

# **MANGALORE UNIVERSITY**



## **National Education Policy – 2020 [NEP-2020]**

### **CURRICULUM STRUCTURE**

### **FOR**

### **V AND VI SEMESTER BCA**

## CURRICULUM STRUCTURE FOR V AND VI SEMESTER BCA

Semester	Course No	Theory/Practical	Credits	Paper Title	S.A	L.A
V	DSC13	Theory	4	Design & Analysis of Algorithms	60	40
	DSC13-Lab	Practical	2	Design & Analysis of Algorithms Lab	25	25
	DSC14	Theory	4	Statistical Computing and R Programming	60	40
	DSC14-Lab	Practical	2	R Programming Lab	25	25
	DSC15	Theory	4	Software Engineering	60	40
	DSE-E1	Theory	3	<b>A.</b> Cloud Computing <b>B.</b> Business Intelligence	60	40
	Voc-1	Theory	3	Digital Marketing	60	40
	SEC-4	Theory	3	Employability skills	60	40
VI	DSC16	Theory	4	Artificial Intelligence and Applications	60	40
	DSC17	Theory	4	PHP and MySQL	60	40
	DSC17-Lab	Practical	2	PHP and MySQL Lab	25	25
	DSC18-Project	Project	6	Project Work	75	75
	DSE-E2	Theory	3	<b>A.</b> Fundamentals of Data Science <b>B.</b> Mobile Application Development	60	40
	Voc-2	Theory	3	Web Content Management System	60	40
	SEC-5	Theory/Practical	2	internship	30	20

Program Name	BCA	Semester	V
Course Title	Design And Analysis of Algorithms (Theory)		
Course Code:	DSC 13	No. of Credits	04
Contact hours	52 Hours	Duration of SEA/Exam	3 hours
Formative Assessment Marks	40	Summative Assessment Marks	60

### Course Outcomes (COs):

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

- CO1. Understand the fundamental concepts of algorithms and their complexity, including time and space complexity, worst-case and average-case analysis, and Big-O notation.
- CO2. Design algorithms for solving various types of problems, such as Sorting, Searching, and Graph traversal, Decrease-and-Conquer, Divide-and-Conquer and Greedy Techniques.
- CO3. Analyze and compare the time and space complexity of algorithms with other algorithmic techniques.
- 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.
- CO5. Apply various algorithm designs to real-world problems and evaluate their effectiveness and efficiency in solving them.

Unit	Description	Hours
1	<p><b>Introduction:</b> What is an Algorithm? Fundamentals of Algorithmic problem solving, Important Problem Type Fundamentals of Data Structures, 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.</p> <p><b>Asymptotic Notations and Basic:</b> Efficiency classes, Informal Introduction, O-notation, <math>\Omega</math>-notation, <math>\theta</math>-notation, mathematical analysis of non-recursive algorithms, and mathematical analysis of recursive algorithms.</p>	13
2	<p><b>Brute Force &amp; Exhaustive Search:</b> Introduction to Brute Force approach, Selection Sort and Bubble Sort, Sequential search- -Closest-Pair and Convex-Hull Problems by Brute Force, Exhaustive Search - Travelling Salesman Problem and Knapsack Problem.</p>	13

<p><b>3</b></p>	<p><b>Decrease-and-Conquer:</b> Introduction, Insertion Sort, Depth First Search, Breadth First Search Topological Sorting.</p> <p><b>Divide-and-Conquer:</b> Introduction, Merge Sort, Quick Sort, Binary Search, Binary Tree traversals and related properties, Multiplication of large Integers and Strassen's Matrix Multiplication.</p>	<p><b>13</b></p>
<p><b>4</b></p>	<p><b>Greedy Technique:</b> Introduction, Prim's Algorithm, Kruskal's Algorithm, Dijkstra's Algorithm, Huffman Trees, Lower-Bound Arguments, Decision Trees, P Problems, Challenges of Numerical Algorithms.</p>	<p><b>13</b></p>

## Text Books:

1. Introduction to the Design and Analysis of Algorithms, Anany Levitin: 2nd Edition, 2009, Pearson.

### References:

1. Computer Algorithms/C++, Ellis Horowitz, SatrajSahni and Rajasekaran, 2nd Edition, 2014, Universities Press.
2. Introduction to Algorithms, Thomas H. Cormen, Charles E. Leiserson, Ronal L. Rivest, Clifford Stein, 3rd Edition, PHI.
3. Design and Analysis of Algorithms, S. Sridhar, Oxford (Higher Education)
4. 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>

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

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

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Program Name	<b>BCA</b>	Semester	<b>V</b>
Course Title	<b>Design and Analysis of Algorithms Lab</b>		
Course Code:	DSC13-Lab	No. of Credits	<b>02</b>
Contact hours	04 Hours per week	Duration of SEA/Exam	<b>3 hours</b>
Formative Assessment Marks	<b>25</b>	Summative Assessment Marks	<b>25</b>

**Note:** Programs implementation using Java or Python

**Evaluation Scheme for Lab Examination:**

<b>Assessment Criteria</b>		
<b>Program-1</b>	<b>PART-A</b> <b>Writing:4 Marks Execution:4Marks</b>	<b>8 Marks</b>
<b>Program-2</b>	<b>PART-B</b> <b>Writing:6 Marks Execution:6Marks</b>	<b>12 Marks</b>
<b>Practical Record</b>		<b>05 Marks</b>
<b>Total</b>		<b>25 Marks</b>

Program Name	<b>BCA</b>	Semester	<b>V</b>
Course Title	<b>Statistical Computing &amp; R Programming (Theory)</b>		
Course Code:	<b>DSC 14</b>	No.of Credits	<b>04</b>
Contact hours	<b>52 Hours</b>	Duration of SEA/Exam	<b>2 hours</b>
Formative Assessment Marks	<b>40</b>	Summative Assessment Marks	<b>60</b>

### 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.

Unit	Description	Hours
<b>1</b>	Introduction of the language, numeric, arithmetic, assignment, and vectors, Matrices and Arrays, Non-numeric Values, Lists and Data Frames, Special Values, Classes, and Coercion, Basic Plotting.	<b>13</b>
<b>2</b>	Reading and writing files, Programming, Calling Functions, Conditions and Loops: stand- alone statement with illustrations in exercise, stacking statements, coding loops, Writing Functions, Exceptions, Timings, and Visibility. Basic Data Visualization.	<b>13</b>
<b>3</b>	<p><b>Descriptive Statistics:</b> Types of Data, Nominal, Ordinal, Scale and Ratio, Measures of Central Tendency, Mean, Mode and Median, Percentiles, Quartiles, Measures of Variability, Mean Absolute Deviation Range, Inter-Quartile-Range, Standard Deviation, Z-Scores. Coefficient of Variation, Measure of shaper-Skewness and Kurtosis, Bar Chart, Pie Chart and Box Plot, Histogram, Frequency Polygon, Stem and Leaf Diagram.</p> <p><b>Probability, Probability and Sampling Distribution:</b> Methods of assigning probability, Structure of probability, Marginal, union, joint and conditional probabilities. Discrete Probability Distributions: Binomial, Poisson, Continuous Probability Distribution, Normal</p>	<b>13</b>





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Program Name	<b>BCA</b>	Semester	<b>V</b>
Course Title	R Programming Lab		
Course Code:	DSC14-Lab	No.of Credits	<b>02</b>
Contact hours	04 Hours per week	Duration of SEA/Exam	<b>3 hours</b>
Formative Assessment Marks	<b>25</b>	Summative Assessment Marks	<b>25</b>

#### Evaluation Scheme for Lab Examination:

Assessment Criteria		
Program-1	<b>PART-A</b> <b>Writing:4 Marks Execution:4Marks</b>	<b>8 Marks</b>
Program-2	<b>PART-B</b> <b>Writing:6 Marks Execution:6Marks</b>	<b>12 Marks</b>
<b>Practical Record</b>		<b>05 Marks</b>
<b>Total</b>		<b>25 Marks</b>

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

### Course Outcomes (COs):

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

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

Unit	Description	Hours
<b>1</b>	<b>OVERVIEW:</b> Introduction; Professional and ethical responsibility; Software process models; Process Iteration; Process activities; The Rational Unified Process; Agile Software Development: Agile methods; Plan- driven and agile development. <b>REQUIREMENTS ENGINEERING:</b> Functional and non-functional requirements; Software requirements document; Requirement's specification; Requirements engineering processes; Requirement's elicitation and analysis; Requirement's validation; Requirements management	13
<b>2</b>	<b>SYSTEM MODELS:</b> Context Models; Behavioral models- Data Flow Models, State Machine Models; Data Models; Object Models: Inheritance models, object aggregation, object behavior modeling, Structured methods.	13
<b>3</b>	<b>ARCHITECTURAL DESIGN:</b> Architectural design decisions; System Organization-The repository model, The layered model, The Client-server model; Modular decomposition styles. <b>DESIGN AND IMPLEMENTATION:</b> An Object-Oriented Design Process- System context and models of use, Architectural design, Object identification, Design models, Object Interface specification; Design Patterns.	13



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

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

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

Unit	Description	Hours
<b>1</b>	<b>Introduction:</b> 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.	<b>10</b>
<b>2</b>	<b>Cloud Architecture:</b> 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.	<b>10</b>



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

**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

Unit	Description	Hours
<b>1</b>	Information Systems Support for Decision Making, An Early Framework for Computerized Decision Support, The Concept of Decision Support Systems, A Framework for Business Intelligence, Business Analytics Overview, Brief Introduction to Big Data Analytics	<b>10</b>
<b>2</b>	Introduction and Definitions, Phases of the Decision, Making Process, The Intelligence Phase, Design Phase, Choice Phase, Implementation Phase, Decision Support Systems Capabilities, Decision Support Systems Classification, Decision Support Systems Components.	<b>10</b>
<b>3</b>	Basic Concepts of Neural Networks, Developing Neural Network-Based Systems, Illuminating the Black Box of ANN with Sensitivity, Support Vector Machines, A Process Based Approach to the Use of SVM, Nearest Neighbor Method for Prediction, Sentiment Analysis Overview, Sentiment Analysis Applications, Sentiment Analysis Process,, Sentiment Analysis, Speech Analytics.	<b>10</b>
<b>4</b>	Decision Support Systems modeling, Structure of mathematical models for decision support, Certainty, Uncertainty, and Risk, Decision modeling with spreadsheets, Mathematical programming optimization, Decision Analysis with Decision Tables and Decision Trees, Multi-Criteria Decision Making With Pairwise Comparisons. Automated Decision Systems, The Artificial Intelligence field, Basic concepts of Expert Systems, Applications of Expert Systems, Structure of Expert Systems, Knowledge Engineering, and Development of Expert Systems.	<b>12</b>



**Text Books:**

1. Ramesh Sharda, Dursum Delen, Efraim Turban, J.E. Aronson, Ting-Peng Liang, David King, "Business Intelligence and Analytics: System for Decision Support", 10<sup>th</sup> Edition, Pearson Global Edition.

## Reference books

1. Data Analytics: The Ultimate Beginner's Guide to Data Analytics Paperback-  
12 November 2017 by Edward Miz

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

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

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Program Name	<b>B.C.A</b>	Semester	<b>V</b>
Course Title	<b>Digital Marketing (Theory)</b>		
Course Code:	<b>Voc-1</b>	No.of Credits	<b>03</b>
Contact hours	<b>42 Hours</b>	Duration of SEA/Exam	<b>2 hours</b>
Formative Assessment Marks	<b>40</b>	Summative Assessment Marks	<b>60</b>

### **Course Outcomes (COs):**

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

CO1. Understand the fundamental concepts and principles of digital marketing.

CO2. Develop practical skills to implement various digital marketing strategies and techniques

Co3. Analyze and evaluate the effectiveness of digital marketing campaigns.

CO4. Apply critical thinking and problem-solving skills to real-world digital marketing scenarios.

CO5. Create comprehensive digital marketing plans and strategies.

<b>Unit</b>	<b>Description</b>	<b>Hours</b>
1	<b>Introduction to Digital Marketing:</b> Overview of digital marketing, Evolution of digital marketing, Importance and benefits of digital marketing, Digital marketing channels and platforms Digital Marketing Strategy and Planning: Developing a digital marketing strategy, Setting goals and objectives, Budgeting and resource allocation. Campaign planning and execution, Monitoring and adjusting digital marketing campaigns	<b>10</b>
2	<b>Social Media Marketing:</b> 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	<b>10</b>
3	<b>Email Marketing:</b> Introduction to email marketing, Building an email list, Creating effective email campaigns, Email automation and segmentation, Email marketing metrics and analytics Content Marketing: Understanding content marketing, Content strategy and planning, Content creation and distribution, Content promotion and amplification, Content marketing metrics and analytics	<b>11</b>



Program Name	<b>BCA</b>	Semester	<b>V</b>
Course Title	<b>Employability skills</b>		
Course Code:	<b>SEC-5</b>	No.of Credits	<b>03</b>
Contact hours	<b>48 Hours</b>	Duration of SEA/Exam	<b>2 hours</b>
Formative Assessment Marks	<b>40</b>	Summative Assessment Marks	<b>60</b>

Program Name	<b>BCA</b>	Semester	<b>VI</b>
Course Title	<b>Artificial Intelligence and Applications</b>		
Course Code:	DSC16	No.of Credits	<b>04</b>
Contact hours	<b>52 Hours</b>	Duration of SEA/Exam	<b>2 hours</b>
Formative Assessment Marks	<b>40</b>	Summative Assessment Marks	<b>60</b>

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

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

Unit	Description	Hours
<b>1</b>	<b>Introduction-</b> What is Artificial Intelligence, Foundations of AI, History, AI - Past, Present and Future. Intelligent Agents-Environments- Specifying the task environment, Properties of task environments, Agent based programs-Structure of Agents, Types of agents- Simple reflex agents, Model-based reflex agents, Goal-based agents; and Utility-based agents.	<b>13</b>
<b>2</b>	<b>Problem Solving by Searching-</b> Problem-Solving Agents, Well-defined problems and solutions, examples Problems, Searching for Solutions, Uninformed Search Strategies-Breadth-first search, Uniform-cost search, Depth-first search, Depth-limited search, Iterative deepening depth-first search, Bidirectional search, Greedy best-first search, A* Search, AO* search Informed (Heuristic) Search Strategies, Heuristic Functions	<b>13</b>
<b>3</b>	<b>Knowledge Representation -</b> Knowledge-Based Agents, The Wumpus World , Logic, Propositional Logic, Propositional Theorem Proving, Effective Propositional Model Checking, Agents Based on Propositional Logic, First-Order Logic-Syntax and Semantics of First-Order Logic, Using First-Order Logic, Unification and Lifting Forward Chaining, Backward Chaining.	<b>13</b>
<b>4</b>	<b>Learning-</b> Forms of Learning, Supervised Learning, Machine Learning - Decision Trees, Regression and Classification with Linear Models, Artificial Neural Networks, Support Vector Machines	<b>13</b>



Program Name	<b>B.C.A</b>	Semester	<b>VI</b>
Course Title	<b>PHP &amp; MySQL</b>		
Course Code:	DSC17	No.of Credits	<b>04</b>
Contact hours	<b>52 Hours</b>	Duration of SEA/Exam	<b>2 hours</b>
Formative Assessment Marks	<b>40</b>	Summative Assessment Marks	<b>60</b>

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

CO1. Design dynamic and interactive web pages and websites.

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

CO3. Handle databases like MySQL using PHP in websites.

Unit	Description	Hours
<b>1</b>	<b>Introduction to PHP:</b> Introduction to PHP, History and Features of PHP, Installation & Configuration of PHP, Embedding PHP code in Your Web Pages, Understanding PHP, HTML and White Space, Writing Comments in PHP, Sending Data to the Web Browser, Data types in PHP, Keywords in PHP, Using Variables, Constants in PHP, Expressions in PHP, Operators in PHP.	<b>13</b>
<b>2</b>	<b>Programming with PHP:</b> Conditional statements: if, if-else, switch, The ? Operator, Looping statements: while Loop, do-while Loop, for Loop Arrays in PHP: Introduction- What is Array?, Creating Arrays, Accessing Array elements, Types of Arrays: Indexed v/s Associative arrays, Multidimensional arrays, Creating Array, Accessing Array, Manipulating Arrays, Displaying array, Using Array Functions, Including and Requiring Files- use of Include() and Require(), Implicit and Explicit Casting in PHP.	<b>13</b>
<b>3</b>	<b>Using Functions , Class- Objects, Forms in PHP:</b> Functions in PHP, Function definition, Creating and invoking user-defined functions, Formal parameters versus actual parameters, Function and variable scope, Recursion, Library functions, Date and Time Functions Strings in PHP: What is String?, Creating and Declaring String, String Functions <b>Class &amp; Objects in PHP:</b> What is Class & Object, Creating and accessing a Class & Object, Object properties, object methods, Overloading, inheritance, Constructor and Destructor Form Handling:	<b>13</b>





Program Name	<b>B.C.A</b>	Semester	<b>VI</b>
Course Title	<b>PHP and MySQL Lab</b>		
Course Code:	<b>DSC17-Lab</b>	No.of Credits	<b>02</b>
Contact hours	<b>4 Hours per week</b>	Duration of SEA/Exam	<b>3 hours</b>
Formative Assessment Marks	<b>25</b>	Summative Assessment Marks	<b>25</b>

**Evaluation Scheme for Lab Examination:**

<b>Assessment Criteria</b>		
<b>Program-1</b>	<b>PART-A</b> <b>Writing:4 Marks Execution:4Marks</b>	<b>8 Marks</b>
<b>Program-2</b>	<b>PART-B</b> <b>Writing:6 Marks Execution:6Marks</b>	<b>12 Marks</b>
<b>Practical Record</b>		<b>05 Marks</b>
<b>Total</b>		<b>25 Marks</b>

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

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

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

Unit	Description	Hours
1	<b>Data Mining:</b> Introduction, Data Mining Definitions, Knowledge Discovery in Databases (KDD) Vs Data Mining, DBMS Vs Data Mining, DM techniques, Problems, Issues and Challenges in DM, DM applications.	<b>11</b>
2	<b>Data Warehouse:</b> Introduction, Definition, Multidimensional Data Model, Data Cleaning, Data Integration and transformation, Data reduction, Discretization	<b>11</b>
3	<b>Mining Frequent Patterns:</b> Basic Concept – Frequent Item Set Mining Methods -Apriori and Frequent Pattern Growth (FPGrowth) algorithms -Mining Association Rules	<b>10</b>
4	<b>Classification:</b> Basic Concepts, Issues, And Algorithms: Decision Tree Induction. Bayes Classification Methods, Rule-Based Classification, Lazy Learners (or Learning from your Neighbours), k Nearest Neighbour. Prediction - Accuracy- Precision and Recall <b>Clustering:</b> Cluster Analysis, Partitioning Methods, Hierarchical Methods, Density-Based Methods, Grid-Based Methods, Evaluation of Clustering	<b>10</b>
<b>Text Books:</b> <ol style="list-style-type: none"> <li>1. Jiawei Han and Micheline Kambar - “Data Mining Concepts and Techniques” Second Edition</li> <li>2. Arun K Pujari - “Data Mining Techniques” 4th Edition, Universities Press 3</li> <li>3. Pang-Ning Tan, Michael Steinbach, Vipin Kumar: Introduction to Data Mining, Pearson Education, 2012.</li> </ol>		



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

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

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

Unit	Description	Hours
<b>1</b>	<b>Android OS design and Features:</b> Android development framework, SDK features, Installing and running applications on Android Studio, Creating AVDs, Types of Android applications, Best practices in Android programming, Android tools, Building your First Android application.	<b>11</b>
<b>2</b>	<b>Android Application Design Essentials:</b> Anatomy of an Android applications, Android terminologies, Application Context, Activities, Services, Intents, Receiving and Broadcasting Intents, Android Manifest File and its common settings, Using Intent Filter, Permissions.	<b>11</b>
<b>3</b>	<b>Android User Interface Design Essentials:</b> User Interface Screen elements, Designing User Interfaces with Layouts, Drawing and Working with Animation. Testing Android applications, Publishing Android application, Using Android preferences, Managing Application resources in a hierarchy, working with different types of resources.	<b>10</b>
<b>4</b>	<b>Using Common Android APIs:</b> Using Android Data and Storage APIs, Managing data using Sqlite, Sharing Data between Applications with Content Providers, Using Android Networking APIs, Using Android Web APIs, Deploying Android Application to the World.	<b>10</b>

### Text Books:

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

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

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

### 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

Unit	Description	Hours
<b>1</b>	Web Content Development and Management, Content Types and Formats, Norms and Guidelines of Content Development, Creating Digital Graphics, Audio Production and Editing.	<b>11</b>
<b>2</b>	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.	<b>11</b>
<b>3</b>	Planning and Developing Dynamic Web Content Sites, Website Design Using CSS Creating and Maintaining a WIKI Site, Creating and Managing a Blog Site,	<b>10</b>
<b>4</b>	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,  Create and Add Assessment, Add and Enroll User and Discussion Forum, Content Management System: Joomla, Content Management System: Drupal	<b>10</b>

**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. Content Management Bible (2nd Edition) 2nd Edition by Bob Boiko.
4. Using Joomla!: Efficiently Build and Manage Custom Websites 2nd Edition by Ron Severdia

Additional Reading:

[https://onlinecourses.swayam2.ac.in/cec20\\_lb09/preview](https://onlinecourses.swayam2.ac.in/cec20_lb09/preview)

- Text Books:**
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Additional Reading:

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

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

[illegible]

Program Name	<b>B.C.A</b>	Semester	<b>VI</b>
Course Title	<b>Internship</b>		
Course Code:	<b>SEC-5</b>	No.of Credits	<b>02</b>
Contact hours	<b>30 Hours</b>	Duration of SEA/Exam	<b>2 hours</b>
Formative Assessment Marks	<b>20</b>	Summative Assessment Marks	<b>30</b>

### **GUIDELINES FOR CONDUCTING INTERNSHIP:**

Internships can cover a wide range of concepts and topics and some common concepts that can be covered under various types of internships:

- **Technical Skills**

- Depending on the field, interns can develop technical skills such as programming languages, software tools, data analysis, design software, and more.

- **Soft Skills:**

- Communication: Written and verbal communication skills, including effective email communication, presentations, and client interactions.
  - Teamwork: Collaborating with colleagues, working in cross-functional teams, and building effective relationships.
  - Time Management: Prioritizing tasks, managing deadlines, and staying organized.
  - Problem Solving: Analysing challenges, identifying solutions, and making informed decisions.
  - Adaptability: Handling changes, learning new processes, and adjusting to evolving situations.

- **Innovation and Entrepreneurship:**

- Exploring innovative business ideas, product development, market research, and business model creation.

- **Data Analytics and Interpretation:**

- Learning how to work with data, perform analysis, and derive insights to inform decision-making.

- **Leadership and Management:**

- Developing leadership skills, understanding different management styles, and learning how to motivate teams.



These are just a few examples of the many concepts that can be covered in internship programs. The specific concepts/coverage of the above will vary based on college infrastructure and faculty competence. It is important to tailor the internship experience to align with the interns' career goals and the industry needs.

**Evaluation:**

The report shall be prepared by the student under the guidance of the identified mentor in the college and submitted to the Head of the Department for evaluation. The report shall be evaluated by the two internal faculty members and submit the final sessional and summative marks to the university.

Program Name	<b>B.C.A</b>	Semester	<b>VI</b>
Course Title	<b>PROJECT WORK</b>		
Course Code:	<b>DSC18-Project</b>	No.of Credits	<b>06</b>
Contact hours	<b>12 Hours per week</b>	Duration of SEA/Exam	<b>3 hours</b>
Formative Assessment Marks	<b>75</b>	Summative Assessment Marks	<b>75</b>

## **PROJECT GUIDELINES**

**Preamble:** Project work has been made a part of BCA course to give students exposure to Software development exercises. The primary emphasis of the project work is to understand and gain the knowledge of the principles of software engineering practices. As such, during the development of the project students shall involve themselves in all the stages of the software development life cycle (SDLC) like requirements analysis, systems design, software development/coding, testing and documentation with an overall emphasis on the development of reliable software systems. Since, the project work spans over the entire final semester, the students shall be advised to take up projects for solving problems of software industry or any research organization or the real life problems suggested by the faculty in- charge of BCA project work in the Institutions. Topic chosen of work must be nontrivial, analytical and application-oriented. It must involve substantial original work and/or development effort based on the theme. Solved, off-the-shelf and pirated work is not entertained .Any attempt of plagiarism or use of unfair means will result in rejection of the work. All activities of the Project Development must be time-bound and the equal participation of the team members expected throughout the Development process.

## **GENERAL GUIDELINES TO THE INSTITUTIONS**

- Calendar of Project Work shall be announced before the commencement of the Sixth semester. Calendar should contain tentative schedules for the submission of Project Proposal, Project Acceptance, Project Synopsis, Problem Analysis Document, System Design Document, Database Design , Detailed Design , Coding and Testing , Final Report, Internal Assessment exams (at least two), Viva/Voce etc.

- Students shall undertake projects with real life problems (that has direct relevance in day-to-day activities or to knowledge extension) either in their Colleges or in industry/research and development laboratories/software companies as recommended by the faculty in-charge of BCA project work in the Institutions. If a student intends to do industry project, the faculty in-charge shall ensure that the projects are genuine and original in nature.
- There shall be not more than three members in a Project team.
- At least two internal assessment exams shall be conducted to evaluate the progress made by the students at different stages of project work. Such exams may include written tests, document verification and presentations, work demonstration, group discussion, viva-voce etc. so as to objectively assess the understanding gained by the students in course of their project work.

## **PROJECT VALUATION**

External and Internal Examiners together conduct project valuation objectively. To begin with, the finer details about various points contained in the scheme of valuation may be conclusively agreed upon through mutual consultation. During project evaluation, a student shall present his/her work through live demonstration of the software application developed as a part of project. However, if live demonstration is not possible due to the reason that some companies do not divulge source code on account of ownership rights or copyrights, students may be allowed to make PPT presentation of their authentic works. In such cases, candidates shall produce necessary declarations issued by the companies to this effect. However, students shall be enabled to present their work in entirety. The primary objective of project evaluation shall be to assess the extent of effort that was put in to meet the objectives of the project and also to gauge the understanding gained by the students in course of their project works. While evaluating Project Reports, examiners shall scrutinize whether Software Development Life Cycle (SDLC) principles have been consistently followed in the project work and the same are documented well in the Reports. However, the relative and overall emphasis of these principles to a particular problem domain chosen may be taken into account so that project evaluations remain fair and objective.

## SCHEME OF VALUATION AND MARKS DISTRIBUTION

	Particulars	Marks
<b>Internal Assessment</b>		
	Progress assessment for three Times @ 25 marks at each time	75
<b>Project Report Valuation :50 marks</b>		
1	Innovativeness and utility of the project for Industry/Academic or Society(Utility)	05
2	Related studies about the project (Adequacy)	05
3	Project plan & implementation-target achieved/output delivered(effectiveness)	
	3.1 Problem Analysis	05
	3.2 System Design	05
	3.3 Database Design	05
	3.4 Detailed Design	05
	3.5 Implementation	10
	3.6 Testing	05
4	Other mandatory documents & information (certificates, contents, tables, figures, bibliography etc.)	05
<b>Viva-Voce : 25 marks</b>		
1	Live Demonstration (Software execution) or Dry runs (Presentation of authentic screenshots or captured videos may be used to walk through complete scenarios)-consistency and completeness	15
2	Question and Answer (Oral only or Oral and written)	10
<b>Total Marks</b>		150

## **FORMAT OF PROJECT SYNOPSIS**

Synopsis is a brief outline or general view, as of a subject or written work; an abstract or a summary of the Project Work. It must be as brief (NOT MORE THAN 20 A4 sized paper pages) as is sufficient enough to explain the objective and implementation of the project that the candidate is going to take up.

*The write up must adhere to the guidelines and should include the following:*

1. Title of the Project.
2. Introduction, objectives and scope of the Project.
3. Project category (Database/ Web Application/ Client-server/ Networking/ Multimedia/ Gaming/ Simulation etc).
4. Tools / Platform, Hardware and Software Requirement specifications.
5. Analysis (DFDs at least up to second level, ER Diagrams/ Class Diagrams, Database Design etc, as per the project requirements).
6. A complete structure which includes: Number of modules and their description to provide an estimation of the students effort on the project, Data Structures as per the project requirements for all the modules, Process logic of each module, testing process to be used, reports generation (Mention tentative content of report).
7. Whether Industry Defined/Client Defined/User Defined Project? Mention the type. Mention the name and Address of the Industry/Client.
8. Limitation of the project.
9. Future scope and further enhancement of the project.

# **GUIDELINES FOR PREPARATION OF DISSERTATION**

## **1. ORGANISATION OF THE DISSERTATION**

The dissertation shall be presented in a number of chapters; starting with Introduction and ending with Conclusion. Each of the chapters will have precise title reflecting the contents of the chapter. A chapter can be subdivided into sections, sub-sections and sub-sub-section so as to present the content discretely and with due emphasis.

### **Sequence of items in Dissertation Report**

The following sequence may be followed in the preparation of the final dissertation report:

- Cover Page (On the hardbound cover)
- Title Page (Inner Cover Page)
- Certificate from the Institute
- Certificate from the Company
- Declaration
- Acknowledgement
- (Detailed) Table of Contents (with page numbers).
- List of Figures(with figure number, figure titles and page numbers)
- List of Tables with table number, table title and page number.
- Chapters

#### **1. Introduction**

- a. Introduction of the System
  - i. Project Title
  - ii. Category
  - iii. Overview
- b. Background
  - i. Introduction of the Company
  - ii. Brief note on Existing System
- c. Objectives of the System
- d. Scope of the System
- e. Structure of the System
- f. System Architecture
- g. End Users
- h. Software/Hardware used for the development
- i. Software/Hardware required for the implementation

#### **2. SRS**

- a. Introduction (Brief write-up about SRS)
- b. Overall Description
  - i. Product perspective
  - ii. Product Functions
  - iii. User characteristics.
  - iv. General constraints
  - v. Assumptions
- c. Special Requirements (Software / Hardware-if any)

- d. Functional requirement.
  - i. Module 1
  - ii. Module 2
- e. Design Constraints
- f. System Attributes
- g. Other Requirements (if any)

### **3. System Design (Functional Design)**

- a. Introduction (brief write-up about System Design)
- b. Assumptions and Constraints
- c. Functional decomposition
- d. Description of Programs
  - i. Context Flow Diagram (CFD)
  - ii. Data Flow Diagrams (DFDs-Level 0, Level 1, Level 2)
- e. Description of components
  - i. Functional component 1
  - ii. Functional component 2

### **4. Database Design (or Data structure)**

- a. Introduction (brief write-up about Database design)
- b. Purpose and scope
- c. Table Definition
- d. ER diagram

### **5. Detailed Design (Logic design of modules)**

- a. Introduction (brief write-up about Database design)
- b. Structure of the software package (structure chart)
- c. Modular decomposition of the System
  - i. Module1
    - 1. Inputs
    - 2. Procedural details
    - 3. File I/O interfaces
    - 4. Outputs
    - 5. Implementation aspects (if any)
  - ii. Module 2 .....

### **6. Program code listing**

- a. Database connection
- b. Authorization / Authentication
- c. Data store / retrieval /update
- d. Data validation
- e. Search
- f. Named procedures / functions
- g. Interfacing with external devices (if any)
- h. Passing of parameters
- i. Backup/recovery
- j. Internal documentation

### **7. User Interface (Screens and Reports)**

- a. Login
- b. Main Screen / Home page
- c. Menu
- d. Data store / retrieval / update

- e. Validation
- f. View
- g. On screen reports
- h. Data Reports
- i. Alerts
- j. Error messages

## **8. Testing**

- a. Introduction (brief write-up about Software Testing)
  - i. Unit Testing
  - ii. Integrate Testing
  - iii. System Testing
- b. Test Reports

- Conclusion
- Limitations
- Scope for enhancement (future scope)
- Abbreviations and Acronyms (list)
- Bibliography / References (list in specified format)

**Do not include any header or footer in any page of the report.** Only page numbers should be mentioned at the bottom center of each page. 'n' copies of dissertation along with soft copy in CD should be prepared by the candidate.

## **2. DISSERTATION FORMAT**

### **2.1 Paper**

#### **2.1.1 Quality**

The dissertation shall be printed on white bond paper, whiteness 95% or above, weight 70 gram or more per square meter.

#### **2.1.2 Size**

The size of the paper shall be standard A4; height 297 mm, width 210 mm.

#### **2.1.3 Type-Setting, Text Processing and Printing**

The text shall be printed employing LaserJet or Inkjet printer, the text having been processed using a standard text processor. The standard font shall be Times New Roman of 12 pts with 1.5 line spacing.

#### **2.1.4 Page Format**

- The printed sheets shall have the following writing area and margins:
- Top margin .5"
- Bottom margin .5"
- Left margin 1"
- Right margin .75"



### 2.1.5 Pagination

Page numbering in the text of the dissertation shall be numerals starting from '1' **at the center of the footer**. The text of the written dissertation shall not be less than 60 pages excluding references, tables, questionnaires and other annexure.

**Pagination for pages before the Introduction chapter shall be in lower case Roman numerals, e.g., 'iv'.**

### 2.1.6 Paragraph format

- Vertical space between paragraphs shall be about 2.5 line spacing.
- The first line of each paragraph should normally be indented by five characters or 12 mm. A candidate may, however, choose not to indent if (s) he has provided sufficient paragraph separation.
- A paragraph should normally comprise more than one line. A single line of a paragraph shall not be left at the top or bottom of a page (that is, no windows or orphans should be left). The word at the right end of the first line of a page or paragraph should, as far as possible, not be hyphenated.

## 2.2 Chapter and Section format

### 2.2.1 Chapter

Each chapter shall begin number (in Hindu on a fresh page with an additional top margin of about 75 mm. Chapter Arabic) and title shall be printed at the center of the line in 6 mm font size (18 pt) in bold face using both upper and lower case (all capitals or small capitals shall not be used). A vertical gap of about 25 mm shall be left between the chapter number and chapter title lines and between chapter title line and the first paragraph.

### 2.2.2 Sections and Sub sections

A chapter can be divided into Sections, Sub sections and Sub different concepts separately. Sections and sub-- sub sections so as to present sections can be numbered using decimal points, e.g., 2.2 for the second Section in Chapter 2 and 2.3.4 for the fourth Sub Sections and Sub-- section in third Section of Chapter 2. Chapters, Sections shall be included in the Contents with page numbers flushed to the right. Further subsections need not be numbered or included in the contents. The Sections and Sub sections titles along with their numbers in 5 and 4mm (16 and 14 pt) fonts, respectively, in bold face shall be flushed to the left (not centered) with 15 mm space above and below these lines. In further subdivisions character size of 3 and 3.5 with bold face, small caps, all caps and italics may be used for the titles flushed left or centered. These shall not feature in the contents.

### 2.2.3 Table / Figure Format

As far as possible tables and figures should be presented in portrait style. Small size table and figures (less than half of writing area of a page) should be incorporated within

the text, while larger ones may be presented in separate pages. Table and figures shall be numbered chapter wise. For example, the fourth figure in Chapter 5 will bear the number Table Figure 5.4 or Fig.5.4

**Table number and title will be placed above the table while the figure number and caption will be located below the figure.** Reference for Table and Figures reproduced from elsewhere shall be cited in the last and separate line in the table and figure caption, e. g. (after McGregor [12]).

### **3. AUXILIARY FORMATS**

#### **a. Binding**

The dissertation shall be hard cover bound in leather or rexin.

#### **b. Front Covers**

The front cover shall contain the following details:

- Full title of dissertation in 6 mm 22 point size font properly centered and positioned at the top.
- Full name of the candidate in 4.5 mm 15 point size font properly centered at the middle of the page.
- A 40 mm dia replica of the college emblem followed by the name of the Department and the year of submission, each in a separate line and properly centered and located at the bottom of the page.

##### **i. Lettering**

All lettering shall be embossed in gold.

##### **ii. Bound back**

The degree, the name of the candidate and the year of submission shall also be embossed on the bound (side) in gold.

#### **c. Blank sheets**

In addition to the white sheets (binding requirement) two white shall be put at the beginning and end of the dissertation.

#### **d. Title sheet**

This shall be the first printed page of the dissertation and shall contain the submission statement: the Dissertation submitted in partial fulfillment of the requirements of the BCA, the name and Roll No. Of the candidate, name (s) of the supervisor and co- supervisor (s) (if any), Department and year of submission.