: How to Program" - Paul Deitel and Harvey Deitel.
- "HTML and CSS: Design and Build Websites" - Jon Duckett
- "Eloquent JavaScript: A Modern Introduction to Programming" - Marijn Haverbeke
- "PHP & MySQL: Novice to Ninja" - Kevin Yank
- "PHP and MySQL Web Development" - Luke Welling and Laura Thomson

Reference Book:

- "Web Technologies: A Computer Science Perspective" - Jeffrey C. Jackson
- "Learning Web Design: A Beginner's Guide to HTML, CSS, JavaScript, and Web Graphics" - Jennifer Niederst Robbins
- "Murach's PHP and MySQL" - Joel Murach and Ray Harris

Web Links and Video Lectures:

1. https://onlinecourses.swayam2.ac.in/nou24_cs09/preview
2. https://onlinecourses.swayam2.ac.in/aic20_sp32/preview

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Class: **S.Y. BCA**	Semester: **III**	**L**	**T**	**P**	**Credits**
Course Code: **BC215**	Course Name: **Environmental Science**	2	-	2	3

Course Description:

The syllabus of Environmental Science provides an integrated, quantitative and interdisciplinary approach to the study of environmental systems. The students undergoing this course would develop a better understanding of the environment with due respect to perceptions and policies. The exposure to the various contents of the course, like understanding of alternative energy systems, pollution control and mitigation, natural resource management and the effects of global climate change, will help the students to bring a systems approach to the analysis of environmental problems.
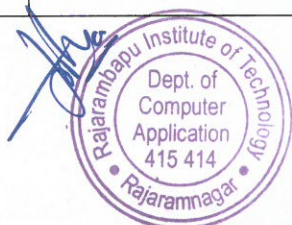
Course Learning Outcomes:

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

1. Identify natural resources and their conservation methods.
2. Demonstrate ecosystem functions and strategies for biodiversity conservation
3. Analyze environmental pollution and control measures.
4. Evaluate waste and disaster management strategies.

Prerequisite: Basics of Science, High School Environmental Studies, Logical Thinking

	Course Content	
Unit No	**Description**	**Hrs**
1.	**Natural Resources** Renewable and Non-renewable resources, Forest resources, water resources, Mineral resources, food resources, Energy resources, alternative energy resources Land resources, Role of individual in conservation of natural resources, Equitable use of resources for Sustainable life styles.	04

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2.	**Ecology and Environment** Definition, Principles and Scope of ecology, Ecosystem: Structure and Functions, biotic and abiotic components, energy flows, food chains, food web, ecological pyramids, Biodiversity, types of biodiversity, conservation of biodiversity.	**04**
3.	**Environmental Pollution and Control Measures:** Environmental Pollution, types of pollution, Air pollution, Water Pollution, Noise Pollution, Soil Pollution, Marine Pollution, Radioactive Pollution, Thermal Pollution (Causes, sources and effects, abatement methods), Pollution Case studies- Bhopal Gas Tragedy, Chernobyl Accident: A nuclear Disaster, Ganga Water Pollution.	**04**
4.	**Solid Waste, Hazardous Waste and Disaster Management** Solid Waste management, Urban & industrial Waste Management, (Causes, sources, effects & control measures), Hazardous waste management, Plastic waste management, E-waste management, Waste minimization technology, Disaster management. Disaster management and risk analysis: Flood, Earthquakes, Cyclones, Landslides, Draught, Tsunami etc. Artificial and natural Pandemics.	**04**
5.	**Environmental Management** Environmental impact assessment, Impact Assessment Methodologies, Environmental impact statement and environmental management plan, Environmental audit, Cost-benefit analysis, Role of Central Pollution Control Board (CPCB), State Pollution Control Board, Role of NGO's, Role of Information technology in environment & human health, Environmental Ethics: Issues & possible solutions, Awareness of Environmental Legislation.	**04**
6.	**Social Issues and Environment** From unsustainable to sustainable development, Urban problems related to energy, Water conservation: Rainwater harvesting, Watershed management, Resettlement & rehabilitation of people: Problems & concerns, Climate change, Global Warming, Ozone layer depletion, Acid Rain,	**04**

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Consumerism & waste Products, Concepts of Eco-labeled products, Eco-mark, Public Environmental education &awareness regarding environmental issues.	

Guidelines For Environmental Science project:

1. The Environmental Science project will be the teamwork consisting of min 3 to max 5 students.

2. Project topics should be application oriented and with consideration to Environmental science problems in their respective stream. Selection and finalization will be done by project guide.

3. Prepare project report as per guidelines.

4. Project groups must provide a complete solution to the selected problem with conceptual clarity.

5. The project will be evaluated by respective branch HOD and project guide and senior faculty.

6. The project should be presented before the committee, which shall evaluate 50 marks.

References –

TextBooks:

- D.K.Asthana, Meera Asthana, A Textbook of Environmental Studies, S.Chand Publication Revised edition, 2006.
- S. Deswal & A. Deswal, Basic course in environmental Studies, Dhanpat Rai & Co ltd., Delhi, Second revised edition, 2009.

Reference Books:

- Eldon D Enger, Bradley F. Smith, Environmental science – a study of inter-relationships Wm C Brown Publishers 1989
- Francois Ramade Ecology of Natural resources, John wiley & Sons
- Robert Leo Smith, Ecology and field biology, Harper Collins Publishers
- Gilbert M. Masters, Introduction to Environmental Engineering & Science, Prentice Hall International Inc. Second Edition

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Class: **S.Y. BCA**	Semester: **IV**	**L**	**T**	**P**	**Credits**
Course Code: **BC202**	Course Name: **Software Engineering and Project Management**	3	-	-	3

Course Description:

This course provides a comprehensive understanding of software engineering principles, system development methodologies, and best practices for designing and testing software. It covers fundamental concepts such as system analysis, software development models, structured design techniques, and software testing strategies. The course is designed to equip students with essential skills in software project management, requirement gathering, and software quality assurance.

Course Learning Outcomes:

1. Identify system concepts, categorize types, and highlight characteristics.
2. Identify software engineering principles, quality factors, and methodologies.
3. Analyze system requirements using various techniques and design tools.
4. Demonstrate software testing approaches for ensuring quality and performance.

Prerequisite: Basic knowledge of computers, Basic knowledge of databases and data storage

	Course Content	
Unit No.	**Description**	**Hrs.**
1.	**Fundamentals of System Concepts** Definition and Elements of a System, Characteristics and Types of Systems, Understanding System Concepts.	6
2.	**Introduction to Software Engineering** Meaning and Importance of Software Engineering, Key Software Characteristics, Software Quality Factors (McCall's Model)	6

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3.	**Requirement Analysis** Overview of System Analysis, Anticipating System Requirements, Essential Knowledge & Skills of a System Analyst, Roles & Responsibilities of a System Analyst, Feasibility Study and Its Classifications, Techniques for Fact Gathering, Understanding User Transaction & Design Requirements, System Requirement Specification (SRS)	6
4.	**Software Development Methodologies** System Development Life Cycle (SDLC), Traditional & Modern Approaches: Waterfall Model, Spiral Model, Prototyping Model	4
5.	**Analysis and Design Tools** Creating and Interpreting Entity-Relationship (ER) Diagrams, Decision Trees & Decision Tables for Logical Structuring, Data Flow Diagrams (DFD) and Their Role in System Design, Data Dictionary: Elements & Benefits, Writing Pseudo Code for System Representation, Principles of Effective Input and Output Design, Case Studies (Minimum of Four)	8
6.	**Software Testing** Testing Fundamentals and Key Characteristics, Different Approaches to Software Testing: Black-Box Testing, White-Box Testing, Stress Testing, Performance Testing.	6

Reference Textbooks:
- Software Engineering: A Practitioner's Approach – Roger S. Pressman
- System Analysis and Design (SADSE) – Prof. Khalkar & Prof. Parthasarathy

Reference Books:
- Fundamentals of Software Engineering – Rajib Mall
- Software Engineering Concepts – Richard Fairley
- Software Engineering – Ian Sommerville
- An Integrated Approach to Software Engineering – Pankaj Jalote
- Object-Oriented Software Engineering – Ivar Jacobson
- Software Testing: Principles and Practices – Srinivasan Desikan & Gopalaswamy Ramesh

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Class: **S.Y. BCA**	Semester: **IV**	**L**	**T**	**P**	**Credits**
Course Code: **BC204**	Course Name: **Computer Network**	**3**	**--**	**--**	**3**

Course Description:

The course will create fundamental of Networking and network devices with functions. Introduce to data transfer in Network.

Course Learning Outcomes:

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

1. Apply fundamental concepts of computer network technology.
2. Identify different types of network topologies and protocols.
3. Analyze the functions and interactions of the OSI and TCP/IP model layers.
4. Analyze the roles of IP addressing, DNS, URL, WWW, web servers, web browsers, search engines, intranet, and extranet in web communication.

Prerequisite: Basic information of Computer hardware and Devices.

	Course Content	
Unit No	**Description**	**Hrs**
1.	**Basics of Computer Network** Computer Network: Definition, Goals, Structure; Broadcast and Point-To Point Networks; Network Topology and their various Types; Types of networks: LAN, MAN, WAN; Server Based LANs & Peer-to-Peer LANs; communication Types: Synchronous, Asynchronous; Modes of Communication: Simplex, Half Duplex, Full Duplex; Protocols and Standards.	06
2.	**Network Models** Design Issues of the Layer, Protocol Hierarchy, ISO-OSI Reference Model: Functions of each Layer, Various Terminology used in Computer Network, Connection-Oriented & Connectionless Services, Internet (TCP/IP) Reference	06

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	Model, Comparison of ISO-OSI and TCP/IP Model.	
3.	**Transmission Media** Transmission Media, Guided Media (Wired) : Coaxial Cable: Physical Structure, Standards, BNC Connector, Applications, Twisted Pair : Physical Structure, UTP vs STP, Connectors, Applications, Fiber Optics Cable: Physical Structure, Propagation Modes (Single Mode & Multimode), Fiber Sizes, Connectors , Applications , Advantages & Disadvantages; Unguided Media(Wireless): Electromagnetic Spectrum for Wireless Communication, Propagation Methods, (Ground, Sky, Line-of-Sight); Wireless Transmission: Radio Waves, Infrared, Micro-wave; Wireless LANs (IEEE 802.11), Architecture, MAC Sub Layer, Frame Format, Frame Types; Bluetooth, Architecture (Piconet, Scatternet, Bluetooth, Layers), Applications.	06
4.	**Network Connectivity Devices** Categories of Connectivity Devices, Passive and Active Hubs, Repeaters, Bridges, Switches (2-Layer Switch, 3-Layer, Switch (Router), Gateways, Network Security Devices (Firewalls, Proxy Servers)	06
5.	**Components of LAN** Network Interface Card (NIC), Network Adapters, Components of NIC, Functions of NIC, Types of NIC; Ethernet: Basic Features, Types of Ethernets, Different Framer Format: IEEE 802.3, IEEE 802.4, IEEE 802.5.	06
6.	**Internet Basics** Internet: Growth, Architecture, Accessing, Internet Service Providers (ISP), Internet Addressing System: IP Address, DNS, URL,World Wide Web (WWW): Web Servers, Web Browsers, Search Engine; Concept of Intranet & Extranet.	06

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References -

Text Books:

- Data Communications & Computer Networks by Prakash C. Gupta, PHI, New Delhi

- Data Communications and Networking 2nd Edition by Dr. N. Vanjulavalli, Mrs. P. S. Uma Priyadarsini, Dr. Mary Subaja Christo.

Reference Books:

- Tanenbaum, Andrew, Computer Networks, PH

- Forouzan Behrouz A., Tata Mcgraw Hill

- Norton Peter, Complete Guide to Networking

Web links and Video Lectures (e-Resources)

- https://archive.nptel.ac.in/courses/106/105/106105081/

- https://archive.nptel.ac.in/courses/106/105/106105080/

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Class: **S.Y.BCA**	Semester: **IV**				
Course Code: **BC206**	Course Name: **Statistical Methods for Data Science (PE-I)**	**L**	**T**	**P**	**Credits**
		2	**-**	**2**	**3**

Course Description:

This course aims to teach students the essential principles and methods of data science and statistical analysis. It presents a complete review of data science components, tools, and model-building procedures, with a focus on using statistical approaches and data visualization to make educated decisions. Students will obtain a solid foundation in statistics, covering measures of central tendency, dispersion, and correlation, along with probability principles and hypothesis testing.

Course Learning Outcomes:

1. Apply Data Science fundamentals, key components, and data types.
2. Apply statistical measures and graphical techniques for data analysis.
3. Utilize probability concepts and hypothesis testing for decision-making.
4. Build regression models and analyze data using various tools and techniques.

Prerequisite: Basic Mathematics, Programming knowledge, Databases and SQL, Basic proficiency in Excel

Course Content		
Unit No.	**Description**	**Hrs.**
1.	Introduction to Data Science, overview, Components, Model building process, Data types and its measures, Random Variables, its applications with exercise, Tools, Applications, Sources of data	4
2.	Measures of central tendency (Mean, Median, Mode), Measures of dispersion (Variance, standard deviation, range),Measures of Skewness and Kurtosis – Graphical representation and its application, Measures of correlation coefficient and it analysis, Various graphical representation of data for analysis	4

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3.	Concept of Probability and it's Applications, probability distributions, Central limit theorem for sampling variations, Confidence Interval – computation and analysis. Basic concepts related to hypothesis testing	4
4.	Regression model using ordinary least squares, Coefficient of determination as strength of model, Prediction interval and confidence interval, Prerequisites to regression, Model building using regression	4
5.	Measures of accuracy, Model improvement techniques, listwise, pairwise deletion, Imputation techniques: Regression Imputation, Hot Deck, KNN imputation	4
6.	Data analysis using Excel, Overview of tools SQL, Hadoop, Hive, Weka, Tableau, Introduction of Hadoop Ecosystem (Pig, Hive and Hbase), Big data analysis	4

Practical Course Contents		
Expt. No	Description	Hrs
1	Explain the concept of Random Variables. Provide an example and a solution exercise on its application	2
2	Computing and Interpreting Measures of Central Tendency: Mean, Median, and Mode	2
3	Calculating and Analyzing Measures of Dispersion: Variance, Standard Deviation, and Range	2
4	Exploring Skewness and Kurtosis: Concepts, Calculations, and Data Interpretation	2
5	Visualizing Data: Creating and Comparing Bar Charts, Histograms, Pie Charts, and Box Plots	2
6	Measuring Relationship Strength: Calculating and Interpreting Correlation Coefficients	2
7	Demonstrating the Central Limit Theorem Through Simulation and Analysis	2
8	Constructing and Interpreting Confidence Intervals for Population Means	2

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9	Fundamentals of Hypothesis Testing: Formulation, Execution, and Result Interpretation.	2
10	Performing Simple Linear Regression: Model Building, Residuals, and Prediction	2

References—

Reference books

- James, G., Witten, D., Hastie, T., & Tibshirani, R. (2013). *An introduction to statistical learning* (Vol. 112, p. 18). New York: springer.

- Friedman, J., Hastie, T., & Tibshirani, R. (2001). The elements of statistical learning (Vol. 1, No. 10). New York: Springer series in statistics.

- Spiegel halter, D. (2020). Introducing The Art of Statistics: How to Learn from Data. *Numeracy*, *13*(1), 7.

- Grus, J. (2019). *Data science from scratch: first principles with python*. O'Reilly Media.

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Class: **S.Y. BCA**	Semester: **IV**	L	T	P	Credits
Course Code: **BC208**	Course Name: **Introduction to Artificial Intelligence (PE -I)**	2	-	2	3

Course Description:

This course introduces the fundamentals of Artificial Intelligence, including AI definitions, rationality, and intelligent agents. It covers problem-solving techniques, search strategies, and game-playing methods like Min-Max and Alpha-Beta Pruning. Logic-based knowledge representation, reasoning schemes, and probabilistic approaches are explored. Students will gain hands-on experience with AI applications and problem-solving techniques.

Course Learning Outcomes:

1. Assess Artificial Intelligence concepts and techniques.
2. Apply AI algorithms for solving typical practical problems. to develop AI algorithms for solving
3. Analyze appropriate knowledge representation schemes in AI.
4. Analyze reasoning schemes in AI.

Prerequisite: Basic knowledge of logical reasoning and Probability theory.

	Course Content	
Unit No.	**Description**	**Hrs.**
1.	**Introduction** The four categories of definitions of AI, Concept of rationality, The AI Problems, Artificial Intelligence Technique, Tic-Tac- Toe game and its data structure, Question-Answering and its one typical data structure, Sample few examples of the state-of-art AI applications.	04
2.	**Intelligent Agents** PEAS description of the task, Simple reflex agents, Model based agents, Learning Agents, advantages, Impact and Examples of AI, Application domains of AI.	04
3.	**Problem solving techniques** State space search, control strategies, heuristic search, problem	04

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	characteristics, production system characteristics., Generate and test, Hill climbing, best first search, A* search.	
4.	**Constraint satisfaction problem** Mean-end analysis, Game playing, Min-Max Search, Alpha-Beta Pruning. Iterative deepening.	04
5.	**Logic and Knowledge Representation schemes in AI** Propositional logic, predicate logic, Resolution, Resolution in proportional logic and predicate logic, Clause form, unification algorithm.	04
6.	**Reasoning schemes in AI** Introduction to nonmonotonic reasoning, default reasoning, statistical reasoning, probability and Bayes' theorem, combining uncertain rules.	04

Practical Course Contents

Expt No.	Description	Hrs
1	Implement and compare Depth First Search and Breadth First Search algorithms on a graph or tree.	2
2	Apply Hill Climbing and A* heuristic search algorithms to solve optimization problems.	2
3	Solve the N-Queen and Water Jug problems using constraint satisfaction and backtracking techniques.	2
4	Use recursion and state-space search to solve Tower of Hanoi and Missionaries & Cannibals problems.	2
5	Develop a Tic-Tac-Toe game-playing AI using Min-Max algorithm with Alpha-Beta pruning.	2
6	Implement AI logic to solve the Number Puzzle and Blocks World problem using planning techniques.	2
7	Simulate a shuffled deck of cards to demonstrate randomness and basic AI logic.	2
8	Solve the Traveling Salesman Problem using AI-based heuristic or metaheuristic methods.	2
9	Model and solve AI planning problems using constraint satisfaction and STRIPS-like methods.	2
10	Design and implement a mini project integrating multiple AI techniques to solve a real-world problem.	2

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References

Textbook

- Artificial Intelligence by Rich and Knight, The McGraw Hill publication
- Artificial Intelligence: A modern approach - Stuart Russel, Peter Norvig, Pearson Education

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Class: **S.Y. BCA**	Semester: **IV**				
Course Code: **BC210**	Course Name: **Fundamentals of Information Security (PE-I)**	**L**	**T**	**P**	**Credits**
		2	–	2	3

Course Description:

The course, Information Security, introduces the theoretical concepts of computer and information security. The course includes concepts of cryptographic algorithms, authentication systems, message authentication, hash function, threats and vulnerabilities network security, security audits and database security.

Course Learning Outcomes:

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

1. Differentiate key components of information, network, and computer security along with their strategic importance.

2. Identify potential security threats and vulnerabilities, and design appropriate countermeasures.

3. Apply classical and modern cryptographic techniques to secure data and analyze encryption algorithms.

4. Implement basic security solutions for networks, emails, and databases using standard security tools and practices.

Prerequisite: Introduction to operating system, Computer Network

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	Course Content	
Unit No	**Description**	**Hrs**
1.	**Introduction to Information Security** Computer Security Concepts, Computer Security, Information Security, Network Security, Threats, Attacks and Assets, Security Requirements, Security Design Principles, Attack Surfaces and Attack Trees, Computer Security Strategy.	04
2.	**Cryptography** Classical Cryptosystems: Ceasar, Vigenère, Playfair, Rail Fence Ciphers, Modern Ciphers: Block vs. Stream Ciphers, Symmetric vs. Asymmetric Ciphers, Symmetric Encryption: Feistel Cipher Structure, Data Encryption Standards (DES), Basic Concepts of Fields: Groups, Rings, Fields, Modular Arithmetic, Galois Fields, Polynomial Arithmetic, Advanced Encryption Standards (AES), Number Theory: Prime Numbers, Fermat's Theorem, Primality Testing: Miller- Rabin Algorithm, Euclidean Theorem, Extended Euclidean Theorem, Euler Totient Function, Asymmetric Encryption: Diffie-Helman Key Exchange, RSA Algorithm.	05
3.	**Message Authentication and Hash Functions** Message Authentication, Hash Functions, and Message Digests: MD4 and MD5, Secure Hash Algorithms: SHA-1, HMAC, Digital Signatures.	03
4.	**Threats and vulnerabilities** Introduction, Types of Hackers, Hacktivism, Common Threats to the data, Vulnerability and Penetration testing and its tools, Malicious Codes, Back Doors, Spoofing, Sniffing, Spam, Social Engineering, Denial of Service and Distributed Denial of Service.	04
5.	**Network and email security** Introduction, Planning for Network Security, TCP/IP and OSI models, Firewalls and its types, VPNs, and Wireless security, Intrusion Detection and Prevention Systems and Other Security Tools, Email security and PGP.	04
6.	**Database Security** Introduction of Unit, Describe the structures and vulnerabilities of key databases for cyber security including SQL, Oracle and Mongo DB, Common database Vulnerabilities and Owasp top 10, SQL injection.	04

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Practical Course Contents		
Experiment No.	**Description**	**Hrs**
1	Write a program to study different security protocols like WEP/WPA2 PSK, 802.1x EAP security protocol. And Implement RC4 Algorithm.	03
2	Write a Program to implement AES.	03
3	Write a program to perform Encryption / Decryption using Caesar cipher.	03
4	Write a program to perform Encryption / Decryption using Mono Alphabetic techniques.	03
5	Write a program to perform Encryption / Decryption using Playfair system.	03
6	Write a program to perform Encryption / Decryption using Hill cipher Technique.	03
7	Write a program to perform Encryption / Decryption using the transposition technique.	03
8	Write a program to study the steps of implementation of VPN using Packet tracer.	03

References -
Textbook
- William Stallings and Lawrie Brown, Computer Security: Principles and Practice, Pearson
- William Stallings, Cryptography and Network Security: Principles and Practice, Pearson.

Reference books
- Cryptography and Network Security, Farozan, Behrouz A.
- Data and Computer Communication, Pearson Education, Stallings William
- Cryptography and Network Security, S. Bose

Web links and Video Lectures(e-Resources)
- https://archive.nptel.ac.in/courses/106/106/106106129/
- https://onlinecourses.swayam2.ac.in/nou19_cs08
- https://www.coursera.org/learn/introduction-cybersecurity-cyber-attacks
- https://www.codecademy.com/learn/introduction-to-cybersecurity

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Class: **S.Y. BCA**	Semester: **IV**	L	T	P	Credits
Course Code: **BC212**	Course Name: **Mobile Application Development**	2	-	4	4

Course Description:

This course, Mobile Application Development, introduces students to the dynamic and fast-evolving field of mobile app creation. Focusing primarily on the Android platform, students will gain hands-on experience in setting up development environments, understanding the structure of Android projects, and using Android Studio to build applications. The course covers essential topics such as activities, services, intents, user interface design, data handling, web services, and multimedia. Advanced topics include networking, location services, sensor programming, and application publishing. Through a combination of theoretical lectures and practical lab sessions, students will acquire the skills needed to design, develop, and deploy robust mobile applications, preparing them for careers in mobile software development.

Course Learning Outcomes:

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

1. Analyze mobile app development basics and platforms.
2. Develop Android apps with UI and data handling.
3. Implement web services, multimedia, and networking.
4. Demonstrate advanced features and cross-platform development.

Prerequisite: Basics of Computers and Operating Systems.

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Course Content		
Unit No	**Description**	**Hrs**
1.	**Introduction to Mobile Application Development** Overview of mobile application development, Mobile platforms and development environments, Setting up development environment, Basics of Android and iOS development.	04
2.	**Android Project Structure and Components** Android Project Structure, Android Manifest File and its common settings, Activities, Services, Intents Permissions and Application resources.	04
3.	**User Interface Design and Data Handling** Basic User Interface Screen elements, Designing User Interfaces with Layouts, Using Content Providers, Handling Persisting Data	04
4.	**Web Services and Multimedia** JSON Web Service, Gallery, drawing 2D and 3D Graphics and Multimedia Drawing and Working with Animation.	04
5.	**Networking and Location Services** Android Networking, Web and Telephony API, Search, Location and Mapping, Communication, Identity, Sync and social media	04
6.	**Advanced Topics and Application Publishing** Sensor and Hardware Programming, Publishing Android Application, Introduction to cross-platform development frameworks (e.g., Flutter, React Native)	04

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Course Learning Outcomes for Lab

After successful completion of the practical course, students will be able to

1. Set up the development environment and build a basic Android app.
2. Develop Android applications using Activities, Services, and UI components.
3. Implement data handling, web services, multimedia, and networking features.
4. Integrate hardware, sensors, location services, and publish Android apps.

Experiment No	Description	Hours
1	Set up the Android development environment and build your first sample app using Android Studio.	4
2	Understand Android project structure and configure key settings in the Android Manifest file.	4
3	Implement core Android components: Activities, Services, and Intents to manage application behavior.	4
4	Manage runtime permissions and app resources including strings, colors, and drawables.	4
5	Design effective Android UIs using Layouts and screen elements like buttons, text views, and input fields.	4
6	Work with Content Providers and implement persistent data storage using SQLite or Shared Preferences.	4
7	Fetch and display JSON data from web services and integrate multimedia content like images or videos.	4
8	Draw custom 2D/3D graphics and use animation techniques in Android apps.	4
9	Implement networking, telephony, and location-based services with mapping integration.	4
10	Access hardware sensors and publish your app to the Play Store, with an intro to cross-platform tools.	4

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References -

Text Books -:

- **"Android Programming: The Big Nerd Ranch Guide" -** Bill Phillips and Chris Stewart

- **"iOS Programming: The Big Nerd Ranch Guide" -** Christian Keur and Aaron Hillegass

Reference Books -:

- Professional Android" by Reto Meier

- "The Swift Programming Language" by Apple Inc.

Electronic References

https://onlinecourses.swayam2.ac.in/nou24_ge66/preview

Android Mobile Application Development - Dr. Himanshu N. Patel, Dr. Babasaheb Ambedkar Open University (BAOU), Ahmedabad

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Class: **S.Y. BCA**	Semester: **IV**	**L**	**T**	**P**	**Credits**
Course Code: **BC214**	Course Name: **Design Thinking and Innovation**	**2**	**-**	**0**	**2**

Course Description:

This course introduces Design Thinking, covering its principles, history, and industry applications. It explores the Design Thinking Process, including empathy, ideation, and prototyping. Students will understand the difference between creativity and innovation and its role in organizations. The course includes Product Design Strategies, problem identification, and case studies. It also covers Business Applications of Design Thinking, including startups and strategic innovation. Lastly, it highlights Emerging Trends like AI integration, sustainability, and human-centered design.

Course Learning Outcomes:

1. Implement the fundamental concepts of design thinking.
2. Implement the core principles of design thinking and innovation.
3. Apply design thinking techniques to problem-solving in various sectors.
4. Analyse interdisciplinary approaches in design thinking.

Prerequisite: Basic design knowledge, Creative thinking, Problem-solving skills, business awareness, and teamwork.

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Course Content		
Unit No.	Description	Hrs.
1.	**Introduction to Design Thinking** Elements and Principles of Design, Basics of Design: Dot, Line, Shape, Form as Fundamental Components, Principles of Design, History and Evolution of Design Thinking, Introduction to New Materials in Industry	04
2.	**Design Thinking Process** Steps in the Design Thinking Process: Empathize, Analyze, Ideate, Prototype, Application in Invention and Social Innovation, Tools of Design Thinking: Persona, Customer Journey Mapping, Brainstorming, Product Development	04
3.	**Innovation** Understanding Innovation vs. Creativity, Role of Creativity and Innovation in Organizations, Transition from Creativity to Innovation, Teams for Innovation, Measuring the Impact of Creativity	04
4.	**Product Design** Problem Identification and Product Strategies, Product Value and Planning, Product Specifications and Case Studies, Innovation in Product Design.	04
5.	**Design Thinking in Business Processes** Application of Design Thinking in Business and Strategic, Innovation, Addressing Business Challenges: Growth, Change, Competition, Standardization, Design Thinking for Startups, Developing and Testing Business Models	04
6.	**Emerging Trends in Design Thinking & Innovation** Future of Design Thinking: Integration with AI, Big Data, and IoT, Sustainable Innovation: Eco-friendly and sustainable design approaches, Human-Centered Design: Advanced concepts in empathy-driven solutions, Ethical Considerations in Innovation: Responsible and inclusive design.	04

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References —

Textbook

- **Tim Brown**, *Change by Design,* Harper Collins, 2009.
- **Idris Mootee**, *Design Thinking for Strategic Innovation*, Adams Media, 2014.

Reference books

- **David Lee**, *Design Thinking in the Classroom,* Ulysses Press, 2018.
- **Shrrutin N Shetty**, *Design the Future,* Norton Press, 2018.
- **William Lidwell, Kritina Holden & Jill Butler**, *Universal Principles of Design*, Rockport Publishers, 2010.
- **Henry Chesbrough**, *The Era of Open Innovation*, 2003.

Web links and Video Lectures (e-Resources):

- NPTEL Course on Design Thinking
- Swayam Online Course on Design Thinking
- NPTEL Course on Innovation