Rani Channamma University Belagavi

Vidyasangama, NH-04, Bhutaramanahatti, Belagavi – 591 156

Bachelor of Computer Application (BCA)

Syllabus for V and VI Semester

(as per National Education Policy – 2020)

2023-24 onwards

RANI CHANNAMMA UNIVERSITY

Vidyasangama, NH-04, Bhutaramanahatti, Belagavi – 591 156

SYLLABUS

Bachelor of Computer Application (BCA)

(as per National Education Policy – 2020)

Submitted by

Dr. Parashuram Bannigidad

Chairperson BoS (UG) – Rani Channamma University, Belagavi

Members of Board of Studies

1. Dr. Vijayalaxmi M. Belagumpi — Member
   Assistant Professor,
   Dept. of Computer Science,
   GFGC Vijayapur
2. Dr. Bhagirathi Halalli — Member
   Assistant Professor,
   Dept. of Computer Science,
   GFGC Raibag
3. Dr. Basavaraj K Galagali — Member
   Assistant Professor,
   Coordinator of BCA
   BLDEA'S Commerce, BHS Arts and TGP Science College, Jamakhandi

SEMESTER-5										
Category	**Course code**	**Title of the Paper**	**Marks**			**Teaching hours/week**			**Credit**	**Duration of exams(Hrs)**
			IA	**SEE**	**Total**	**L**	**T**	**P**		
DSC13	21BCA5C13L	Design & Analysis of Algorithms	40	60	100	4	0	0	4	2
	21BCA5C13P	Design & Analysis of Algorithms Laboratory	25	25	50	0	0	3	2	3
DSC14	21BCA5C14L	Statistical Computing and R Programming	40	60	100	4	0	0	4	2
	21BCA5C14P	R Programming Lab	25	25	50	0	0	3	2	3
DSC15	21BCA5C15L	Software Engineering	40	60	100	4	0	0	4	2
DSE-E1	21BCA5DE1AL	Information Security & Cryptography	40	60	100	3	0	0	3	2
	21BCA5DE1BL	Cloud Computing								
	21BCA5DE1CL	Business Intelligence								
VC1	21BCA5VC1AL	Digital Marketing	40	60	100	3	0	0	3	2
SEC3	21BCA5SE3L	Cyber Security	20	30	50	2	0	2	3	2
Total Marks					**650**	**Semester Credits**			**25**	

SEMESTER-6										
Category	**Course code**	**Title of the Paper**	**Marks**			**Teaching hours/week**			**Credit**	**Duration of exams(Hrs)**
			IA	**SEE**	**Total**	**L**	**T**	**P**		
DSC16	21BCA6C16L	PHP and MySQL	40	60	100	4	0	0	4	2
	21BCA6C16P	PHP and MySQL LAB	25	25	50	0	0	3	2	3
DSC17	21BCA6C17L	Artificial Intelligence and Applications	40	60	100	4	0	0	4	2
DSC18	21BCA6C18P	Project Work	50	100	150	0	0	10	6	3
DSE-E2	21BCA6DE2AL	Fundamentals of Data Science	40	60	100	3	0	0	3	2
	21BCA6DE2BL	Mobile Application Development								
	21BCA6DE2CL	Embedded Systems								
VC2	21BCA6VC2AL	Web Content Management System	40	60	100	3	0	0	3	2
INT	21BCA6INT1	Internship	50	-	50			-	2	-
Total Marks					**650**	**Semester Credits**			**24**	
Exit Option with Bachelor of Computer Applications Degree, BCA Degree (with completion of courses equivalent to a minimum of 136 credits)					**4100**	**Total Credits for BCA Program**			**152**	

Program Name	**BCA**	Semester	**V**
Course Title	**Design and Analysis of Algorithm (Theory)**		
Course Code:	**DSC13**	No. of Credits	04
Contact hours	**42 Hours**	Duration of SEA/Exam	2 hours
Formative Assessment Marks	40	Summative Assessment Marks	60

Course Pre-requisite(s): Basic Knowledge of Data structure
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

Description	**42 Hrs**
UNIT 1: 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.	8
UNIT 2: 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.	8
UNIT 3: 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	9
UNIT 4: Decrease-and-Conquer: Introduction, Insertion Sort, Topological Sorting **Divide-and-Conquer:** Introduction, Merge Sort, Quick Sort, Binary Search, Binary Tree traversals and related properties.	9
UNIT 5: 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.	8

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, 4. Clifford Stein, 3rd Edition, PHI.
5. Design and Analysis of Algorithms, S. Sridhar, Oxford (Higher Education)
6. 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

Course Title	**Design and Analysis of Algorithm Lab (Practical)**	Practical Credits	**02**
Course Code	**DSC5-Lab**	Contact Hours	**04** **Hours/week**
Formative Assessment	**25 Marks**	Summative Assessment	**25 Marks**

Part-A

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 a program to perform Knapsack Problem using Greedy Solution
4. Write program to implement the DFS algorithm for a graph.
5. Write program to implement the 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 for Quick sort algorithm
8. Write a program to implement Merge sort algorithm for sorting a list of integers in ascending order.

Part-B

1. Write C program that accepts the vertices and edges for a graph and stores it as an adjacency matrix.
2. Implement function to print In-Degree, Out-Degree and to display that adjacency matrix.
3. Write program to implement backtracking algorithm for solving problems like N queens .
4. Write a program to implement the backtracking algorithm for the sum of subsets problem
5. Write program to implement Dynamic Programming algorithm for the 0/1 Knapsack problem.
6. Write program to implement Dynamic Programming algorithm for the Optimal Binary Search Tree Problem.
7. Write a program that implements Prim's algorithm to generate minimum cost spanning Tree.
8. Write a program that implements Kruskal's algorithm to generate minimum cost spanning tree.

ProgramName	**BCA**	Semester	**V**
Course Title	**Statistical Computing & R Programming (Theory)**		
Course Code:	**DSC14**	No. of Credits	**04**
Contact hours	**42 Hours**	Duration of SEA/Exam	**2 hours**
Formative Assessment Marks	**40**	Summative Assessment Marks	**60**

Course Pre-requisite(s): Basic Knowledge About Programming and Web browsers	
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	**42 Hrs**
UNIT-I: **Introduction of the Language**, Numeric, Arithmetic, Assignment, And Vectors, Matrices andArrays, Non-numeric Values, Lists and Data Frames, Special Values, Classes, and Coercion, Basic Plotting.	08
UNIT-II: R Programming Structures, Control Statements, Loops, – Looping Over Non-vector Sets,- If-Else, Arithmetic, and Boolean Operators and values, Default Values for Argument, Return Values, Deciding Whether to explicitly call return- Returning Complex Objects, Functions are Objective, No Pointers in R, Recursion, A Quicksort Implementation-Extended Example: ABinary Search Tree, Error Handling.	08
UNIT-III: Doing Math and Simulation in R, Math Function, Extended Example Calculating Probability Cumulative Sums and Products-Minima and Maxima- Calculus, Functions for Statistical Distribution, Sorting, Linear Algebra Operation on Vectors and Matrices, Extended Example: Vector cross Product Extended Example: Finding Stationary Distribution of Markov Chains, Set Operation, Input /output, Accessing the Keyboard and Monitor, Reading and writer Files.	10
UNIT-IV: Probability Distributions, Normal Distribution- Binomial Distribution- Poisson Distributions Other Distribution, Basic Statistics, Correlation and Covariance, T-Tests - ANOVA.	08
UNIT-V Simple Linear & Non-Linear Regression, multiple linear regressions, 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.	08

Preferred Text Books	
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

References	
1	Introductory Statistics with R (Statistics and Computing) Dalgaard, Peter (Author) English (Publication Language) 267 Pages - 02/10/2004 (Publication Date) - Springer (Publisher) Read more at: https://examupdates.in/statistics-with-r-programming-notes/
2	Statistics: An Introduction using R Crawley, Michael J. (Author) English (Publication Language) 342 Pages - 03/11/2005 (Publication Date) - Wiley–Blackwell (Publisher) Read more at: https://examupdates.in/statistics-with-r-programming-notes/
3	A Handbook of Statistical Analyses using R RC Press Hothorn, Torsten (Author) English (Publication Language) 304 Pages - 06/25/2014 (Publication Date) - Chapman and Hall/CRC (Publisher) Read more at: https://examupdates.in/statistics-with-r-programming-notes/
4	A First Course in Statistical Programming with R Braun, W. John (Author) English (Publication Language) 230 Pages - 07/18/2016 (Publication Date) - Cambridge University Press (Publisher) Read more at: https://examupdates.in/statistics-with-r-programming-notes
5	Statistical Analysis with R For Dummies Schmuller, Joseph (Author) English (Publication Language) 464 Pages - 05/16/2017 (Publication Date) - For Dummies (Publisher) Read more at: https://examupdates.in/statistics-with-r-programming-notes

ProgramName	**B.C.A**	Semester	**V**
Course Title	**R Programming Lab**		
Course Code:	**DSC14-Lab**	No. of Credits	**02**
Contact hours	**03 Hours per week**	Duration of SEA/Exam	**2 hours**
Formative Assessment Marks	**25**	Summative Assessment Marks	**25**

1. Write an R program Illustrate with if-else statement and how does it operate on vectors of variable length.
2. Write an R program Illustrate with for loop and stop on condition, to print the error message.
3. Write an R Program To find Factorial of given number using recursion.
4. Write an R Program to implement T-Test for Anova.
5. Write an R Program Compute mean values for vector aggregates defined by factors tapply and sapply.
6. Write a R program for finding stationary distribution of markanov chains.
7. Write an R Program for implementing Quick Sort for Binary Search.
8. Write an R Program Illustrate Reading & Writing Files.
9. Write a R program for any visual representation of an object with creating graphs using graphic functions: Plot(),Hist(),Linechart(),Pie(),Boxplot(),Scatterplots().
10. Write a R program for with any dataset containing data frame objects, and employ manipulating and analyzing data.
11. Write a program to create an any application of Linear Regression in multivariate context for predictive purpose.
12. Write an R Program to Find Mean, Mode & Median.

Program Name	**B.C.A**	Semester	**V**
Course Title	**Software Engineering (Theory)**		
Course Code:	**DSC15**	No. of Credits	**04**
Contact hours	**42 Hours**	Duration of SEA/Exam	**2 hours**
Formative Assessment Marks	**40**	Summative Assessment Marks	**60**

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.

Description	42 Hrs
Introduction: Professional software development, Software engineering ethics Requirements engineering: Functional and non-functional requirements, The software requirements document - IEEE structure of a requirements document (SRS) , Requirement elicitation and analysis, Requirement validation, Requirement management	08
Software Processes: Software process models – Waterfall model, Incremental development, Reuse oriented software engineering, Process Activities, Boehm's spiral model of the software process Agile software development: Plan-driven and agile development, The extreme programming release cycle, The Scrum process (scrum sprint cycle).	08
Architectural Design: Architectural Views, Architectural Patterns – MVC, Layered, Repository, Client Server, Pipe and Filter System Modeling: Interaction Modeling: Use case diagrams, Sequence diagrams; Structural modeling: Class diagrams; Behavioral Modeling : State diagrams; Functional modeling : Data flow diagrams	10
User Interface Design: The golden rules, User Interface Analysis and Design models and process, Webapp and mobile interface design (interface design principles and guidelines) Implementation issues: Reuse, configuration management, Host target development Software quality: What is software quality, McCall's quality factors, ISO 9126 quality factors	08
Software Testing: Types of testing – white box, black box, stages of testing (development testing) – Unit, Component, System, Test-driven development (TDD) , Release testing, User Testing	08

Reference Books
Software Engineering, Ian Summerville, 9th Edition, Pearson Education (for Unit 1 , Unit 2, Unit3 , Unit 4 (Implementation issues) , Unit 5
Software Engineering A Practitioner's Approach, Roger S Pressman , McGraw Hill , 8th Edition - Indian Edition (for Unit 4)
Additional Reading: An Integrated Approach to Software Engineering, Pankaj Jalote, 3rd Edition, 2013, Narosa Publishing House

Program Name	**B.C.A**	Semester	**V**
Course Title	**Information Security & Cryptography (Theory)**		
Course Code:	**DSE1**	No. of Credits	**04**
Contact hours	**42 Hours**	Duration of SEA/Exam	**2 hours**
Formative Assessment Marks	**40**	Summative Assessment Marks	**60**

CO1	Understand Cybercrime and Information Security and its classification.
CO2	Understand how criminals plan cyber-attacks.
CO3	Understand various tool and methods used in cyber-attacks.
CO4	Understand legal perspectives and punishments for cybercrime in India.
CO5	Understand cyber forensic life cycle.
CO6	Understand various cryptographic methods.

Course Content	**42 Hrs**
Introduction to Cybercrime: Cybercrime definition and origins of the world, Cybercrime and information security, Classifications of cybercrime, Cybercrime and the Indian ITA2000, A global Perspective on cybercrimes	6
Cyber offenses & Cybercrime: How criminal plan the attacks, Social Engg, Cyber stalking,Cybercafé and Cybercrimes, Botnets, Attack vector, Cloud computing, Credit Card Frauds	8
Tools and Methods Used in Cyberline: Proxy Servers and Anonymizers, Phishing, Password Cracking, Keyloggers and Spywares, Virus and Worms, Steganography, DoS DDoS Attacks, SQL Injection, Buffer Over Flow, Phishing, Identity Theft (ID Theft). Cybercrimes and Cybersecurity: The Legal Perspectives Why do we need Cyberlaw: The Indian Context, The Indian IT Act, Amendments to the Indian IT Act, Cybercrime and Punishment.	10
Understanding Computer Forensics: Digital Forensics Science, The Need for Computer Forensics, Cyberforensics and Digital Evidence, Forensics Analysis of Email, Digital Forensics Lifecycle, Chain of Custody Concept, Setting of a Computer Forensics Laboratory: Understanding the Requirements, The Security/Privacy Threats, Forensics Auditing, Anti Forensics.	8
Cryptography: Mathematical Background for Cryptography - Modulo Arithmetic's, The Greatest Comma Divisor, Useful Algebraic Structures, Chinese Remainder Theorem, Basics of Cryptography - Preliminaries, Elementary Substitution Ciphers, Elementary Transport Ciphers, Other Cipher Properties, Secret Key Cryptography – Product Ciphers, DES Construction.	10

References

Nina Godbole, SunitBelapure, Cyber Security, Wiley India, New Delhi (UNIT I, II, III, IV)
Cryptography, Network Security and Cyber Laws – Bernard Menezes, Cengage Learning, 2010 edition (UNIT V)

Additional Reading

Kennetch J. Knapp, Cyber Security & Global Information Assurance Information Science Publishing. William Stallings, Cryptography and Network Security, Pearson Publication

ProgramName	**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 hours**
Formative Assessment Marks	**40**	Summative Assessment Marks	**60**

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 storage-overview, cloud storage providers, standards: - applications, client, infrastructure, service.	**8**
Cloud Computing At Work: Software as a service-overview, driving forces, company offerings, industries, software plus services- overview, mobile device integration, Providers, Microsoft Online.	**8**
Cloud Applications: Scientific Applications- Healthcare (ECG Analysis in the Cloud) 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.	**8**

Text Books:	
1	Rajkumar Buyya, Christian Vecchiola, S. ThamaraiSelvi: "Mastering Cloud Computing-Foundations and Applications Programming", Elsevier, 2013
2	Barrie Sosinsky: "Cloud Computing Bible", Wiley-India, 2010
3	Cloud Computing A practical Approach, Anthony T Velte, Toby J Velte,Ph.D. Robert Elsenpeter, McGraw Hill Education(India) Private Limited.
4	K Chandrashekaran: "Essentials of Cloud Computing", CRC Press, 2015
5	Derrick Rountree, Ileana Castrillo: "The Basics of Cloud Computing", Elsevier, 2014

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

Course Pre-requisite(s):	
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**
Business View of Information Technology Applications: Business Enterprise Organization, Its Functions and Core Business Process, Baldrige Business Excellence Framework, Key Purpose of Using IT in Business, The Connected World: Characteristics of Internet-ready IT Applications, Enterprise applications(ERP/CRM) and Bespoke IT applications, Information Users and Their Requirements. **Types of Digital data:** Getting to know Structured Data, Unstructured Data, Semi- structured Data and Difference between Semi-structured and Structured data.	8
Introduction to OLTP and OLAP: OLTP (Online Transaction Processing) OLAP (Online Analytical Processing), Different OLAP Architectures, OLTP and OLAP, Data models for OLTP and OLAP, Role of OLAP tools in the BI Architecture, OLAP operations on multidimensional data. **Business Intelligence:** Using Analytical Information of Decision Support, Information sources before dawn of BI, BI defined, Evolution of BI and Role of DSS, EIS, MIS and Digital Dashboards, Need for BI at virtually all levels, BI for past, present and future, The BI value chain, Introduction to Business Analytics.	8
BI Definitions and Concepts: BI Component Framework, BI Users, Business Intelligence Applications, BI Roles and Responsibilities. Basics of Data Integration: Need for Data Warehouse, Definition of Data Warehouse, Ralph Kimball's Approach vs Inmon's Approach, Goals of Data Warehouse, Constituents of Data Warehouse, Data Integration, Data Integration Technologies, Data Quality, Data Profiling.	8
Multidimensional Data Modeling: Data Modeling Basics, Types of Data Model, Data Modeling Techniques, Fact Table, Dimension Table, Typical Dimensional Models and Dimensional Modeling Life Cycle. Measures, Metrics, KPIs, and Performance Management: Understanding Measures and Performance Measurement System Terminology, Navigating a Business Enterprise: Attributes of a Good Metric, SMART test for ensuring metric relevance to business, KPI usage in Companies.	8
Basics of Enterprise Reporting: Reporting perspectives common to all levels of Enterprise, Report Standardization and Presentation Practices, Enterprise Reporting Characteristics in OLAP World, Balanced Scorecard and Dashboards. Introducing Power BI application: Installation of Power BI Desktop (Free trial), Importing the Data, Fixing the Column Names, Transforming the Data, Getting Started with Reports, Slicing the Data.	8

Text Book:
R.N. Prasad, Seema Acharya, Fundamentals of Business analytics, First Edition, 2011, Wiley-India

Reference Books:
1. GaliShmueli,. Nitin R Patel , peter C . Bruce, " Data mining for Business Intelligence" Wiley-India, 2011. 2. Ralph Kimball ,Margy Ross, "Practical tools for Data Warehosuing and Business Intelligence" , second Edition Wiley-India 2011

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

Course Pre-requisite(s):

- Basic Knowledge of internet and internet browsing.
- Experimental and Analytical mindset.
- No Hardcore technical knowledge required to pursue this course.

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

Units	**Contents**	42 Hours
UNIT I	**Introduction to Digital Marketing:** Overview of digital marketing, Evolution of digital marketing, Importance and benefits of digital marketing, Digitalmarketing channels and platforms **Digital Marketing Strategy and Planning:** Developing a digital marketing strategy, Setting goals and objectives, Budgeting and resource allocation.	**9**
UNITII	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**
UNITIII	**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 strategyand planning,	**8**
UNITIV	**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**
UNIT V	**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	**9**

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	**BCA**	Semester	**VI**
Course Title	**PHP & MySQL (Theory)**		
Course Code:	**DSC17**	No. of Credits	**04**
Contact hours	**42 Hours**	Duration of SEA/Exam	**2 hours**
Formative Assessment Marks	**40**	Summative Assessment Marks	**60**

Course Pre-requisite(s):	
Course Outcomes (COs): 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 Website

Contents	**42**
Introducing PHP: Basic development Concepts –Creating first PHP Scripts –Using Variable and Operators –Storing Data in variable –Understanding Data types –Setting and Checking variables–Data types –Using Constants –Manipulating Variables with Operators.	**10**
Controlling Program Flow: Writing Simple Conditional Statements -Writing More Complex Conditional Statements – Repeating Action with Loops –Working with String Functions.	**8**
Working with Arrays: Storing Data in Arrays –Processing Arrays with Loops and Iterations Working with Array Functions –Working with Dates and Times.	**8**
Functions and Classes: Creating User-Defined Functions -Creating Classes –Using Advanced OOP Concepts. Working with Database MySQL and PHP, MYSQL and PHP Database Create, Read, Update and Delete operations.	**8**
Introduction to Laravel framework: composer, Artisan, Features of Laravel, Laravel, Installation With composer, Laravel Application Structure/Directory Structure, LaravelRouting.	**8**

Text Books:
PHP A Beginner‟s Guide, VIKRAM VASWANI,Tata McGraw-Hill, 2008.
The PHP Complete Reference, Steven Holzner –Tata McGraw-HillEdition,2010
Spring into PHP5, Steven Holzer, Tata McCraw HillEdition,2005
https://www.tutorialspoint.com/laravel

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	**2 hours**
Formative Assessment Marks	**25**	Summative Assessment Marks	**25**

Sl. No	**Title of the Experiment**
1	Develop a PHP program to display prime numbers between the given range and display the total number of prime numbers.
2	Develop a PHP program and check message passing mechanism between pages.
3	Write a PHP program to implement simple calculator operations.
4	Develop a PHP program to demonstrate String functions. (any 6).
5	Write a PHP program to illustrate built in Array manipulation functions.(any 6)
6	Write a PHP program that displays a different message based on time of day. For example page should display "Good Morning" if it is accessed in the morning.
7	Write a PHP program that accepts two numbers using a web form and calculates greatest common divisor (GCD) and least common multiple (LCM) of entered numbers.(Use recursive function)
8	Develop a PHP program to demonstrate constructors and destructors.
9	Develop a PHP code to read the values entered into the form using the MySQL database.
10	Create Laravel Project using composer display Simple "Hello World" Message on Web page.

Program Name	**B.C.A**	Semester	**VI**
Course Title	Artificial Intelligence and Applications **(Theory)**		
Course Code:	**DSC16**	No. of Credits	**04**
Contact hours	**42 Hours**	Duration of SEA/Exam	**2 Hours**
Formative Assessment Marks	**40**	Summative Assessment Marks	**60**

Course Pre-requisite(s):	
Course Outcomes (COs): After the successful completion of the course, the student will be able to:	
CO1	Students will able to develop semantic-based and context-aware systems and use the knowledge embedded in multimedia content.
CO2	Students will achieve semantic interoperability between Web resources and services.
CO3	Students are understand the field of Robotics is a multi disciplinary.

Contents	**42 Hrs**
Introduction : What is Artificial Intelligence: The AI Problems, The Underlying assumption, What is an AI Technique?, Foundation of AI and History of AI intelligent agents: Agents and Environments, the concept of rationality, the nature of environments, structure of agents, problem solving agents, problem formulation.	8
Searching and Reduction: Searching for solutions: uniformed search strategies – Breadth first search, depth first Search. Heuristic search techniques: Generate-and-test, Hill climbing, Best-first search, Problem reduction, Constraint satisfaction, Mean-ends analysis Game Playing-Adversial search, Games, mini-max algorithm, A* Search, AO* search Informed (Heuristic) Search Strategies, Heuristic Functions	10
Knowledge representation issues: Representations and mappings, Approaches to knowledge representation, Issues in knowledge representation, , predicate logic- logic programming, semantic nets- frames and inheritance .Representing knowledge using Rules : Procedural verses Declarative Knowledge, Logic Programming, Forward verses Backward Reasoning, Matching.	8
Learning: First order logic. Inference in first order logic, propositional vs. first order inference, unification & lifts forward chaining, Backward chaining, Resolution, Learning from observation Inductive learning, Decision trees, Explanation based learning, Statistical Learning methods ,Reinforcement Learning.	8
Application : Introduction, basic concepts, structure of expert systems, the human element in expert systems how expert systems works, problem areas addressed by expert systems, expert systems success factors, types of expert systems, expert systems and the internet interacts web, knowledge engineering, scope of knowledge, difficulties, in knowledge acquisition methods of knowledge acquisition	8

Text Books:	
1	Elaine Rich,Kevin Knight, Shivashanka B Nair:Artificial Intelligence, Tata CGraw Hill 3rd edition. 2013
2	S. Russel and P. Norvig, “Artificial Intelligence – A Modern Approach”, SecondEdition, Pearson Education
3	David Poole, Alan Mackworth, Randy Goebel, ”Computational Intelligence : a logical approach”, Oxford University Press.
4	G. Luger, “Artificial Intelligence: Structures and Strategies for complex problemsolving”, Fourth Edition, Pearson Education.
5	J. Nilsson, “Artificial Intelligence: A new Synthesis”, Elsevier Publishers.

Program Name	**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 Hours**
Formative Assessment Marks	**40**	Summative Assessment Marks	**60**

Course Pre-requisite(s):	
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

Course Content	**42 Hours**
Introduction: What is Data Science? Big Data and Data Science hype – and getting past the hype, Why now? – Datafication, Current landscape of perspectives, A data Science Profile. Statistical Inference, Populations and samples, Populations and samples of Big Data, BigData can mean Big Assumptions, Modeling, Philosophy of Exploratory Data Analysis, The Data Science Process , A Data Scientist's Role in this Process.	10
Mathematical Preliminaries: Probability, Descriptive Statistics, Correlation Analysis. Data Munging: Languages for Data Science, Collecting Data, Cleaning Data, Crowdsourcing.	08
Scores and Rankings: The Body Mass Index(BMI), Developing Scoring Systems, Z-scores and Normalization. Statistical Analysis: Statistical Distributions, Sampling from Distributions, Statistical Significance, Permutation Tests and P-values	08
Visualizing Data: Exploratory Data Analysis, Developing a Visualization Aesthetic, Chart Types, Great Visualizations. Mathematical Models: Philosophies of Modeling, A Taxonomy of Models, Baseline Models, Evaluating Models, Evaluation Environment.	08
Linear and Logistic Regression: Linear Regression, Classification and Logistic Regression, Issues in Logistic Classification. Machine Learning: Naive Bayes, Decision Trees Classifiers.	08

References:	
1	Rachel Schutt & O'neil, "Doing Data Science", Straight Talk from The Frontline O'REILLY, ISBN:978-1-449-35865-5, 1st edition, October 2013. (Unit-1)
2	Steven S. Skiena, "The Data Science Design Manual", Springer 2017. (Unit-2,3,4,5)

Program Name	**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 hours**
Formative Assessment Marks	**40**	Summative Assessment Marks	**60**

Course Pre-requisite(s):	
Course Outcomes (COs): After the successful completion of the course, the student will be able to:	
CO1	Being able to build cross platform mobile application development
CO2	Learn the basics of the Dart programming language.
CO3	Learn the fundamentals of Flutter widgets.
CO4	Learn how to design and build user interfaces with Flutter.

Contents	**42 Hrs**
Introduction to Mobile Applications : Development, Flutter Introduction: Features of Flutter Advantages of Flutter and Disadvantages of Flutter, Flutter SDK, Android Studio and Creating Simple Hello world Application with flutter, Hot Reload Feature, Basic Flutter Application Structure, Creating Simple Flutter App using Online Sandboxes like FlutLab.io	**8**
Dart Programming Language Basics: Variable declaration and initialization, Constants and final values, Data Types: Numeric values, Strings, Boolean Types, Operators, Flow Control constructs: if and switch statements, looping statements. Lists and Maps. Object oriented Programming in Dart: Defining Classes, Instance Variables and Methods. Named parameters, Arrow functions Constructors, Subclasses,	**8**
Introduction to Widgets: Widgets, Gestures, Concept of State, Layers Widget Build Visualization, Platform Specific Widgets, Layout Widgets: Types of Layout Widgets, MaterialApp, Scaffold, Center, Row, Column, Expanded, Align, Container, Padding and Text Widgets, Button, Image and Icon Widgets.	**8**
Introduction to Gestures and State management: Tap, Double Tap, Long Press, VerticalDrag,Horizontal Drag and Pan. Dialogs, Flutter State Management: Ephemeral State Management, Application State, Navigation and Routing. Stateful Widgets: Input, Checkbox, Radio, Date and Time pickers and ListView	**8**
Introduction to Dart Packages and Accessing REST API and Database Concepts: Types of Packages and using Dart Package. Accessing REST API: Basic Concepts, Accessing ProductService API. Database Concepts: SQLite, SQLiteDbProvider object and its methods.	**10**

Text Books:
Practical Flutter: Improve your Mobile Development with Google's Latest Open-Source SDK By Author Frank Zammett
https://www.tutorialspoint.com/flutter/flutter_tutorial.pdf
https://flutlab.io/
https://zapp.run/

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

Contents	**40 Hrs**
Introduction to Embedded Systems : Introduction to embedded systems and their applications, Overview of hardware and software components in embedded systems, embedded system design process and development tools, embedded system architectures and microcontrollers, Basics of programming embedded systems	**8**
Embedded System Programming : Programming languages for embedded systems (C and Assembly),Data types, variables, and operators in embedded programming, Control structures and functions in embedded programming, Memory management in embedded systems, Debugging and testing embedded software	**10**
Real-Time Operating Systems (RTOS) : Introduction to real-time systems and their characteristics, Overview of real-time operating systems (RTOS), Task scheduling and synchronization in RTOS, Memory management and resource allocation in RTOS, Interfacing with peripherals and device drivers in RTOS	**8**
Embedded System Interfacing : Basics of digital and analog interfacing, Serial communication protocols (UART, SPI, I2C), Interfacing with sensors and actuators, A/D and D/A converters in embedded systems, Communication protocols for networking (Ethernet, Wi-Fi)	**8**
Embedded System Design and Testing : Design methodologies for embedded systems, System modeling and simulation techniques, Verification and validation of embedded systems, Power management and optimization in embedded systems, Case studies of real-world embedded systems	**8**

References	
1	Title: Embedded Systems: Architecture, Programming and Design Author: Raj Kamal Publisher: McGraw-Hill Education Year: 2014 (UNIT 1)
2	Title: Programming Embedded Systems: With C and GNU Development Tools Author: Michael Barr and Anthony Massa Publisher: O'Reilly Media Year: 2006 (UNIT 2)
3	Title: Real-Time Systems and Programming Languages: Ada, Real-Time Java, and C/Real-Time POSIX Author: Alan Burns and Andy Wellings Publisher: Addison-Wesley Professional Year: 2009 (UNIT 3)
4	Title: Interfacing PIC Microcontrollers: Embedded Design by Interactive Simulation Author: Martin P. Bates Publisher: Newnes Year: 2004 (UNIT 4)
5	Title: Embedded Systems Design: An Introduction to Processes, Tools, and Techniques Author: Arnold S. Berger Publisher: CMP Books Year: 2002 (UNIT 5)

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

Course Pre-requisite(s):	
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.	**10**
Planning and Developing Dynamic Web Content Sites, Website Design Using CSSCreating 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,	**8**
Create and Add Assessment, Add and Enroll User and Discussion Forum, ContentManagement System: Joomla, Content Management System: Drupal	**8**

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	**BCA**	Semester	**VI**
Course Title	**Internship**		
Course Code:	**Inter1**	No. of Credits	**02**
Contact hours	**02 Hour per week**	Duration of SEA/Exam	**3 hours**

Internship Guidelines for BCA Graduate Programme

1. Internship shall be Discipline specific of 90 hours (2 credits) with a duration 4-6 weeks.
2. Internship may be full-time/part-time (full-time during semester holidays and part-time in the academic session)
3. Internship mentor/supervisor shall avail work allotment during 6^{th} semester is 1hour per week and Maximum 20 hours in a semester.
4. The student should submit the final internship report to the mentor for completion of the internship.

Program Name	**BCA**	Semester	**VI**
Course Title	**Project Work**		
Course Code:	**Proj 1**	No. of Credits	**06**
Contact hours	**10 Practical Hour per week**	Duration of SEA/Exam	**3 hours**

Guidelines for Project Work

1. Students are expected to work out a real life project in some industry/research and development laboratories/educational institutions/software companies, it is suggested that the project is to be chosen which should have some direct relevance in day-to-day activities of the candidates in his/her institution. However, it is not mandatory for a student to work on a real life project. The student can formulate a project problem with the help of Guide.
2. Project mentor/supervisor shall avail work allotment during 6th semester is 2 hour per week and Maximum 20 hours in a semester.
3. The student should submit the final project report to the college through the mentor for completion of the project work.

	Formative Assessment for Theory	
Components	**Assessment Occasion/ type**	**Marks**
C1	Test	10
	Seminar/Activity	10
C2	Test	10
	Assignment/Projects/Quiz	10
	Total	**40 Marks**

Summative Assessment for Theory

Semester End Exam Question Paper Pattern

Duration of the examination: **2hour** **Max. Marks:60**

Section A

Answer any TEN from the following, each carries 2 marks: **[10X2=20]**

1. ----------
2. ----------
3. ----------
4. ----------
5. ----------
6. ----------
7. ----------
8. ----------
9. ----------
10. ----------
11. ----------
12. ----------

Section B

Answer any FOUR from the following questions each carries 5 marks.

[4X5=20]

13. ----------
14. ----------
15. ----------
16. ----------
17. ----------

Section C

Answer any two from the following questions each carries 10 marks.

(The Question may consist two sub-questions)

[2X10=20]

18. ----------
19. ----------
20. ----------