



MANGALORE UNIVERSITY

State Education Policy – 2024 [SEP-2024]

CURRICULUM STRUCTURE

FOR

BCA

BACHELOR OF COMPUTER APPLICATIONS

Semester VI								
Sl. No	Course Code	Title of the Course	Category of Courses	Teaching Hours per Week	SE E	IA	Total Marks	Credits
1	BCACAC S601	Artificial Intelligence and Applications	Core	3	80	20	100	3
2	BCACAC S602	Fundamentals of Data Science	Core	3	80	20	100	3
3	BCACAP S603	Artificial Intelligence-Lab	Practical	4	40	10	50	2
4	BCACAP S604	Fundamentals of Data Science-Lab	Practical	4	40	10	50	2
5	BCACAP S605	Research Methodology+ Project Work	Project Work	22	400	100	500	12
Sub - Total				36	640	160	800	22

SEMESTER VI

Program Name	BCA-GENERAL	Semester	VI
Course Title	Artificial Intelligence and Applications (Theory)		
Course Code:	BCACACS601	No.of Credits	03
Contact hours	39 Hours	Duration of SEA/Exam	3 Hours
Formative Assessment Marks	20	Summative Assessment Marks	80

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
1	Introduction- What is AI, Foundations of Artificial Intelligence, History of Artificial Intelligence, State of the Art. Intelligent Agents: Agents and Environments, Good Behaviour: The Concept of Rationality, Nature of Environments, Structure of Agents.	13
2	Solving Problems by Searching: Problem-Solving Agents, Example Problems, Searching for Solutions, Uninformed Search Strategies, Avoiding Repeated States, Searching with Partial Information	13

	Informed Search and Exploration: Informed (Heuristic) Search Strategies, Heuristic Functions, Local Search Algorithms and Optimization Problems	
3	Logical Agents: Knowledge –Based Agents, The Wumps World, Logic, Propositional Logic: A Very Simple Logic, Reasoning Patterns in Propositional Logic, Effective propositional inference, Agents Based on Propositional Logic. First Order Logic: Representation Revisited, Syntax and Semantics of First Order Logic, Knowledge Engineering in First-Order Logic. Inference in First-Order Logic: Propositional vs. First-Order Inference, Unification and Lifting, Forward Chaining, Backward Chaining.	13
4	Learning– Forms of Learning, Supervised Learning, Machine Learning - Decision Trees, Regression and Classification with Linear Models, Artificial Neural Networks, Support Vector Machines Applications of AI - Natural Language Processing, Text Classification and Information Retrieval, Speech Recognition , Image processing and computer vision, Robotics	13
Text Book: 1. Stuart Russel, Peter Norvig: Artificial Intelligence A Modern Approach, 2nd Edition, Pearson Education, 2003 Reference Books: 1. Tom Mitchell, “Machine Learning”, 1st Edition, McGraw-Hill, 2017 2. Elaine Rich, Kevin Knight, Shivashankar B Nair: Artificial Intelligence, Tata McGraw Hill 3rd edition.		

Pedagogy: Lecture/ PPT/ Videos/ Animations/ Quizzes/ Mini Projects/Group Discussion/ Experiential Learning etc.

Program Name	BCA-GENERAL	Semester	VI
Course Title	Fundamentals of Data Science (Theory)		
Course Code:	BCACACS602	No.of Credits	03
Contact hours	39 Hours	Duration of SEA/Exam	3 Hours
Formative Assessment Marks	20	Summative Assessment Marks	80

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	Data Mining: Introduction, Data Mining as a subject, Definitions, Knowledge Discovery in Databases (KDD) Vs Data Mining, DBMS Vs Data Mining, DM techniques, Problems, Issues and Challenges in DM, DM applications.	13
2	Data Warehouse: Introduction- What is Data Warehouse, Difference between Operational Database System and Data Warehouses, Multidimensional Data Model- From Tables and Spreadsheets to Data Cubes, Stars, Snowflakes, and Fact Constellations, OLAP Operations in the Multidimensional Data Model. Data Warehouse Architecture- A Three-Tier Architecture, Metadata Repository. Data Processing: Why Preprocess the Data, Data Cleaning- Missing Value, Noisy Data. Data Integration and transformation- Data Integration (Definition), Data Transformation.	13

3	Mining Frequent Patterns: Basic Concept –Market Basket Analysis, Frequent Item Set Mining Methods, frequent Pattern Mining. Apriori algorithm, Generating Association Rule, Improving the efficiency of Apriori. Mining Association Rules- Mining Multilevel Association Rules, Mining Multidimensional Association Rules, and Constraint based Association Mining.	13
4	Classification: Basic Concepts, Issues, Decision Tree Induction, Attribute Selection Measures (Definition and formula -Information gain, Gain ratio, Gini index). Bayesian Classification: Bayes’ Theorem, Rule-Based Classification, k Nearest Neighbor. Prediction: Linear Regression, Nonlinear Regression. Clustering: Cluster Analysis, A Categorization of Major Clustering Methods Partitioning Methods: k-means.	13
Text Books: 1. Arun K Pujari – “Data Mining Techniques” 3rd Edition, Universities Press 2. Jiawei Han and Micheline Kambar – “Data Mining Concepts and Techniques” Second Edition Reference Books: 1. Pang-Ning Tan, Michael Steinbach, Vipin Kumar: Introduction to Data Mining, Pearson Education, 2012. 2. 4 K.P.Soman, Shyam Diwakar, V.Ajay: Insight into Data Mining – Theory and Practice, PHI 5 3. Pang-Ning Tan, Michael Steinbach, Vipin Kumar - “Introduction to Data Mining”, Pearson Education		

Pedagogy: Lecture/ PPT/ Videos/ Animations/ Quizzes/ Mini Projects/Group Discussion/ Experiential Learning etc

Program Name	BCA-GENERAL	Semester	V
Course Title	Artificial Intelligence Lab		
Course Code:	BCACAPS603	No.of Credits	02
Contact hours	52 Hours	Duration of SEA/Exam	3 Hours
Formative Assessment Marks	10	Summative Assessment Marks	40

Sl. No.	PART-A Programs
1	Write a program to simulate a simple vacuum cleaner agent
2	Write a program to implement a rule-based chatbot
3	Write a program to implement Forward Chaining.
4	Write a program to check palindrome using AI search approach.
5	Write a program to sort a list using simple heuristic logic
6	Write a Python program to simulate a goal-based agent that finds a path from a start position to a goal position in a maze.
PART-B	
1	Write a Program to Implement the Greedy Best-First Search algorithm to find a path between two nodes in a graph.
2	Write a Program to implement Tic-Tac-Toe game using Python.

3	Write a Program to Implement 8-Puzzle problem using Python
4	Write a Program to Implement Water-Jug problem using Python.
5	Write a Program to Implement Tower of Hanoi using Python.
6	Write a Python program to represent facts and rules using propositional logic and perform simple inference.

Evaluation Scheme for Lab Examination:

Assessment Criteria		
Program-1	PART-A Writing-5, Logic- 5, Execution -5 Marks	15 Marks
Program-2	PART-B Writing-5, Logic- 10, Execution -5 Marks	20 Marks
Practical Record		05 Marks
Total		40 Marks

Program Name	BCA-GENERAL	Semester	V
Course Title	Fundamentals of Data Science-Lab		
Course Code:	BCACAPS604	No.of Credits	02
Contact hours	52 Hours	Duration of SEA/Exam	3 Hours
Formative Assessment Marks	10	Summative Assessment Marks	40

Sl. No.	PART-A Programs
1	Write a Python program to perform data preprocessing techniques such as handling missing values, removing noisy data, and transforming datasets.
2	Write a Python program to create and display a simple multidimensional data cube for sales data using rows, columns, and measures.
3	Write a Python program to perform OLAP operations such as roll-up, drill-down, slice, and dice on a sample dataset.
4	Write a Python program to calculate Information Gain, Gain Ratio, and Gini Index for attribute selection in Decision Tree classification.
5	Consider a dataset with varied numerical scales (e.g., Age ranging from 20–60, and Income ranging from ₹20,000–₹150,000). Write Python program to Implement Min-Max Normalization to scale the features strictly between 0 and 1. Also to Implement Z-Score Standardization to centre the data around a mean of 0 with a standard deviation of 1.
6	Write a Python program to perform cluster analysis using the K-Means algorithm and visualize the formed clusters using graphs.

PART-B Programs	
1	Write a Python program to implement the Apriori algorithm for discovering frequent itemsets from a transactional dataset and display the frequent itemsets based on minimum support threshold.
2	Write a Python program to generate Association Rules from frequent itemsets using support, confidence, and lift measures.
3	Write a Python program to implement Decision Tree classification using a suitable dataset and evaluate the classifier performance using accuracy metrics.
4	Write a Python program to implement the Naïve Bayes classifier for predicting class labels from a suitable dataset.
5	Write a Python program to implement K-Nearest Neighbors (KNN) classification using the Iris dataset and classify flower species based on feature values.
6	Write a Python program to implement Linear Regression analysis for predicting student marks based on study hours or similar numerical data.

Evaluation Scheme for Lab Examination:

Assessment Criteria		
Program-1	PART-A Writing-5, Logic- 5, Execution -5 Marks	15 Marks
Program-2	PART-B Writing-5, Logic- 10, Execution -5 Marks	20 Marks
Practical Record		05 Marks
Total		40 Marks

Program Name	BCA-GENERAL	Semester	VI
Course Title	Research Methodology+ Project Work		
Course Code:	BCACAPS605	No.of Credits	12
Contact hours	22 Hours	Duration of SEA/Exam	3 Hours
Formative Assessment Marks	100	Summative Assessment Marks	500

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
Internal Assessment:100		
	Progress assessment for TWO times @ 50 marks at each time	100
Project Report Valuation :300 marks		
1	Introduction	20
2	Related studies about the project	20
3	Project plan & implementation-target achieved/output delivered(effectiveness)	250
4	Other mandatory documents & information (certificates, contents, tables, figures, bibliography etc.)	10
Viva-Voce: 100 marks		
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	80
2	Question and Answer (Oral only or Oral and written)	20
Grand Total Marks		500

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 student's 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 in to 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 hardboundcover)
- 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)

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 margin1”

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

1.1 Binding

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

1.2 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.

1.2.1 Lettering

All lettering shall be embossed in gold.

1.2.2 Bound back

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

1.3 Blank sheets

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

1.4 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.

Questions Paper for Pattern Core Subjects

Duration:3 Hours

Max.Marks:80

Note: Answer any ten Questions from Part-A. And one full Questions from each unit in Part-B

PART A

1. Answer any 10 questions

$10 \times 2 = 20$

- a.
- b.
- c.
- d.
- e.
- f.
- g.
- h.
- i.
- j.
- k.
- l.

PART B

There are 4 Units - UNIT-I, II, III, IV

Each unit contains 2 main questions and it carry 15 Marks. $4 \times 15 = 60$

Each main question contains 2 or more sub questions.

UNIT-I

2. a)

b)

c)

3. a)

b)

c)

Same pattern for UNIT – II , UNIT - III and UNIT – IV
